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Bījagaṇita of Bhāskara

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I Introduction

I.1 Text

This is a makeshift edition of Bhāskara's *Bījagaṇita* (hereafter BG). It consists of 102 Sanskrit verses for mathematical rules and 110 Sanskrit verses for examples and many of the former category and almost all of the latter are commented on by the author himself in Sanskrit prose. The work has been printed many times (see CESS, A4, 311b). The present edition is based on the latest seven printed books. They are as follows (in the alphabetical order of the abbreviations).

A: Acyutānanda Jhā's edition. Edited with Jīvanātha Jhā's Sanskrit commentary *Subodhinī* and the editor's own Sanskrit and Hindi commentaries. The manuscript(s) used is (are) not mentioned. Very close to Muralīdhara Jhā's edition (see 'M' below). Lacks Bhāskara's own commentary on the last example of Chapter 9 (BG E88p).

F: François Patte's critical edition of Sūryadāsa's commentary *Sūryaprakāśa* on the BG up to the kuṭṭaka section. Based on six manuscripts, but only two of them contain the BG itself (without the prose parts). Since the same two manuscripts are used also in Jain's edition (see 'J' below), I have not mentioned this edition in the critical apparatus except for one case (footnote for BG 32).

G: Girijāprasāda Dvivedī's edition of the BG together with the Sanskrit commentary *Vilāsi* and the Hindi Commentary *Mitākṣara* of his father Durgāprasāda Dvivedī. Several footnotes refer to variant readings of mūla- and ṭīkā-pustakas, although we cannot identify them.

J: Pushpa Kumari Jain's critical edition of Sūryadāsa's commentary *Sūryaprakāśa* on the BG up to the kuṭṭaka section. Based on twelve manuscripts (oldest of which is dated Saṃvat 1609 = AD 1552), but only three of them contain the BG itself (without the prose parts). See J(H), J(L) and J(S) in the 'Additional abbreviations' below.

M: Muralīdhara Jhā's re-edition of the text edited by Sudhākara Dvivedī (Benaress 1888) with Sudhākara's and the editor's own mathematical comments in footnotes. Some of their comments refer to the text readings but all of them are meant for proposing better readings without documentation.

P: Poona edition of Kṛṣṇa's commentary *Bījapallava* (alias *Navāṅkra*) on the BG. Based on six manuscripts (oldest of which is dated Saṃvat 1761 = AD 1704) without critical apparatus. Does not contain the prose parts of the BG except for those quoted by Kṛṣṇa.

T: Tanjore edition of Kṛṣṇa's commentary *Bījapallava* (alias *Navāṅkra*) on the BG. Based on the oldest datable (11 April 1601 Julian) manuscript of the commentary. Only three footnotes (on pp. 2, 3, and 8) refer to the readings of the

manuscript. The corrigenda (śuddhāśuddha-patrikā), printed on the five pages that precede the text, may include corrections not only of printing errors but also of errors in the manuscript. Does not contain the prose parts of the BG except for those quoted by Kṛṣṇa.

Out of these, only A, G, and M contain both metrical and prose parts; the other four editions contain only the metrical parts.

I.2 Abbreviations

In addition to those defined in the previous section, I use the following abbreviations.

BSS: *Brāhmasphuṭasiddhānta* of Brahmagupta.
C: Colebrooke's English translation of the BG.
CV: Vṛddhacāṇakya, textus ornatior version.
GA: *Golādhyāya* of Bhāskara.
J(H): British Museum manuscript 447 used for J. 19th century.
J(L): Akhila Bhāratīya Saṃskṛta Pariṣad (Lucknow) manuscript, 4514, used for J (the BG verses are available up to BG 21). Dated Saṃvat 1745 = AD 1688.
J(S): British Museum manuscript 448 used for J. 19th century.
L: *Līlāvatī* of Bhāskara.
L(ASS): Ānandāśrama edition of the L.
L(VIS): Hoshiarpur edition of the L.
P(K): Prose part of the BG cited by Kṛṣṇa in P.
PPM(Wai): Prājña Pāṭhaśālā Maṇḍala, Wai.
SS: *Siddhāntaśiromaṇi* of Bhāskara.
SSe: *Siddhāntaśekhara* of Śrīpati.
T(cor): Corrigenda (śuddhāśuddhapatrikā) of T.
T(K): Prose part of the BG cited by Kṛṣṇa in T.
T(Ms): Tanjore manuscript D 11523 used for T.

I.3 Notation

BG n: the n-th verse for mathematical rules of the BG. I do not mention 'BG' when there is no fear of confusion, in this and the next three cases.
BG En: the n-th verse for examples of the BG.
BG Qn: the n-th quoted verse in the prose auto-commentary of the BG.
BG np/Enp: the prose commentary that occurs immediately after verse n/En. I divide it in paragraphs with serial numbers (np1, np2, etc.) when appropriate. np0/Enp0 denotes the introductory paragraph for verse n/En or for verses beginning with n/En.
⌊ ⌋ : enclosure for displayed numerical expressions. It is commonly used in Sanskrit

mathematical manuscripts, especially when the numerical expressions have more than one line, although it is not used in AMG.

$\langle x \rangle$: x was added by me. This notation is not used for the chapter headings and the section headings, all of which were supplied by me.

x T1] y T2: the text T2 reads y for x of the text T1 which is accepted in the present edition.

$\emptyset$: non-existence.

I.4 Publishing Information

A: *The Bījagaṇita: Elements of Algebra of Śrī Bhāskarācārya*, edited and compiled with the *Subodhinī* Sanskrit Commentary of Jīvanātha Jhā and the *Vimalā* Exhaustive Sanskrit & Hindi commentaries, Notes, Exercies, Proofs, etc. by Acyuthānanda Jhā. Kashi Sanskrit Series 148. Benares: Chowkhamba Sanskrit Office, 1949.

BSS: *Brāhmasphuṭasiddhānta* of Brahmagupta, edited with the editor's own commentary in Sanskrit by Sudhākara Dvivedī. Benares: Medical Hall Press, 1902.

C: *Algebra with Arithmetic and Mensuration from the Sanscrit of Brahmegupta and Bha′scara*, by Henry Thomas Colebrooke. London: John Murray, 1817. Reprinted under the title, *Classics of Indian Mathematics*, with a foreword by S. R. Sarma. Delhi: Sharada Publishing House, 2005.

CESS: *Census of the Exact Sciences in Sanskrit*, by David Pingree. Ser. A, 5 vols. Memoire of the American Philosophical Society 81, 86, 111, 146, and 213. Philadelphia: American Philosophical Society, 1970, 71, 76, 81, and 94.

CNTT: *Cāṇakya-Nīti-Text-Tradition*, by Ludwik Sternbach, 2 vols. in 5 pts., Vishveshvaranand Indological Series 2 and 29, Hoshiarpur: Vishveshvaranand Vedic Reasearch Institute, 1963–70.

CV: 'Vṛddha-Cāṇakya: Textus Ornatior Version,' CNTT vol. 1, pt. 1, pp. 1–104.

F: *Le Siddhāntaśiromaṇi I-II: Édition, traduction et commentaire*, par François Patte avec une préface de Pierre-Sylvain Filliozat. Hautes Études Orientales 38. Volume I: Text et Volume II: Traduction. Genève: Librairie Droz, 2004.

G: *Bījagaṇitam*, edited with Durgāprasāda Dvivedī's Sanskrit and Hindi commentaries by Girijāprasāda Dvivedī. 3rd ed. Lakṣmaṇapura: Kesarīdās Seṭh, 1941.

GA: See 'SS' below.

J: *The Sūryaprakāśa of Sūryadāsa: A Commentary on Bhāskarācārya's Bījagaṇita, Volume 1: A Critical Edition, English Translation and Commentary for the Chapters, Upodghāta, Ṣaḍvidhaprakaraṇa and Kuṭṭakādhikāra*, by Pushpa Kumari Jain. Gaekwad's Oriental Series 182. Vadodara: Oriental Institute, 2001.

L(ASS): *Līlāvatī* of Bhāskara, edited with Gaṇeśa's *Buddhivilāsinī* and Mahīdhara's *Līlāvatīvivaraṇa* by Dattātreya Āpaṭe, et al. Ānandāśrama Sanskrit Series 107, 2 vols. Poona: Ānandāśrama Press, 1937.

L(VIS): *Līlāvatī* of Bhāskara, edited with Śaṅkara and Nārāyaṇa's *Kriyākramakarī* by K. V. Sarma. Vishveshvaranand Indological Series 66, Hoshiarpur: Vishveshvaranand Vedic Reasearch Institute, 1975.

M: *Bījagaṇita: Elements of Algebra of Śrī Bhāskarācārya, with Expository Notes and Illustrative Examples by M. M. Pandit Śrī Sudhākara Dvivedī*, ed. with further notes by Mahāmahopadhyāya Pandit Śrī Muralīdhara Jhā. Benares Sanskrit Series 159. Benares: Krishna Das Gupta, 1927.

P: *Bhāskrarīya-bījagaṇitam*, edited with Kṛṣṇa's *Navāṅkura* by Dattātreya Āpaṭe, et al. Ānandāśrama Sanskrit Series 99. Poona: Ānandāśrama Press, 1930.

SS: *Siddhāntaśiromaṇi of Bhāskarācārya*, edited with the auto-commentary *Vāsanābhāṣya* and *Vārtika* of Nṛsiṃha Daivajña by Murali Dhara Chaturvedi. Library Rare Text Publication Series 5. Varanasi: Sampurnanand Sanskrit University, 1981.

SSe: *Siddhāntaśekhara* of Śrīpati, edited with Makkibhaṭṭa's *Gaṇitabhūṣana* and the editor's *vivaraṇa* by Babuāji Miśra. 2 parts. Calcutta: University of Calcutta, 1932/47.

T: *Bījapallavam: A Commentary on Bījagaṇita, the Algebra in Sanskrit*, edited with Preface by T. V. Radhakrishna Sastri. Madras Government Oriental Series 67 (Tanjore Saraswathi Mahal Series 78). Tanjore: TMSSM Library, 1958.

II Bījaganita

II.1 Dhanarṇa-ṣaḍvidha

utpādakaṃ yat pravadanti buddher 1
adhiṣṭhitaṃ satpuruṣeṇa sāṃkhyāḥ/
vyaktasya kṛtsnasya tad ekabījam
avyaktam īśaṃ gaṇitaṃ ca vande//1//

pūrvaṃ proktaṃ vyaktam avyaktabījaṃ 2
prāyaḥ praśnā no vināvyaktayuktyā/
jñātuṃ śakyā mandadhībhir nitāntaṃ
yasmāt tasmād vacmi bījakriyāṃ ca//2//[1]

dhanarṇasaṃkalane karaṇasūtraṃ vṛttārdham/3abp0/

yoge yutiḥ syāt kṣayayoḥ svayor vā 3ab
dhanarṇayor antaram eva yogaḥ/3ab/[2]

udāharaṇam/E1p0/

rūpatrayaṃ rūpacatuṣṭayaṃ ca E1
kṣayaṃ dhanaṃ vā sahitaṃ vadāśu/
svarṇaṃ kṣayasvaṃ ca pṛthak pṛthak ced
dhanarṇayoḥ saṃkalanām avaiṣi//E1//[3]

atra rūpāṇām avyaktānāṃ cādyākṣarāṇy upalakṣaṇārthaṃ lekhyāni/ tathā yāny ṛṇagatāni tāny ūrdhvabindūni ca/ nyāsaḥ/ rū $\dot{3}$ rū $\dot{4}$/ yoge jātam rū $\dot{7}$/ nyāsaḥ/ rū 3 rū 4/ yoge jātam rū 7/ nyāsaḥ/ rū 3 rū $\dot{4}$/ yoge jātam rū $\dot{1}$/ nyāsaḥ/ rū $\dot{3}$ rū 4/ yoge jātam rū 1// evaṃ bhinneṣv api//E1p//[4]

dhanarṇavyavakalane karaṇasūtraṃ vṛttārdham/3cdp0/

saṃśodhyamānaṃ svam ṛṇatvam eti 3cd

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[1] vyaktam AMGTPJJ(HL)] vyaktām J(S); praśnā no AMGTPJJ(HS)] praśnānno J(L); śakyā manda AMGTPJJ(HS)] śattyāmīda J(L).

[2] syāt kṣayayoḥ AMGTPJJ(LS)] tkṣayayoḥ J(H).

[3] kṣayasvaṃ JJ(L)] kṣayaṃ svaṃ AMG, kṣayaḥ svaṃ TPJ(HS); pṛthak ced J(HS)] pṛthaṅme AGMTJJ(L), pṛthaktve P.

[4] nyāsaḥ/ (2nd, 3rd, 4th) G] " AM; jātam (1st) G] jātaṃ A, jāta M; rū $\dot{7}$ AM] rū 7 G; yoge jātam (2nd, 3rd, 4th) G] " AM; bhinneṣv api// AM] bhinneṣvapi iti dhanarṇasaṃkalanā/ G.

svatvaṃ kṣayas tadyutir uktavac ca//3cd//

udāharaṇam/E2abp0/

trayād dvayaṃ svāt svam ṛṇād ṛṇaṃ ca E2ab
vyastaṃ ca saṃśodhya vadāśu śeṣam/E2ab/

nyāsaḥ/ rū 3 rū 2/ antare jātam rū 1/ nyāsaḥ/ rū $\dot{3}$ rū $\dot{2}$/ antare jātam rū $\dot{1}$/ nyāsaḥ/ rū 3 rū $\dot{2}$/ antare jātam rū 5/ nyāsaḥ/ rū $\dot{3}$ rū 2/ antare jātam rū $\dot{5}$//E2abp1//[5]
iti dhanarṇasaṃkalanavyavakalane//E2abp2//[6]
guṇane bhāgahāre ca karaṇasūtraṃ vṛttārdham/4abp0/[7]

svayor asvayoḥ svaṃ vadhaḥ svarṇaghāte 4ab
kṣayo bhāgahāre 'pi caivaṃ niruktam/4ab/[8]

udāharaṇam/E2cdp0/

dhanaṃ dhanenarṇam ṛṇena nighnaṃ E2cd
dvayaṃ trayeṇa svam ṛṇena kiṃ syāt//E2cd//[9]

nyāsaḥ/ rū 2 rū 3/ dhanaṃ dhanaghnaṃ dhanaṃ syād iti jātam rū 6/ nyāsaḥ/ rū $\dot{2}$ rū $\dot{3}$/ ṛṇam ṛṇaghnaṃ dhanaṃ syād iti jātam rū 6/ nyāsaḥ/ rū 2 rū $\dot{3}$/ dhanam ṛṇaghnam ṛṇaṃ syād iti jātam rū $\dot{6}$/ nyāsaḥ/ rū $\dot{2}$ rū 3/ ṛṇaṃ dhanaghnam ṛṇaṃ syād iti jātam rū $\dot{6}$//E2cdp1//[10]
iti dhanarṇaguṇanam//E2cdp2//
udāharaṇam/E3p0/

rūpāṣṭakaṃ rūpacatuṣṭayena E3
dhanaṃ dhanenarṇam ṛṇena bhaktam/
ṛṇaṃ dhanena svam ṛṇena kiṃ syād

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[5] nyāsaḥ/ (2nd, 3rd, 4th) G] " AM; antare jātam (2nd, 3rd, 4th) G] " AM.

[6] dhanarṇasaṃkalanavyavakalane AM] dhanarṇavyavakalanam G.

[7] bhāgahāre ca] ∅ AMGTPJ.

[8] vadhaḥ AMGTPJ(HLS)] vadhe J; GTP place 'bhāgahāre 'pi caivaṃ niruktam' after E2cdp2.

[9] dhanaṃ AMGTPJJ(LS)] dhane J(H).

[10] nyāsaḥ/ (2nd, 3rd, 4th) G] " AM; syād iti jātam (2nd, 3rd, 4th) G] " AM; rū 2 (2nd) AG] rū $\dot{2}$ M.

drutaṃ vadedaṃ yadi bobudhīṣi//E3//[11]

nyāsaḥ/ rū 8 rū 4/ dhanaṃ dhanahṛtaṃ dhanaṃ syād iti jātam rū 2/ nyāsaḥ/ rū $\dot{8}$ rū $\dot{4}$/ ṛṇam ṛṇahṛtaṃ dhanaṃ syād iti jātam rū 2/ nyāsaḥ/ rū $\dot{8}$ rū 4/ ṛṇaṃ dhanahṛtam ṛṇaṃ syād iti jātam rū $\dot{2}$/ nyāsaḥ/ rū 8 rū $\dot{4}$/ dhanam ṛṇahṛtam ṛṇaṃ syād iti jātam rū $\dot{2}$//E3p1//[12]

iti dhanarṇabhāgahāraḥ//E3p2//

varge mūle ca karaṇasūtraṃ vṛttārdham/4cdp0/[13]

kṛtiḥ svarṇayoḥ svaṃ svamūle dhanarṇe/ 4cd
na mūlaṃ kṣayasyāsti tasyākṛtitvāt//4cd//[14]

vargodāharaṇam/E4abp0/[15]

dhanasya rūpatritayasya vargaṃ E4ab
kṣayasya ca brūhi sakhe mamāśu/E4ab/[16]

nyāsaḥ/ rū 3 rū $\dot{3}$/ jātau vargau rū 9/ rū 9//E4abp//

mūlodāharaṇam/E4cdp0/[17]

dhanātmakānām adhanātmakānāṃ E4cd
mūlaṃ navānāṃ ca pṛthag vadāśu//E4cd//

nyāsaḥ/ rū 9/ mūlaṃ rū 3 vā rū $\dot{3}$/ nyāsaḥ/ rū $\dot{9}$/ eṣām avargatvān mūlaṃ nāsti//E4cdp1//[18]

iti vargamūle//E4cdp2//[19]

iti dhanarṇaṣaḍvidham//E4cdp3//

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[11]syād drutaṃ AMGTPJJ(H)] syādṛtaṃ J(L), syādrutaṃ J(S).

[12]nyāsaḥ/ (2nd, 3rd, 4th) G] ” AM; dhanaṃ syād iti jātam (2nd) G] ” AM; ṛṇaṃ syād iti jātam (2nd) G] ” AM.

[13]varge mūle ca AMTP] vargādau G.

[14]svarṇayoḥ AMGPJ] svarṇagoḥ T; tasyākṛtitvāt GTPJ] tasyā kṛtitvāt AM.

[15]vargodāharaṇam AM] udāharaṇam G.

[16]vargaṃ AMGPJ] varge T.

[17]mūlodāharaṇam AM] udāharaṇam G.

[18]rū 3 vā rū $\dot{3}$ AM] 3 vā $\dot{3}$ G; nyāsaḥ/ (2nd) G] ” AM.

[19]vargamūle AM] dhanarṇavargamūle G.

II.2 Kha-ṣaḍvidha

khasaṃkalanavyavakalane karaṇasūtraṃ vṛttārdham/5abp0/

khayoge viyoge dhanarṇaṃ tathaiva 5ab
cyutaṃ śūnyatas tad viparyāsam eti/5ab/[20]

udāharaṇam/E5abp0/

rūpatrayaṃ svaṃ kṣayagaṃ ca khaṃ ca E5ab
kiṃ syāt khayuktaṃ vada khāc cyutaṃ ca/E5ab/[21]

nyāsaḥ/ rū 3 rū $\dot{3}$ rū 0/ etāni khayutāny avikṛtāny eva/ nyāsaḥ/ rū 3 rū $\dot{3}$ rū 0/ etāni khāc cyutāni rū $\dot{3}$ rū 3 rū 0//E5abp1//[22]

iti khasaṃkalanavyavakalane//E5abp2//

khaguṇādiṣu karaṇasūtraṃ vṛttārdham/5cdp0/[23]

vadhādau viyat khasya khaṃ khena ghāte 5cd
khahāro bhavet khena bhaktaś ca rāśiḥ//5cd//

udāharaṇam/E5cdp0/

dvighnaṃ trihṛt khaṃ khahṛtaṃ trayaṃ ca E5cd
śūnyasya vargaṃ vada me padaṃ ca//E5cd//[24]

nyāsaḥ/ guṇyaḥ rū 0 guṇakaḥ rū 2 guṇite jātam rū 0/ nyāsaḥ/ bhājyaḥ rū 0 bhājakaḥ rū 3 bhakte jātam rū 0/ nyāsaḥ/ bhājyaḥ rū 3 bhājakaḥ rū 0 bhakte jātam rū $\begin{smallmatrix}3\\0\end{smallmatrix}$ / ayam ananto rāśiḥ khahara ity ucyate//E5cdp1//[25]

asmin vikāraḥ khahare na rāśāv 6

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[20]dhanarṇaṃ AMGPJ] dhanarṇe T.

[21]khāc cyutaṃ AM] khacyutaṃ GTPJ. The commentator Kṛṣṇa accepts 'khacyutaṃ' but in P refers to 'khāc cyutaṃ' as a variant. The editor of G, too, accepts 'khacyutaṃ' but remarks that many manuscripts read 'khāc cyutaṃ'.

[22]nyāsaḥ/ (2nd) G] ∅ AM.

[23]guṇādiṣu AM] guṇanādiṣu G.

[24]vargaṃ AMGTPJJ(HL)] varge J(S).

[25]nyāsaḥ/ (2nd, 3rd) G] " AM; jātam (2nd, 3rd) G] " AM; bhājyaḥ (2nd) G] " AM; bhakte (2nd) G] " AM; rū $\begin{smallmatrix}3\\0\end{smallmatrix}$ / ayam ananto rāśiḥ] rū $\begin{smallmatrix}3\\0\end{smallmatrix}$ / ayamananto $\begin{smallmatrix}3\\0\end{smallmatrix}$ rāśiḥ A, rū 0 3/ ayamananto rāśiḥ M, rū $\frac{3}{0}$ ayamananto rāśiḥ G.

api praviṣṭeṣv api nissṛteṣu/
bahuṣv api syāl layasṛṣṭikāle
'nante 'cyute bhūtagaṇeṣu yadvat//6//[26]

nyāsaḥ/ rū 0/ asya vargaḥ rū 0/ mūlam rū 0//E5cdp2//
evaṃ khaguṇādi//E5cdp3//[27]
iti khaṣaḍvidham//E5cdp4//

II.3 Avyakta-ṣaḍvidha[28]

II.3.1 Avyakta-ṣaḍvidha

athāvyaktakalpanā/7p0/[29]

yāvattāvat kālako nīlako 'nyo 7
varṇaḥ pīto lohitaś caitadādyāḥ/
avyaktānāṃ kalpitā mānasaṃjñās
tatsaṃkhyānaṃ kartum ācāryavaryaiḥ//7//[30]

avyaktasaṃkalanavyavakalane karaṇasūtraṃ vṛttārdham/8abp0/

yogo 'ntaraṃ teṣu samānajātyor 8ab
vibhinnajātyoś ca pṛthaksthitiś ca//8ab//[31]

udāharaṇam/E6p0/

svam avyaktam ekaṃ sakhe saikarūpaṃ E6
dhanāvyaktayugmaṃ virūpāṣṭakaṃ ca/
yutau pakṣayor etayoḥ kiṃ dhanarṇe
viparyasya caikye bhavet kiṃ vadāśu//E6//[32]

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[26]khahare na AMGTJJ(HS)] khahareṇa PJ(L); 'nante AMGPJJ(HL)] 'namte T, 'nata J(S).

[27]khaguṇādi M] khaghanādi AG.

[28]I divide this chapter in two sections, avyakta-ṣaḍvidha and anekavarṇa-ṣaḍvidha, according to the concluding remarks 12p3 and E10p7. But it should be noted that the rules in this chapter are all given in the first section and that the second section consists only of examples for the second category.

[29]athāvyaktakalpanā AM] ∅ G.

[30]māna AMGPJ] nāma T.

[31]sthitiś ca AMGTPJ] sthitiḥ syāt, a variant mentioned by Kṛṣṇa.

[32]svam AMGPJ] kham T; saikarūpaṃ AMGPJ] caikarūpaṃ T; pakṣayor AMGTPJJ(HS)] pakṣayar J(L); kiṃ (1st) MGTPJ] ki A. J(L) places E6 after E7ab.

nyāsaḥ/ yā 1 rū 1/ yā 2 rū $\dot{8}$/ anayor yoge jātam yā 3 rū $\dot{7}$/ ādyapakṣasya dhanarṇavyatyāse nyāsaḥ/ yā $\dot{1}$ rū $\dot{1}$/ yā 2 rū $\dot{8}$/ yoge 'nayor jātam yā 1 rū $\dot{9}$/ dvitīyasya vyatyāse nyāsaḥ/ yā 1 rū 1/ yā $\dot{2}$ rū 8/ yoge jātam yā $\dot{1}$ rū 9/ ubhayor vyatyāse nyāsaḥ/ yā $\dot{1}$ rū $\dot{1}$/ yā $\dot{2}$ rū 8/ yoge jātam yā $\dot{3}$ rū 7//E6p//[33]

anyad udāharaṇam/E7abp0/[34]

dhanāvyaktavargatrayaṃ satrirūpaṃ E7ab
kṣayāvyaktayugmena yuktaṃ ca kiṃ syāt//E7ab//[35]

nyāsaḥ/ yāva 3 rū 3/ yā $\dot{2}$/ yoge jātam yāva 3 yā $\dot{2}$ rū 3//E7abp//

anyad udāharaṇam/E7cdp0/[36]

dhanāvyaktayugmād ṛṇāvyaktaṣaṭkaṃ E7cd
sarūpāṣṭakaṃ projjhya śeṣaṃ vadāśu//E7cd//[37]

nyāsaḥ/ yā 2/ yā $\dot{6}$ rū 8/ śodhite jātam yā 8 rū $\dot{8}$//E7cdp1//

ity avyaktasaṃkalanavyavakalane//E7cdp2//

avyaktādiguṇane karaṇasūtraṃ sārdhavṛttadvayam/8cdp0/

syād rūpavarṇābhihatau tu varṇo 8cd
dvitryādikānāṃ samajātikānām//8cd//[38]
vadhe tu tadvargaghanādayaḥ syus 9
tadbhāvitaṃ cāsamajātighāte/
bhāgādikaṃ rūpavad eva śeṣaṃ
vyakte yad uktaṃ gaṇite tad atra//9//[39]
guṇyaḥ pṛthag guṇakakhaṇḍasamo niveśyas 10
taiḥ khaṇḍakaiḥ kramahataḥ sahito yathoktyā/
avyaktavargakaraṇīguṇanāsu cintyo
vyaktoktakhaṇḍaguṇanāvidhir evam atra//10//[40]

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[33] yoge 'nayor AM] anayoryoge G.

[34] anyad AM] ∅ G.

[35] dhanāvyakta MGTPJ] dhanāāvyakta A.

[36] anyad udāharaṇam/ A] ∅ MG.

[37] dhanāvyakta AMGTPJJ(HS)] dhanavyakta J(L); projjhya AMP] projhya G, prokta T, prohya J.

[38] varṇo MGTPJJ(H)] varṇau AJ(LS).

[39] cāsama AMGPJ] syātsama T; vyakte AGTPJ] vyakta M.

[40] pṛthag guṇaka AMGPJ] pṛthakpṛthagguṇa T; niveśyas taiḥ AMGPJ] niveśya taiḥ tair T.

udāharaṇam/E8p0/

yāvattāvatpañcakaṃ vyekarūpaṃ E8
yāvattāvadbhis tribhiḥ sadvirūpaiḥ/
saṃguṇya drāg brūhi guṇyaṃ guṇaṃ vā
vyastaṃ svarṇaṃ kalpayitvā ca vidvan//E8//[41]

nyāsaḥ/ guṇyaḥ yā 5 rū $\dot{1}$/ guṇakaḥ yā 3 rū 2/ guṇanāj jātaṃ phalam yāva 15 yā 7 rū $\dot{2}$/ guṇyasya dhanarṇatvavyatyāse nyāsaḥ/ guṇyaḥ yā $\dot{5}$ rū 1/ guṇakaḥ yā 3 rū 2/ guṇanāj jātam yāva $\dot{1}5$ yā $\dot{7}$ rū 2/ guṇakasya dhanarṇatvavyatyāse nyāsaḥ/ guṇyaḥ yā 5 rū $\dot{1}$/ guṇakaḥ yā $\dot{3}$ rū $\dot{2}$/ guṇanāj jātam yāva $\dot{1}5$ yā $\dot{7}$ rū 2/ dvayor dhanarṇatvavyatyāse nyāsaḥ/ guṇyaḥ yā $\dot{5}$ rū 1/ guṇakaḥ yā $\dot{3}$ rū $\dot{2}$/ guṇanāj jātam yāva 15 yā 7 rū $\dot{2}$//E8p//[42]

bhāgahāre karaṇasūtraṃ vṛttam/11p0/

bhājyāc chedaḥ śudhyati pracyutaḥ san 11
sveṣu sveṣu sthānakeṣu krameṇa/
yair yair varṇaiḥ saṃguṇo yaiś ca rūpair
bhāgāhāre labdhayas tāḥ syur atra//11//[43]

pūrvaguṇanaphalasya svaguṇacchedasya prathamapakṣasya bhāgahārārthaṃ nyāsaḥ/ bhājyaḥ yāva 15 yā 7 rū $\dot{2}$/ bhājakaḥ yā 3 rū 2/ bhajanād āpto guṇyaḥ yā 5 rū $\dot{1}$/ dvitīyasya nyāsaḥ/ bhājyaḥ yāva $\dot{1}5$ yā $\dot{7}$ rū 2/ bhājakaḥ yā 3 rū 2/ bhajanena labdho guṇyaḥ yā $\dot{5}$ rū 1/ tṛtīyasya nyāsaḥ/ bhājyaḥ yāva $\dot{1}5$ yā $\dot{7}$ rū 2/ haraḥ yā $\dot{3}$ rū $\dot{2}$/ haraṇād āpto guṇyaḥ yā 5 rū $\dot{1}$/ caturthasya nyāsaḥ/ bhājyaḥ yāva 15 yā 7 rū $\dot{2}$/ haraḥ yā $\dot{3}$ rū $\dot{2}$/ hṛte labdho guṇyaḥ yā $\dot{5}$ rū 1//11p1//[44]

ity avyaktaguṇanabhajane//11p2//

vargodāharaṇam/E8efp0/

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[41]tribhiḥ AMGPJ] tribhiḥs T; saṃguṇya AMGPJ] saṃguṇyaṃ T; brūhi MGTPJ] brahi A; guṇyaṃ guṇaṃ AMGTPJ] guṇye guṇe, a variant mentioned by Kṛṣṇa; vyastaṃ svarṇaṃ AMGTPJ] vyastasvarṇaṃ, a variant mentioned by Kṛṣṇa; kalpayitvā AMGTPJJ(HS)] kalpitvā J(L); ca GTPJ(S)] tu AMJJ(HL).

[42]yā $\dot{5}$ (2nd) AG] yā $\dot{2}$ M.

[43]san sveṣu AMGTPJJ(L)] santsveṣu J(H), san J(S); saṃguṇo AMGTPJJ(HL)] saṃguṇair J(S); bhāgāhāre AMGPJ] bhāgāhare T.

[44]pūrva AG] pūva M; prathamapakṣasya bhāgahārārthaṃ AG] bhāgahārātha prathamapakṣasya M; bhājakaḥ (2nd) AG] ∅ M; haraḥ yā (twice) AM] bhājakaḥ/ yā G; rū $\dot{2}$ (4th) AG] rū 2 M; yā $\dot{5}$ (2nd) A] yā 5 MG.

rūpaiḥ ṣaḍbhir varjitānāṃ caturṇām E8ef
avyaktānāṃ brūhi vargaṃ sakhe me//E8ef//[45]

nyāsaḥ/ yā 4 rū $\dot{6}$/ jāto vargaḥ yāva 16 yā $\dot{4}8$ rū 36//E8efp//[46]

kṛtibhya ādāya padāni teṣāṃ 12
dvayor dvayoś cābhihatiṃ dvinighnīm/
śeṣāt tyajed rūpapadaṃ gṛhītvā
cet santi rūpāṇi tathaiva śeṣam//12//[47]

pūrvasiddhavargasya mūlārthaṃ nyāsaḥ/ yāva 16 yā $\dot{4}8$ rū 36/ labdhaṃ mūlam yā 4 rū $\dot{6}$//12p1//[48]
ity avyaktavargamūle//12p2//[49]
ity avyaktaṣaḍvidham//12p3//

II.3.2 Anekavarṇa-ṣaḍvidha

athānekavarṇaṣaḍvidham//E9p$\dot{1}$//

tatra saṃkalanavyavakalanodāharaṇam/E9p0/[50]

yāvattāvatkālakanīlakavarṇās tripañcasaptadhanam/ E9
dvitryekamitaiḥ kṣayagaiḥ sahitā rahitāḥ kati syus taiḥ//E9//[51]

nyāsaḥ/ yā 3 kā 5 nī 7/ yā $\dot{2}$ kā $\dot{3}$ nī $\dot{1}$/ yoge jātam yā 1 kā 2 nī 6/ viyoge jātam yā 5 kā 8 nī 8//E9p1//
ity anekavarṇasaṃkalanavyavakalane//E9p2//
guṇanāder udāharaṇam/E10p0/

yāvattāvattrayam ṛṇam ṛṇaṃ kālakau nīlakaḥ svaṃ E10
rūpeṇāḍhyā dviguṇitamitais te tu tair eva nighnāḥ/

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[45]rūpaiḥ AMGPJ] rūpai T.

[46]yā 4 AG] yā 3 M.

[47]rūpapadaṃ MGTPJ] rupapadaṃ A; tathaiva śeṣam AMGTPJJ(HS)] padāni caivam J(L).

[48]siddha AM] siddhasya G.

[49]vargamūle AM] vargavargamūle G.

[50]vyavakalanodāharaṇam AM] vyavakalanayorudāharaṇam G.

[51]kālaka AMGTPJJ(HL)] kāla J(S); rahitāḥ AMGPJ] rahitā T; syus taiḥ AMGTPJ(S)] syuste JJ(HL).

kiṃ syāt teṣāṃ guṇanajaphalaṃ guṇyabhaktaṃ ca kiṃ syād
guṇyasyātha prakathaya kṛtiṃ mūlam asyāḥ kṛteś ca//E10//[52]

nyāsaḥ/ guṇyaḥ yā $\dot{3}$ kā $\dot{2}$ nī 1 rū 1/ guṇakaḥ yā $\dot{6}$ kā $\dot{4}$ nī 2 rū 2/ guṇite jātam yāva 18 kāva 8 nīva 2 yākābhā 24 yānībhā $\dot{1}\dot{2}$ kānībhā $\dot{8}$ yā $\dot{1}\dot{2}$ kā $\dot{8}$ nī 4 rū 2//E10p1//[53]

asmād eva guṇanaphalād guṇyenānena yā $\dot{3}$ kā $\dot{2}$ nī 1 rū 1 bhaktād āpto guṇakaḥ yā $\dot{6}$ kā $\dot{4}$ nī 2 rū 2//E10p2//

ity anekavarṇaguṇanabhajane//E10p3//

pūrvaguṇyasya vargārthaṃ nyāsaḥ/ yā $\dot{3}$ kā $\dot{2}$ nī 1 rū 1/ jāto vargaḥ yāva 9 kāva 4 nīva 1 yākābhā 12 yānībhā $\dot{6}$ kānībhā $\dot{4}$ yā $\dot{6}$ kā $\dot{4}$ nī 2 rū 1//E10p4//

vargād asmān mūlam yā $\dot{3}$ kā $\dot{2}$ nī 1 rū 1//E10p5//[54]

ity anekavarṇavargavargamūle//E10p6//[55]

ity anekavarṇaṣaḍvidham//E10p7//

II.4 Karaṇī-ṣaḍvidha

atha karaṇīṣaḍvidham//13p$\dot{1}$//

tatra saṃkalanavyavakalanayoḥ karaṇasūtraṃ vṛttadvayam/13p0/

yogaṃ karaṇyor mahatīṃ prakalpya 13
ghātasya mūlaṃ dviguṇaṃ laghuṃ ca/
yogāntare rūpavad etayoḥ sto
vargeṇa vargaṃ guṇayed bhajec ca//13//[56]
laghvyā hṛtāyās tu padaṃ mahatyāḥ 14
saikaṃ nirekaṃ svahataṃ laghughnam/
yogāntare staḥ kramaśas tayor vā
pṛthaksthitiḥ syād yadi nāsti mūlam//14//[57]

udāharaṇam/E11p0/

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[52]tāvattrayam AMGPJ] tāvatrayam T; kālakau AMGTPJJ(LS)] kālako J(H); rūpeṇāḍhyā AMGPJ] rūpeṇādyād T; dviguṇitamitais te AMGTJJ(H)] dviguṇitamitaistais P, dviguṇamitaiste J(L), dviguṇitamiteste J(S); asyāḥ AMGPJ] asyā T.

[53]kā $\dot{4}$ AG] kā 4 M; kā $\dot{8}$ AG] kā 8 M.

[54]kā $\dot{2}$ AG] kā 2 M.

[55]ity anekavarṇavargavargamūle// G] ∅ AM.

[56]ghātasya GTPJ(HL)] vadhasya AMJ, pātasya J(S); etayoḥ sto AMGTJJ(HL)] etayoste P, etayoḥ ste J(S).

[57]mahatyāḥ AMGTJ] mahatyā P.

dvikāṣṭamityos tribhasaṃkhyayoś ca E11
yogāntare brūhi pṛthak karaṇyoḥ/
trisaptamityoś ca ciraṃ vicintya
cet ṣaḍvidhaṃ vetsi sakhe karaṇyāḥ//E11//[58]

nyāsaḥ/ ka 2 ka 8/ yoge jātam ka 18/ antare ca ka 2/ dvitīyodāharaṇe nyāsaḥ/ ka 3 ka 27/ yoge jātam ka 48/ antare ca ka 12/ tṛtīyodāhṛtau nyāsaḥ/ ka 3 ka 7/ anayor ghāte mūlābhāvāt pṛthaksthitir eva/ yoge jātam ka 3 ka 7/ antare ca ka $\dot{3}$ ka 7//E11p1//[59]

iti karaṇīsaṃkalanavyavakalane//E11p2//

guṇanodāharaṇam/E12p0/

dvitryaṣṭasaṃkhyā guṇakaḥ karaṇyo E12
guṇyas trisaṃkhyā ca sapañcarūpā/
vadhaṃ pracakṣvāśu vipañcarūpe
guṇo 'thavā tryarkamite karaṇyau//E12//[60]

nyāsaḥ/ guṇakaḥ ka 2 ka 3 ka 8/ guṇyaḥ ka 3 rū 5/ atra guṇye guṇake vā bhājye bhājake vā karaṇīnāṃ karaṇyor vā yathāsaṃbhavaṃ lāghavārthaṃ yogaṃ kṛtvā guṇanabhajane kārye/ tathā kṛte jāto guṇakaḥ ka 18 ka 3/ guṇyaḥ ka 25 ka 3/ guṇite jātam rū 3 ka 450 ka 75 ka 54//E12p1//

viśeṣasūtraṃ vṛttam/15p0/

kṣayo bhavec ca kṣayarūpavargaś 15
cet sādhyate 'sau karaṇītvahetoḥ/
ṛṇātmikāyāś ca tathā karaṇyā
mūlaṃ kṣayo rūpavidhānahetoḥ//15//

dvitīyodāharaṇe nyāsaḥ/ guṇakaḥ ka $\dot{2}\dot{5}$ ka 3 ka 12/ guṇyaḥ ka 25 ka 3/ atra guṇake karaṇyor yoge kṛte guṇakaḥ ka $\dot{2}\dot{5}$ ka 27/ guṇite jātam ka $6\dot{2}\dot{5}$ ka 675 ka $\dot{7}\dot{5}$ ka 81/ etāsv anayoḥ ka $6\dot{2}\dot{5}$ ka 81 mūle rū $\dot{2}\dot{5}$ rū 9/ anayor yoge jātam rū $\dot{1}\dot{6}$/ anayoḥ ka 675 ka $\dot{7}\dot{5}$ antare yoga iti jāto yogaḥ ka 300/ yathākramaṃ nyāsaḥ/ rū $\dot{1}\dot{6}$ ka 300//E12p2//[61]

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[58]pṛthak AMGTJJ(HL)] sakhe PJ(S); mityoś ca ciraṃ AMGPJJ(HL)] mityoścaritaṃ T, mityāś-caciraṃ J(S); vidhaṃ AMGTPJJ(HL)] bhidhaṃ J(S).

[59]tṛtīyodāhṛtau AM] tṛtīyodāharaṇe G.

[60]karaṇyo AMJ] karaṇyor GTP; sapañcarūpā AMGPJ] sa pañcarūpā T; guṇo J(HS)] guṇe AMGP, guṇyo T, guṇye JJ(L).

[61]rū $\dot{1}\dot{6}$ (1st) AG] rū 16 M; ka $\dot{7}\dot{5}$ (2nd) AG] ka 75 M.

iti karaṇīguṇanam//E12p3//

pūrvaguṇanaphalasya svaguṇacchedasya bhāgahārārthaṃ nyāsaḥ/ bhājyaḥ ka 9 ka 450 ka 75 ka 54/ bhājakaḥ ka 2 ka 3 ka 8/ atra ka 2 ka 8 etayoḥ karaṇyor yoge kṛte jātam ka 18 ka 3/ 'bhājyāc chedaḥ śudhyati pracyutaḥ san' (BG 11a) ityādikaraṇena labdho guṇyaḥ rū 5 ka 3//E12p4//

dvitīyodāharaṇe nyāsaḥ/ bhājyaḥ ka $2\dot{5}6$ ka 300/ bhājakaḥ ka $\dot{2}5$ ka 3 ka 12/ karaṇyor yoge kṛte jātam ka $\dot{2}5$ ka 27/ atrādau tribhir guṇayitvā dhanakaraṇyor ṛṇakaraṇyoś ca yogaṃ vidhāya paścāt pañcaviṃśatyā guṇayitvā śodhite labdham rū 5 ka 3/ atrāpi pūrvaval labdho guṇyaḥ rū 5 ka 3//E12p5//[62]

athavānyathocyate/16p0/[63]

dhanarṇatāvyatyayam īpsitāyāś 16
chede karaṇyā asakṛd vidhāya/
tādṛkchidā bhājyaharau nihanyād
ekaiva yāvat karaṇī hare syāt//16//[64]
bhājyās tayā bhājyagatāḥ karaṇyo 17
labdhāḥ karaṇyo yadi yogajāḥ syuḥ/
viśleṣasūtreṇa pṛthak ca kāryās
tathā yathā praṣṭur abhīpsitāḥ syuḥ//17//[65]

tathā ca viśleṣasūtraṃ vṛttam/18p0/

vargeṇa yogakaraṇī vihṛtā viśudhyet 18
khaṇḍāni tatkṛtipadasya yathepsitāni/
kṛtvā tadīyakṛtayaḥ khalu pūrvalabdhyā
kṣuṇṇā bhavanti pṛthag evam imāḥ karaṇyaḥ//18//[66]

nyāsaḥ/ bhājyaḥ ka 9 ka 450 ka 75 ka $5\dot{4}$/ bhājakaḥ ka 18 ka 3/ atra bhājake trimitakaraṇyā ṛṇatvaṃ prakalpya ka 18 ka $\dot{3}$/ anena bhājye guṇite yoge ca kṛte jātam ka 5625 ka 675/ bhājake ca ka 225/ anayā bhājye hṛte labdham ka 25 ka

[62]The editor of G refers to a manuscript that omits the passage 'atrādau ... labdham rū 5 ka 3.' This passage occurs in all of AMG but, as it is too explanatory and overlaps with the next sentence, it is presumably a later interpolation.

[63]athavānyathocyate AM] athānyathocyate G.

[64]harau AMGTPJJ(HL)] haro J(S).

[65]tayā AMGTPJJ(LS)] tathā J(H); pṛthak ca kāryās tathā yathā AMGJ] pṛthakkāryāstathā yathā T, pṛthakca kāryā yathā tathā P; praṣṭur AMGTPJJ(HL)] pṛṣṭur J(S).

[66]viśudhyet AGP] viśuddhyet MTJJ(HL), viśuddhet J(S); khaṇḍāni AMGTPJ(HS)] khaṇḍā J(L); kṣuṇṇā AMTPJ] kṣuṇṇāḥ G.

3//18p1//[67]

dvitīyodāharaṇe nyāsaḥ/ bhājyaḥ ka $\dot{2}5\dot{6}$ ka 300/ bhājakaḥ ka $\dot{2}\dot{5}$ ka 27/ atra bhājake pañcaviṃśatikaraṇyā dhanatvaṃ prakalpya ka 25 ka 27 bhājye guṇite dhanarṇakaraṇīnām antare ca kṛte jātam ka 100 ka 12/ bhājake ca ka 4/ anayā bhājye hṛte labdham ka 25 ka 3//18p2//[68]

idānīṃ pūrvodāharaṇe guṇye bhājake kṛte nyāsaḥ/ bhājyaḥ ka 9 ka 450 ka 75 ka 54/ bhājakaḥ ka 25 ka 3/ atrāpi trimitakaraṇyarṇatvaṃ prakalpya bhājye guṇite yute ca jātam ka 8712 ka 1452/ bhājake ca ka 484/ anayā hṛte bhājye labdho guṇakaḥ ka 18 ka 3/ pūrvaṃ guṇake khaṇḍatrayam āsīd iti yogakaraṇīyam ka 18 viśleṣyā/ tatra 'vargeṇa yogakaraṇī vihṛtā viśudhyet' (BG 18a) iti navātmakavargeṇa 9 vihṛtā satī śudhyatīti labdham 2/ navānāṃ mūlam 3/ asya khaṇḍe 1/ 2/ anayoḥ kṛtī 1/ 4/ pūrvalabdhyā 2 guṇite 2/ 8/ evaṃ jāto guṇakaḥ ka 2 ka 3 ka 8//18p3//[69]

karaṇīvargāder udāharaṇam/E13p0/

dvikatripañcapramitāḥ karaṇyas E13
tāsāṃ kṛtiṃ tridvikasaṃkhyayoś ca/
ṣaṭpañcakatridvikasammitānāṃ
pṛthak pṛthaṅ me kathayāśu vidvan//E13//[70]
aṣṭādaśāṣṭadvikasammitānāṃ E14ab
kṛtīkṛtānāṃ ca sakhe padāni/E14ab/[71]

nyāsaḥ/ prathamaḥ ka 2 ka 3 ka 5/ dvitīyaḥ ka 3 ka 2/ tṛtīyaḥ ka 6 ka 5 ka 3 ka 2/ caturthaḥ ka 18 ka 8 ka 2/ 'sthāpyo 'ntyavargaś caturguṇāntyanighnāḥ'[72] ity anena 'guṇyaḥ pṛthag guṇakakhaṇḍasamo ⟨niveśyas⟩' (BG 10a) ity anena vā jātāḥ krameṇa vargāḥ/ prathamaḥ rū 10 ka 24 ka 40 ka 60/ dvitīyaḥ rū 5 ka 24/ tṛtīyaḥ rū 16 ka 120 ka 72 ka 60 ka 48 ka 40 ka 24/ atrāpi karaṇīnāṃ yathāsaṃbhavaṃ yogaṃ kṛtvā vargavargamūle kārye/ tad yathā ka 18 ka 8 ka 2/ āsāṃ yogaḥ ka 72/ asyā vargaḥ ka 5184/ asyā mūlam rū 72//E14abp1//[73]

iti karaṇīvargaḥ//E14abp2//

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[67]bhājye hṛte (1st) AM] hṛte bhājye G.

[68]ka $\dot{2}\dot{5}$ AG] ka° $\dot{2}\dot{5}$ M; ka 100 AM] ka 300 G.

[69]navānāṃ AM] navānāṃ 9 G.

[70]tridvika (1st) AMGJJ(L)] dvitrika TPJ(HS); tridvika (2nd) AMGJJ(H)] dvitrika TPJ(S), trikadvika J(L).

[71]kṛtīkṛtānāṃ AMGTJ(HLS)] kṛtī kṛtīnāṃ PJ.

[72]This is a modification on L 19, which reads dvi instead of catur.

[73]vargaś caturguṇāntya G] vargaśca caturgaṇāntya AM; ka 72 (1st) AG] 72 M; ka 40 ka 24 G] ka0 24 AM.

karaṇīmūle sūtraṃ vṛttadvayam/19p0/[74]

varge karaṇyā yadi vā karaṇyos tulyāni rūpāṇy athavā bahūnām/ 19
viśodhayed rūpakṛteḥ padena śeṣasya rūpāṇi yutonitāni//19//
pṛthak tadardhe karaṇīdvayaṃ syān 20
mūle 'tha bahvī karaṇī tayor yā/
rūpāṇi tāny evam ato 'pi bhūyaḥ
śeṣāḥ karaṇyo yadi santi varge//20//[75]

udāharaṇam/ prathamavargasya mūlārthaṃ nyāsaḥ/ rū 10 ka 24 ka 40 ka 60/ rūpakṛteḥ 100 caturviṃśaticatvāriṃśatkaraṇyos tulyāni rūpāṇy apāsya śeṣam 36/ asya mūlam 6/ anenonādhikarūpāṇām ardhe jāte 2/ 8/ tatrāpīyaṃ 2 mūlakaraṇī/ dvitīyāṃ rūpāṇy eva prakalpya punaḥ śeṣakaraṇībhiḥ sa eva vidhiḥ kāryaḥ/ tatreyaṃ rūpakṛtiḥ 64/ asyāḥ ṣaṣṭirūpāṇy apāsya śeṣam 4/ asya mūlam 2/ anenonādhikarūpāṇām ardhe 3/ 5 jāte mūlakaraṇyau ka 3 ka 5/ mūlakaraṇīnāṃ yathākramaṃ nyāsaḥ/ ka 2 ka 3 ka 5//20p1//[76]

dvitīyavargasya nyāsaḥ/ rū 5 ka 24/ rūpakṛteḥ 25 karaṇītulyāni rūpāṇi 24 apāsya śeṣam 1/ asya mūlena 1 ūnādhikarūpāṇām ardhe jāte mūlakaraṇyau ka 2 ka 3//20p2//[77]

tṛtīyavargasya nyāsaḥ/ rū 16 ka 120 ka 72 ka 60 ka 48 ka 40 ka 24/ rūpakṛteḥ 256 karaṇītritayasyāsya ka 48 ka 40 ka 24 tulyāni rūpāṇy apāsyoktavaj jāte khaṇḍe 2/ 14/ mahatī karaṇīty asyāḥ 14 kṛtiḥ 196/ asyāḥ karaṇīdvayasyāsya ka 72 ka 120 tulyarūpāṇy apāsyoktavaj jāte khaṇḍe 6/ 8/ punā rūpakṛteḥ 64 ṣaṣṭirūpāṇy apāsyoktavat khaṇḍe 3/ 5/ evaṃ mūlakaraṇīnāṃ yathākramaṃ nyāsaḥ/ ka 6 ka 5 ka 3 ka 2//20p3//[78]

caturthasya nyāsaḥ/ rū 72 ka 0/ iyam eva labdhā mūlakaraṇī ka 72/ pūrvaṃ khaṇḍatrayam āsīd iti 'vargeṇa yogakaraṇī vihṛtā viśudhyet' (BG 18a) iti ṣaṭtriṃśatā vihṛtā śudhyatīti ṣaṭtriṃśato mūlam 6/ etasya khaṇḍānāṃ 1/ 2/ 3 kṛtayaḥ 1/ 4/ 9 pūrvalabdhyānayā 2 kṣuṇṇāḥ 2/ 8/ 18/ evaṃ pṛthak karaṇyo jātāḥ ka 2 ka 8 ka 18//20p4//[79]

atha vargagatarṇakaraṇyā mūlānayanārthaṃ sūtraṃ vṛttam/21p0/

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[74]sūtraṃ vṛttadvayam AM] sūtradvayam G.

[75]evam ato 'pi GTPJ(HS)] eva kṛtāni AMJ, eva kṛtā J(L).

[76]AM place the paragraph 20p1 after 20p2. udāharaṇam/ AM] ∅ G; mūlārthaṃ G] ∅ AM; mūlam 6/ anenonādhika G] mūlenonādhika AM; tatrāpīyaṃ AM] atrāpīyaṃ G; mūlakaraṇyau G] mūlakaraṇī AM.

[77]nyāsaḥ G] mūlārthaṃ nyāsaḥ AM; mūlena 1 ūnādhika AM] mūlenonādhika G.

[78]asyāḥ G] asya AM.

[79]rū 72 ka 0/ G] rū 72/ AM; 1/ 4/ 9 AM] 1/ 4/ G.

ṛṇātmikā cet karaṇī kṛtau syād 21
dhanātmikāṃ tāṃ parikalpya sādhye/
mūle karaṇyāv anayor abhīṣṭā
kṣayātmikaikā sudhiyāvagamyā//21//[80]

udāharaṇam/E14cdp0/

trisaptamityor vada me karaṇyor E14cd
viśleṣavargaṃ kṛtitaḥ padaṃ ca//E14cd//

nyāsaḥ/ ka $\dot{3}$ ka 7/ yadvā ka 3 ka $\dot{7}$/ anayor vargaḥ sama eva rū 10 ka $\dot{8}\dot{4}$/ atra varga ṛṇakaraṇyā dhanatvaṃ prakalpya prāgvallabdhakaraṇyor ekābhīṣṭarṇagatā syād iti jātam ka $\dot{3}$ ka 7 vā ka 3 ka $\dot{7}$//E14cdp//[81]

udāharaṇam/E15p0/

dvikatripañcapramitāḥ karaṇyaḥ E15
svasvarṇagā vyastadhanarṇagā vā/
tāsāṃ kṛtiṃ brūhi kṛteḥ padaṃ ca
cet ṣaḍvidhaṃ vetsi sakhe karaṇyāḥ//E15//

nyāsaḥ/ ka 2 ka 3 ka $\dot{5}$/ vā ka $\dot{2}$ ka $\dot{3}$ ka 5/ āsāṃ vargaḥ sama eva jātaḥ rū 10 ka 24 ka $\dot{4}0$ ka $\dot{6}0$/ atrarṇakaraṇyos tulyāni dhanarūpāṇi 100 rūpakṛteḥ 100 apāsya śeṣasya mūlam 0/ anenonādhikarūpāṇām ardhe ka 5/ ka 5/ atraikarṇam ka $\dot{5}$/ anyā rūpāṇīti nyāsaḥ/ rū 5 ka 24/ pūrvavaj jāte karaṇyau dhane eva ka 3 ka 2/ yathākramaṃ nyāsaḥ/ ka 2 ka 3 ka $\dot{5}$//E15p1//[82]

athavānayoḥ ka 24 ka $\dot{6}0$ tulyāni dhanarūpāṇi 84 rūpakṛteḥ 100 apāsyoktavaj jāte mūlakaraṇyau ka 7 ka 3/ anayor mahaty ṛṇaṃ ka $\dot{7}$/ tāny eva rūpāṇi prakalpya rū $\dot{7}$ ka 40/ ataḥ prāgvat karaṇyau ka 5 ka 2/ anayor api mahaty ṛṇam iti yathākramaṃ nyāsaḥ/ ka 3 ka 2 ka $\dot{5}$//E15p2//[83]

atha dvitīyodāharaṇe prāgvat prathamapakṣe mūlakaraṇyau ka 5 ka 5/ anayor

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[80]parikalpya AMGTPJJ(HS)] prakalpya J(L); sādhye AMGTPJJ(HL)] sāmadhye J(S); sudhiyāvagamyā AMGTPJJ(HL)] sudhiyāvāgamyā J(S). J(L) is available up to this verse.

[81]G places E14cdp immediately after E15 (before E15p1). nyāsaḥ AM] prathamodāharaṇe nyāsaḥ G; yadvā AM] vā G; atra varga] atra varge AM, atra vaga G; ekābhīṣṭarṇa] ekābhīṣṭā ṛṇa AMG.

[82]nyāsaḥ AM] dvitīyodāharaṇe nyāsaḥ G; atrarṇa] atra ṛṇa AMG; śeṣasya AM] ∅ G; atraikarṇam] atraikā ṛṇam AMG; dhane eva M] dhana eva A, dhanameva G.

[83]ka 24 ka $\dot{6}0$] ka 24 ka 60 AMG; 100 AM] ∅ G; anayor mahaty ṛṇaṃ] anayormahatī ṛṇaṃ AG, anayārmahatī ṛṇaṃ M; ka 5 ka 2 AM] ka 5 ka 3 G; mahaty ṛṇam] mahatī ṛṇam AMG.

ekarṇaṃ ka $\dot{5}$/ tāny eva rūpāṇīty ṛṇotpanne karaṇīkhaṇḍe ṛṇe eveti yathākramaṃ nyāsaḥ/ ka $\dot{3}$ ka $\dot{2}$ ka 5/ dvitīyapakṣeṇāpi yathoktā eva mūlakaraṇyaḥ ka $\dot{2}$ ka $\dot{3}$ ka 5/ evaṃ buddhimatānuktam api jñāyata iti//E15p3//[84]

pūrvair nāyam artho vistīryokto bālāvabodhārthaṃ tu mayocyate/22p0/

ekādisaṃkalitamitakaraṇīkhaṇḍāni vargarāśau syuḥ/ 22
varge karaṇītritaye karaṇīdvitayasya tulyarūpāṇi//22//
karaṇīṣaṭke tisṛṇāṃ
daśasu catasṛṇāṃ tithiṣu ca pañcānām/ 23
rūpakṛteḥ projjhya padaṃ
grāhyaṃ ced anyathā na sat kvāpi//23//[85]
utpatsyamānayaivaṃ mūlakaraṇyālpayā caturguṇayā/ 24
yāsām apavartaḥ syād rūpakṛtes tā viśodhyāḥ syuḥ//24//[86]
apavarte yā labdhā mūlakaraṇyo bhavanti tāś cāpi/ 25
śeṣavidhinā na yadi tā bhavanti mūlaṃ tadā tad asat//25//[87]

karaṇīvargarāśau rūpair avaśyaṃ bhavitavyam/ ekakaraṇyā varge rūpāṇy eva/ dvayoḥ sarūpaikā karaṇī/ tisṛṇāṃ tisraḥ/ catasṛṇāṃ ṣaṭ/ paṇcānāṃ daśa/ ṣaṇṇāṃ pañcadaśa ityādi/ ato dvayādīnāṃ karaṇīnāṃ vargeṣv ekādisaṃkalitamitāni karaṇīnāṃ khaṇḍāni rūpāṇi ca yathākramaṃ syuḥ/ atha yady udāharaṇe tāvanti na bhavanti tadā saṃyojya yogakaraṇīṃ viśleṣya vā tāvanti kṛtvā mūlaṃ grāhyam ity arthaḥ/ 'varge karaṇītritaye karaṇīdvitayasya tulyarūpāṇi' (BG 22cd) ityādi spaṣṭārtham//25p//[88]

udāharaṇam/E16p0/

varge yatra karaṇyo dantaiḥ siddhair gajair mitā vidvan/ E16

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[84]rūpāṇīty ṛṇotpanne] rūpāṇīti ṛṇotpanne AMG; ka $\dot{3}$ ka $\dot{2}$ ka 5/ AM] ka $\dot{2}$ ka $\dot{3}$ ka 5/ G; ka $\dot{2}$ ka $\dot{3}$ ka 5/ AM] ka $\dot{3}$ ka $\dot{2}$ ka 5/ G. The passage 'tāny eva ... nyāsaḥ/ ka $\dot{3}$ ka $\dot{2}$ ka 5/' is presumably a later interpolation.

[85]catasṛṇāṃ AGPJ] catusṛṇāṃ M, catṛsṛṇāṃ T; ca AMGTPJ] ∅ J(HS); projjhya PJJ(S)] prohya AMJ(H), projhya G, proḍya T; ced anyathā AMGPJ] vedanyathā T.

[86]karaṇyālpayā AMGPJJ(H)] karaṇyā alpayā T, karaṇyātmayā J(S).

[87]apavarte yā GTPJ] apavartādapi AM; na yadi tā AMGPJ] yadi natā T.

[88]The paragraph 25p has been cited verbatim by the commentator Kṛṣṇa (T, p. 77; P, pp. 52–53). vargarāśau AGT(K)P(K)] vargarāśī M; catasṛṇāṃ AGT(K)P(K)] catusṛṇāṃ M; pañcadaśa ityādi AMG] pañcadaśa T(K)P(K); ato dvayādīnāṃ AMG] tato dravyādīnāṃ T(K), tato dvyādīnāṃ P(K); karaṇīnāṃ khaṇḍāni rūpāṇi ca AMG] karaṇīkhaṇḍāni T(K)P(K); tadā saṃyojya yogakaraṇīṃ viśleṣya vā tāvanti GT(K)P(K)] tadāsau yogakaraṇī viśleṣyā vā bhavatīti AMG; rūpāṇi ityādi GT(K)P(K)] rūpāṇīti AM.

rūpair daśabhir upetāḥ kiṃ mūlaṃ brūhi tasya syāt//E16//[89]

nyāsaḥ/ rū 10 ka 32 ka 24 ka 8/ atra 'varge karaṇītritaye karaṇīdvitayasya' (BG 22cd) eva tulyāni rūpāṇi prathamaṃ rūpakṛter apāsya mūlaṃ grāhyam/ punar ekasyā evaṃ kriyamāṇe 'tra padaṃ nāstīty ato 'sya karaṇīgatamūlābhāvaḥ//E16p1//[90]

athāniyamena sarvakaraṇītulyāni rūpāṇy apāsya mūlam ānīyate/ tad idam ka 2 ka 8 samāgacchati/ idam asad yato 'sya vargo 'yam rū 18//E16p2//

athavā dantagajamitayor yogaṃ kṛtvā rū 10 ka 72 ka 24 ānīyate/ tad idam apy asat rū 2 ka 6//E16p3//

udāharaṇam/E17p0/

varge yatra karaṇyas tithiviśvahutāśanaiś caturguṇitaiḥ/ E17
tulyā daśarūpāḍhyāḥ kiṃ mūlaṃ brūhi tasya syāt//E17//

nyāsaḥ/ rū 10 ka 60 ka 52 ka 12/ atra kila varge karaṇītrayam astīti tatkaraṇīdvayasya dvipañcāśaddvādaśamitasya ka 52 ka 12 tulyarūpāṇy apāsya ye mūlakaraṇyāv utpadyete ka 8 ka 2 tayor alpayānayā 2 caturguṇayā 8 dvipañcāśaddvādaśamitayor apavarto na syāt/ atas te na śodhye yata uktam 'utpatsyamānayaivaṃ ⟨mūlakaraṇyālpayā caturguṇayā⟩' (BG 24ab) ityādi/ atrālpayety upalakṣaṇam/ tena kvacin mahatyāpi/ tadā yāṃ mūlakaraṇīṃ rūpāṇi prakalpyānye karaṇīkhaṇḍe sādhye sā mahatī prakalpyety arthaḥ/ tathā kṛte mūlam ka 2 ka 3 ka 5/ idam apy asad yato 'sya vargo 'yam rū 10 ka 24 ka 40 ka 60//E17p//[91]

udāharaṇam/E18p0/

aṣṭau ṣaṭpañcāśat ṣaṣṭiḥ karaṇītrayaṃ kṛtau yatra/ E18
rūpair daśabhir upetaṃ kiṃ mūlaṃ brūhi tasya syāt//E18//[92]

nyāsaḥ/ rū 10 ka 8 ka 56 ka 60/ atrādyakhaṇḍadvaye ka 8 ka 56 śodhite utpannayālpayā caturguṇayā 8 tayoḥ khaṇḍayor apavartanalabdhe khaṇḍe 1/ 7/ paraṃ śeṣavidhinā mūlakaraṇyau notpadyete/ atas te khaṇḍe na śodhye/ anyathā

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[89]dantaiḥ siddhair gajair mitā AGPJ] dantaiḥ simaddhairgajairmitā M, dantaiḥ 32 siddhai 24 rgajai 8 rmitā T.

[90]dvitayasya eva] dvitayasyaiva MG, dvitayasyeva A.

[91]tatkaraṇīdvayasya AM] tatkaraṇīdvaya G; alpayānayā 2 AM] alpayānayā G; utpatsyamānayaivaṃ MG(-m)] utpasyamānayaivam A; tadā yāṃ] tadā AGM; tathā kṛte ... ka 60 AM] ∅ G; 'sya vargo A] 'sya varṇo M.

[92]kṛtau yatra AMGTPJJ(H)] kṛtau sakhe yatra J(S); rūpair ... syāt (2nd line) AMGTPJJ(H)] ∅ J(S).

tu śodhane kṛte mūlaṃ nāyātīty atas tad asat//E18p//[93]

udāharaṇam/E19p0/

caturguṇāḥ sūryatithīṣurudra- E19
nāgartavo yatra kṛtau karaṇyaḥ/
saviśvarūpā vada tatpadaṃ te
yady asti bīje paṭutābhimānaḥ//E19//[94]

nyāsaḥ/ rū 13 ka 48 ka 60 ka 20 ka 44 ka 32 ka 24/ atra 'karaṇīṣaṭke tisṛṇāṃ' (BG 23a) karaṇīnāṃ tulyāni rūpāṇi prathamaṃ rūpakṛter apāsya mūlaṃ grāhyaṃ paścād dvayos tata ekasyāḥ/ evaṃ kṛte 'tra mūlābhāvaḥ/ athānyathā tu prathamam ādyakaraṇyos tulyāni rūpāṇy apāsya paścād dvitīyatṛtīyayos tataḥ śeṣāṇāṃ rūpakṛter viśodhyānīti tanmūlam ka 1 ka 2 ka 5 ka 5/ tad idam apy asat/ yato 'sya vargo 'yam rū 13 ka 8 ka 80 ka 160/ yair asya mūlānayanasya niyamo na kṛtas teṣām idaṃ dūṣaṇam/ evaṃvidhavarge karaṇīnām āsannamūlakaraṇena mūlāny ānīya rūpeṣu prakṣipya mūlaṃ vācyam//E19p//[95]

atha mahatī rūpāṇīty upalakṣaṇam/ yataḥ kvacid alpāpi/ tatrodāharaṇam /E20p0/

catvāriṃśadaśītidviśatītulyāḥ karaṇyaś cet/ E20
saptadaśarūpayuktās tatra kṛtau kiṃ padaṃ brūhi//E20//[96]

nyāsaḥ/ rū 17 ka 40 ka 80 ka 200/ śodhite jāte khaṇḍe ka 10 ka 7/ punar laghvīṃ karaṇīṃ rūpāṇi kṛtvā labdhe karaṇyau ka 5 ka 2/ evaṃ mūlakaraṇīnāṃ nyāsaḥ/ ka 10 ka 5 ka 2//E20p1//

iti karaṇīṣaḍvidham//E20p2//

iti ṣaṭtriṃśatparikarmāṇi//E20p3//[97]

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[93]tu AM] ∅ G.

[94]rudranāga AMGTPJ] rudrā nāga, a variant mentioned by Kṛṣṇa; vada tat AMGTPJJ(H)] vadat J(S).

[95]athānyathā AM] anyathā G; viśodhyānīti tanmūlam AM] viśodhyānītaṃ mūlam G; rū 13 (2nd) M] rū 23 AG.

[96]aśīti AGTPJ] aśītir M, a variant mentioned by Kṛṣṇa; karaṇyaś AMGPJ] karaṇyāś T; tatra kṛtau AMGTPJ] yatra kṛtau tatra, a variant mentioned by Kṛṣṇa.

[97]The concept of '36 parikarmāṇi' seems to consist of the 6 parikarmāṇi each for positive numbers (dhana), negative numbers (ṛṇa), zero (kha), a single unknown number (avyakta), unknown numbers (aneka-varṇa), and karaṇīs. The editor of G reports that some of the manuscripts he used omit this colophon.

II.5 Kuṭṭaka[98]

atha kuṭṭakaḥ/26p0/

bhājyo hāraḥ kṣepakaś cāpavartyaḥ 26
kenāpy ādau saṃbhave kuṭṭakārtham/
yena chinnau bhājyahārau na tena
kṣepaś cet tad duṣṭam uddiṣṭam eva//26//[99]
parasparaṃ bhājitayor yayor yaḥ 27
śeṣas tayoḥ syād apavartanaṃ saḥ/
tenāpavartena vibhājitau yau
tau bhājyahārau dṛḍhasaṃjñakau staḥ//27//[100]
mitho bhajet tau dṛḍhabhājyahārau 28
yāvad vibhājye bhavatīha rūpam/
phalāny adho 'dhas tadadho niveśyaḥ
kṣepas tathānte kham upāntimena//28//[101]
svordhve hate 'ntyena yute tadantyaṃ 29
tyajen muhuḥ syād iti rāśiyugmam/
ūrdhvo vibhājyena dṛḍhena taṣṭaḥ
phalaṃ guṇaḥ syād adharo hareṇa//29//[102]
evaṃ tadaivātra yadā samās tāḥ 30
syur labdhayaś ced viṣamās tadānīm/
yathāgatau labdhiguṇau viśodhyau
svatakṣaṇāc cheṣamitau tu tau staḥ//30//[103]

bhavati kuṭṭavidher yutibhājyayoḥ 31
samapavartitayor api vā guṇaḥ/
bhavati yo yutibhājakayoḥ punaḥ
sa ca bhaved apavartanasaṃguṇaḥ//31//[104]

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[98]Most verses of this chapter occur also in the *Līlāvatī* (see Appendix 7). I mention here the variant readings in it, leaving the prose parts for separate treatment.

[99]kṣepaś cet tad J(S)] kṣepaścaitad AMGTPJJ(H)L.

[100]yaḥ śeṣas AMGTPJL(ASS)] yaccheṣaṃ L(VIS); saḥ AMGTPJL(ASS)] tat L(VIS); tenāpavartena AMGTPJL(ASS)] svenāpavartea L(VIS); saṃjñakau GTPJ] saṃjñitau AML.

[101]vibhājye AMGTPJL(ASS)] vibhakte L(VIS); tathānte kham AMTPJL(VIS)] tathāntye kham G, tataḥ śūnyam L(ASS).

[102]tyajen GTPJL] tyajyen AM; adharo AMGL(ASS)] aparo TPJL(VIS).

[103]yadā AMGTPJJ(H)L] yathā J(S); samās AMGPJL] samas T; yathāgatau GTPJL] yadāgatau AM; tu AMGTPJL] ca J(H), ta J(S).

[104]vidher AMGTPJL(ASS)] vidhir L(VIS); yuti (1st) MGTPJL] yurti A; bhājyayoḥ AMGT-

yogaje takṣaṇāc chuddhe guṇāptī sto viyogaje/ 32
dhanabhājyodbhave tadvad bhavetām ṛṇabhājyaje/
guṇalabdhyos samaṃ grāhyaṃ dhīmatā takṣaṇe phalam//32//[105]
haratasṭe dhanakṣepe guṇalabdhī tu pūrvavat/ 33
kṣepatakṣaṇalābhāḍhyā labdhiḥ śuddhau tu varjitā//33//[106]
athavā bhāgahāreṇa tasṭayoḥ kṣepabhājyayoḥ/ 34
guṇaḥ prāgvat tato labdhiḥ bhājyād dhatayutoddhṛtāt//34//[107]
kṣepābhāvo 'thavā yatra kṣepaḥ śudhyed dharoddhṛtaḥ/ 35
jñeyaḥ śūnyaṃ guṇas tatra kṣepo harahṛtaḥ phalam//35//[108]
iṣṭāhatasvasvahareṇa yukte 36ab
te vā bhavetāṃ bahudhā guṇāptī/36ab/[109]

udāharaṇam/E21p0/

ekaviṃśatiyutaṃ śatadvayaṃ E21
yadguṇaṃ gaṇaka pañcaṣaṣṭiyuk/
pañcavarjitaśatadvayoddhṛtaṃ
śuddhim eti guṇakaṃ vadāśu tam//E21//[110]

nyāsaḥ/ bhā 221/ hā 195/ kṣe 65/ atra parasparaṃ bhājitayor bhājyabhājakayoḥ śeṣaḥ 13/ anena bhājyahārakṣepā apavartitā jātā dṛḍhāḥ bhā 17/ hā 15/ kṣe 5/ anayor dṛḍhabhājyahārayoḥ parasparaṃ bhaktayor labdham adho 'dhas tadadhaḥ kṣepas tadadhaḥ śūnyaṃ niveśyam iti nyaste jātā vallī $\left|\begin{smallmatrix}1\\7\\5\\0\end{smallmatrix}\right|$ 'upāntimena svord-

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PJJ(H)L] bhājayoḥ J(S); api GTPJ(HS)L] atha AMJ; bhavati yo AMGTPJL(ASS)] atha tayor L(VIS); punaḥ AMGPJL] ∅ T; bhaved apavartana AMGTJL] bhavepadavartana P.

[105]yogaje AMGTPJL(ASS)] kṣepaje L(VIS); sto viyogaje AMGTPJL(ASS)] te viśuddhije L(VIS); bhājyodbhave tadvad AMGTPJ] bhājyodbhavettadvad J(H), bhājodbhavettadvad J(S); bhājyaje AMGTPJJ(H)] bhājake J(S). The L does not have 32cd. J and F place 32ef before 32a. The same order of the verse lines is also reported by Kṛṣṇa to be seen in some manuscripts (pustakas). A variant of 32cd referred to by Kṛṣṇa and by Durgāprasāda (the commentator in G): ṛṇabhājyodbhave tadvad bhavetām ṛṇabhājake (ṛṇabhājyake in G)/

[106]tu pūrvavat AMGTPJJ(H)L] taparvata J(S); varjitā AMGPJL] varjitāḥ T.

[107]yutoddhṛtāt AMGPJ] yutoddhatāt T. The L does not have this verse.

[108]śudhyed dharoddhṛtaḥ GP] śudhyet haroddhataḥ T, śuddhyeddharoddhṛtaḥ AMJJ(H); śuddho haroddhṛtaḥ J(S)L; jñeyaḥ AMGTPJL(ASS)] jñeyaṃ L(VIS); guṇas AMGTPJJ(H)L] gaṇas J(S); harahṛtaḥ TPL] hārahṛtaḥ AMGJ.

[109]yukte AMGTPJJ(H)L] yuktaṃ J(S).

[110]dvayoddhṛtaṃ AMGTPJL] dvayoddhataṃ T; tam AMGTPJL(ASS)] me L(VIS).

hve hate' (BG 28d–29a) ityādikaraṇena jātaṃ rāśidvayam $\begin{matrix}40\\35\end{matrix}$ / etau dṛḍhabhājyahārābhyām ābhyāṃ $\begin{matrix}17\\15\end{matrix}$ taṣṭau śeṣamitau labdhiguṇau $\begin{matrix}6\\5\end{matrix}$ / anayoḥ svatakṣaṇam iṣṭaguṇaṃ kṣepa ity athavā labdhiguṇau $\begin{matrix}23\\20\end{matrix}$ / $\begin{matrix}40\\35\end{matrix}$ vetyādi//E21p//[111]

udāharaṇam/E22p0/

śataṃ hataṃ yena yutaṃ navatyā E22
vivarjitaṃ vā vihṛtaṃ triṣaṣṭyā/
niragrakaṃ syād vada me guṇaṃ taṃ
spaṣṭaṃ paṭīyān yadi kuṭṭake 'si//E22//[112]

nyāsaḥ/ bhā 100/ hā 63/ kṣe 90/ atra vallī $\left|\begin{matrix}1\\1\\1\\2\\2\\1\\90\\0\end{matrix}\right|$ 'upāntimena' (BG 28d) ityādinā jātaṃ rāśidvayaṃ $\begin{matrix}2430\\1530\end{matrix}$ / pūrvaval labdhiguṇau $\begin{matrix}30\\18\end{matrix}$ //E22p1//[113]

athavā bhājyakṣepau daśabhir apavartitau bhā 10/ hā 63/ kṣe 9/ ebhyo 'pi pūrvavad vallī $\left|\begin{matrix}0\\6\\3\\9\\0\end{matrix}\right|$ 'upāntimena' (BG 28d) ityādinā rāśidvayam $\begin{matrix}27\\171\end{matrix}$ / pūrvavaj jātau labdhiguṇau $\begin{matrix}7\\45\end{matrix}$ / atra labdhayo viṣamā iti svatakṣaṇābhyām ābhyāṃ $\begin{matrix}10\\63\end{matrix}$ śodhitau jātau labdhiguṇau $\begin{matrix}3\\18\end{matrix}$ / atra labdhir na grāhyā/ guṇaghnabhājye kṣepayute harabhakte labdhiś ca 30/ athavā bhājyakṣepāpavartanena 10 pūrvānītā labdhir 3 guṇitā saiva labdhiḥ 30//E22p2//[114]

athavā hārakṣepau navabhir apavartitau bhā 100/ hā 7/ kṣe 10/ pūrvavad vallī $\left|\begin{matrix}14\\3\\10\\0\end{matrix}\right|$ tato jātaṃ rāśidvayam $\begin{matrix}430\\30\end{matrix}$ / takṣaṇe jātam $\begin{matrix}30\\2\end{matrix}$ / hārakṣepāpavartanena

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[111] bhā 221/ hā 195/ kṣe 65/ AM] bhājyaḥ 221/ hāraḥ 195 kṣepaḥ 65 G; śeṣaḥ 13 AM] śeṣam 13 G; bhā 17/ hā 15/ kṣe 5/ AM] bhā. 17/ hā. 15/ kṣe. 5/ G; bhājyahārābhyām ābhyāṃ $\begin{matrix}17\\15\end{matrix}$ AM] bhājyahārābhyā $\begin{matrix}17\\15\end{matrix}$ mābhyāṃ G; $\begin{matrix}23\\20\end{matrix}$ / $\begin{matrix}40\\35\end{matrix}$ AM] $\begin{matrix}23\\0\end{matrix}$ / $\begin{matrix}40\\54\end{matrix}$ G.

[112] vā vihṛtaṃ AMGTPJL(ASS)] vāpi hṛtaṃ L(VIS); niragrakaṃ AMGTPJL(ASS)] niragragaṃ L(VIS); spaṣṭaṃ AMGPJL] spaṣṭa T.

[113] bhā 100/ hā 63/ kṣe 90/ AM] bhājyaḥ 100/ hāraḥ 63/ kṣepaḥ 90 G.

[114] bhā 10/ hā 63/ kṣe 9/ AM] bhā. 10/ kṣe. 9/ hā. 63/ G; svatakṣaṇābhyām ābhyāṃ $\begin{matrix}10\\63\end{matrix}$ AM] svatakṣaṇābhyā $\begin{matrix}10\\63\end{matrix}$ mābhyāṃ G.

9 guṇaṃ saṃguṇya jātau labdhiguṇau tāv eva $\begin{matrix}30\\18\end{matrix}$ //E22p3//[115]

athavā bhājyakṣepau cāpavartya nyāsaḥ/ bhā 10/ hā 7/ kṣe 1/ atra jātā vallī $\left|\begin{matrix}1\\2\\1\\0\end{matrix}\right|$ pūrvavaj jātaṃ rāśidvayam $\begin{matrix}3\\2\end{matrix}$ / takṣaṇāj jātaṃ tad eva/ bhājyakṣepahāra-

kṣepāpavartanena krameṇa labdhiguṇau guṇitau tāv eva $\begin{matrix}30\\18\end{matrix}$ / guṇalabdhyoḥ svahārau kṣepāv ity athavā labdhiguṇau $\begin{matrix}130\\81\end{matrix}$ vā $\begin{matrix}230\\144\end{matrix}$ ityādi//E22p4//[116]

yogaje guṇāptī $\begin{matrix}18\\30\end{matrix}$ svatakṣaṇābhyām ābhyāṃ $\begin{matrix}63\\100\end{matrix}$ śuddhe jāte navatiśuddhau guṇāptī $\begin{matrix}45\\70\end{matrix}$ vā $\begin{matrix}108\\170\end{matrix}$ vā $\begin{matrix}171\\270\end{matrix}$ ityādi//E22p5//

udāharaṇam/E23p0/

yadguṇā kṣayagaṣaṣṭir anvitā E23
varjitā ca yadi vā tribhis tataḥ/
syāt trayodaśahṛtā niragrakā
taṃ guṇaṃ gaṇaka me pṛthag vada//E23//[117]

nyāsaḥ/ bhā $\overset{\bullet}{60}$/ hā 13/ kṣe 3/ prāgvaj jāte dhanabhājye dhanakṣepe guṇāptī $\begin{matrix}11\\51\end{matrix}$ / ete svatakṣaṇābhyām ābhyāṃ $\begin{matrix}13\\60\end{matrix}$ śuddhe jāte ṛṇabhājye dhanakṣepe $\begin{matrix}2\\9\end{matrix}$ / atra bhājyabhājakayor vijātīyayor 'bhāgahāre 'pi caivaṃ niruktam' (BG 4b) ity uktatvāl labdher ṛṇatvaṃ jñeyam $\begin{matrix}2\\\bullet\\9\end{matrix}$ / punar ete svatakṣaṇābhyām ābhyāṃ $\begin{matrix}13\\\bullet\\60\end{matrix}$ śuddhe jāte ṛṇabhājye ṛṇakṣepe guṇāptī $\begin{matrix}11\\\bullet\\51\end{matrix}$ //E23p1//[118]

'ṛṇabhājya ṛṇakṣepe dhanabhājyavidhir bhavet/ Q0
tadvat kṣepa ṛṇagate vyastaṃ syād ṛṇabhājake'//Q0//[119]

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[115]bhā 100/ hā 7/ kṣe 10/ AM] bhā. 100/ kṣe. 10/ hā. 7/ G; tato AM] ∅ G; 9 MG] ∅ A.

[116]bhājyakṣepau cāpavartya AM] bhājyakṣepau hārakṣepau cāpavartya G; bhā 10/ hā 7/ kṣe 1/ AM] bhā. 10/ kṣe. 1/ hā. 7/ G.

[117]kṣayaga AMGTPJ] gaṇaka L; varjitā ca AMGTPJL(ASS)] vārjitātha L(VIS); yadi vā tribhis tataḥ AMGTPJ] daśabhiḥ ṣaḍuttaraiḥ L; trayodaśahṛtā AMGPJL] trayodaśāhṛtā T; taṃ AMGTPJL(VIS)] tad L(ASS); gaṇaka AMGTPJ] kathaya L; vada AMGTPJ] pṛthak L.

[118]bhā $\overset{\bullet}{60}$/ hā 13/ kṣe 3/] bhā 60/ hā 13/ kṣepaḥ 3/ AM, bhājyaḥ $\overset{\bullet}{6}$/ kṣepaḥ 3/ hāraḥ 13/ G; prāgvaj jāte AG] prāgvañjāte M; svatakṣaṇābhyām (twice) AM] svasvatakṣaṇābhyām G; $\begin{matrix}2\\\bullet\\9\end{matrix}$ M] $\begin{matrix}2\\9\end{matrix}$ AG; $\begin{matrix}13\\\bullet\\60\end{matrix}$] $\begin{matrix}13\\60\end{matrix}$ AMG; $\begin{matrix}11\\\bullet\\51\end{matrix}$] $\begin{matrix}11\\51\end{matrix}$ AMG.

[119]Source unidentified. bhājya ṛṇa G] bhājye ṛṇa AM; kṣepa ṛṇa] kṣepe ṝṇa AM, kṣepe dhana G.

‘dhanabhājyodbhave tadvad bhavetām ṛṇabhājyaje’//Q1//[120] Q1

iti mandāvabodhārthaṃ mayoktam/ anyathā ‘yogaje takṣaṇāc chuddhe’ (BG 32a) ityādinaiva siddhaṃ yata ṛṇadhanayogo viyoga eva/ ata eva bhājyabhājakakṣepāṇāṃ dhanatvam eva prakalpya guṇāptī sādhye/ te yogaje bhavataḥ/ te svatakṣaṇābhyāṃ śuddhe viyogaje kārye/ bhājye bhājake varṇagate parasparabhajanāl labdhaya ṛṇagatāḥ sthāpyā iti kiṃ tena prayāsena/ tathā kṛte sati ‘bhājyabhājakayor ekasmin ṛṇagate guṇāptī dvau rāśī kṣipet tatra’ ityādinā paroktasūtreṇa labdhau vyabhicāraḥ syāt//E23p2//[121]

udāharaṇam/E24p0/

aṣṭādaśa hatāḥ kena daśādhyā vā daśonitāḥ/ E24
śuddhaṃ bhāgaṃ prayacchanti kṣayagaikādaśoddhṛtāḥ//E24//[122]

nyāsaḥ/ bhā 18/ hā $\dot{1}\dot{1}$/ kṣe 10/ atra bhājakasya dhanatvaṃ prakalpya sādhitau labdhiguṇau $\begin{matrix}14\\8\end{matrix}$ / etāv evarṇabhājake kiṃtu labdheḥ pūrvavad ṛṇatvaṃ jñeyaṃ/ tathā kṛte jātau labdhiguṇau $\begin{matrix}\dot{1}\dot{4}\\8\end{matrix}$ / ṛṇakṣepe tu ‘yogaje takṣaṇāc chuddhe’ (BG 32a) ityādinā labdhiguṇau $\begin{matrix}4\\3\end{matrix}$ / bhājakasya dhanatva ṛṇatve vā labdhiguṇāv etāv eva paraṃtu bhājake bhājye varṇagate labdher ṛṇatvaṃ sarvatra jñeyam//E24p//[123]

udāharaṇam/E25p0/

yena saṃguṇitāḥ pañca trayoviṃśatisaṃyutāḥ/ E25
varjitā vā tribhir bhaktā niragrāḥ syuḥ sa ko guṇaḥ//E25//[124]

nyāsaḥ/ bhā 5/ hā 3/ kṣe 23/ atra vallī $\left|\begin{matrix}1\\1\\23\\0\end{matrix}\right|$ pūrvavaj jātaṃ rāśidvayaṃ $\begin{matrix}46\\23\end{matrix}$ /

atra takṣaṇe ’dhorāśau sapta labhyante/ ūrdhvarāśau tu nava labhyante/ te nava na grāhyāḥ/ ‘guṇalabdhyoḥ samaṃ grāhyaṃ dhīmatā takṣaṇe phalam’ (BG 32ef) iti/

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[120]Cited from BG 32cd.

[121]siddhaṃ yata AM] tatsiddheḥ/ G; ṛṇadhanayogo AM] ṛṇadhanayoryogo G; parasparabhajanāl AM] parasparaṃ bhajanāl G; labdhaya ṛṇa AM] labdhayaḥ ṛṇa G; kiṃ tena prayāsena AM] kiṃ prayāsena G.

[122]hatāḥ AMGTJJ(H)] guṇāḥ PJ(S); śuddhaṃ bhāgaṃ AMGTP] śuddhabhāgaṃ J; daśoddhṛtāḥ AMPJ] daśoddhatāḥ GT. The L does not have this verse.

[123]bhā 18/ hā $\dot{1}\dot{1}$/ kṣe 10/ AM] bhājyaḥ 18/ kṣepaḥ 10/ hāraḥ $\dot{1}\dot{1}$ G; $\begin{matrix}\dot{1}\dot{4}\\8\end{matrix}$ AM] $\begin{matrix}14\\8\end{matrix}$ G; yogaje GM] yogage A.

[124]niragrāḥ syuḥ sa AMGTPJL(ASS)] niragrā vada L(VIS).

ataḥ saptaiva grāhyā iti jātau labdhiguṇau $\begin{smallmatrix}11\\2\end{smallmatrix}$ yogajau/ etau svasvatakṣaṇābhyāṃ śodhitau jātau ṛṇakṣepe $\begin{smallmatrix}\dot{6}\\1\end{smallmatrix}$ / ‘iṣṭāhatasvasvahareṇa yukte’ (BG 36a) iti dviguṇitau svasvahārau kṣepyau yathā dhanalabdhiḥ syād iti kṛte jātau labdhiguṇau $\begin{smallmatrix}4\\7\end{smallmatrix}$ / evaṃ sarvatra jñeyam//E25p1//[125]

athavā ‘harataṣṭe dhanakṣepe ⟨guṇalabdhī tu pūrvavat⟩’ (BG 33ab) iti nyāsaḥ/ bhā 5/ hā 3/ kṣe 2/ pūrvavaj jātau labdhiguṇau yogajau $\begin{smallmatrix}4\\2\end{smallmatrix}$ / etau svatakṣaṇābhyāṃ śuddhau $\begin{smallmatrix}1\\1\end{smallmatrix}$ jātau viyogajau/ ‘kṣepatakṣaṇalābhāḍhyā labdhiḥ’ (BG 33cd) iti kṣepatakṣaṇalābhena 7 yogajalabdhir yutā 11 jātā yogajaiva labdhiḥ/ ‘śuddhau tu varjitā’ (BG 33d) iti takṣaṇalābhena 7 labdhir iyaṃ 1 varjitā $\dot{6}$/ dhanalabdhyarthaṃ dviguṇe hare kṣipte jātau tāv eva labdhiguṇau $\begin{smallmatrix}4\\7\end{smallmatrix}$ //E25p2//[126]

athavā ‘bhāgahāreṇa taṣṭayoḥ’ (BG 34ab) iti nyāsaḥ/ bhā 2/ hā 3/ kṣe 2/ atrāpi jātaṃ rāśidvayam $\begin{smallmatrix}2\\2\end{smallmatrix}$ / atrāpi jātaḥ pūrva eva guṇaḥ 2/ labdhis tu ‘bhājyād dhatayutoddhṛtāt’ (BG 34d) iti guṇa2guṇito bhājyaḥ 10 kṣepa23yuto 33 hara3bhakto labdhiḥ saiva 11//E25p3//[127]

udāharaṇam/E26p0/[128]

yena pañca guṇitāḥ khasaṃyutāḥ E26
pañcaṣaṣṭisahitāś ca te ’thavā/
syus trayodaśahṛtā niragrakās
taṃ guṇaṃ gaṇaka kīrtayāśu me//E26//[129]

nyāsaḥ/ bhā 5/ hā 13/ kṣe 0/ kṣepābhāve guṇāptī $\begin{smallmatrix}0\\0\end{smallmatrix}$ / evaṃ pañcaṣaṣṭikṣepe $\begin{smallmatrix}0\\5\end{smallmatrix}$ vā $\begin{smallmatrix}13\\10\end{smallmatrix}$ ityādi//E26p//[130]

atha sthirakuṭṭake sūtraṃ vṛttam/36cdp0/

kṣepaṃ viśuddhiṃ parikalpya rūpaṃ 36cd
pṛthak tayor ye guṇakāralabdhī//36cd//[131]

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[125] bhā 5/ hā 3/ kṣe 23/ AM] bhā. 5/ hā 3/ kṣe 23/ G; $\begin{smallmatrix}\dot{6}\\1\end{smallmatrix}$] $\begin{smallmatrix}6\\1\end{smallmatrix}$ AMG; yukte iti AM] yuktāviti G.

[126] athavā AM] ∅ G; bhā 5/ hā 3/ kṣe 2/ AM] bhā. 5/ hā 3/ kṣe. 2/ G; 7 (1st) AM] ∅ G; 11 AM] 1 G; yogajaiva AM] yogajā G; 7 (2nd) M] ∅ AG.

[127] bhā 2/ hā 3/ kṣe 2/ AM] bhā. 2/ hā. 3/ kṣe 2/ G; $\begin{smallmatrix}2\\2\end{smallmatrix}$ / AM] $\begin{smallmatrix}2\\2\end{smallmatrix}$ takṣaṇājjātṃ $\begin{smallmatrix}2\\2\end{smallmatrix}$ G; yutoddhṛtāt A(-d)] yutoddhatād MG; guṇa2guṇito G] guṇaḥ 2 guṇito AM; hara3bhakto G] harabhakto AM.

[128] udāharaṇam/ MG] ∅ A.

[129] ’thavā AMGTPJJ(H)L] tathā J(S); trayodaśahṛtā AMGTJL] trayodaśa hṛtā P.

[130] bhā 5/ hā 13/ kṣe 0/ AM] bhājyaḥ 5/ hāraḥ 13/ kṣepaḥ 0/ G; $\begin{smallmatrix}0\\5\end{smallmatrix}$ G] $\begin{smallmatrix}5\\0\end{smallmatrix}$ AM.

[131] kṣepaṃ viśuddhiṃ parikalpya rūpaṃ AMGTPJ] kṣepe rūpe yadi vā viśuddhau L(VIS), kṣepe

abhīpsitakṣepaviśuddhinighnyau 37ab
svahārataṣṭe bhavatas tayos te/37ab/[132]

prathamodāharaṇe (BG E21) dṛḍhabhājyahārayo rūpakṣepasya ca nyāsaḥ/ bhā 17/ hā 15/ kṣe 1/ atroktavad guṇāptī $\begin{matrix}7\\8\end{matrix}$ / ete abhīṣṭakṣepapañcaguṇe svahārataṣṭe jāte $\begin{matrix}5\\6\end{matrix}$ te eva/ atha rūpaśuddhau guṇāptī $\begin{matrix}8\\9\end{matrix}$ / ete pañcakaguṇe svahārataṣṭe jāte $\begin{matrix}10\\11\end{matrix}$ / evaṃ sarvatra//37abp//[133]

asya gaṇitasya grahagaṇite mahān upayogaḥ/ tadarthaṃ kiṃcid ucyate/ 37cdp0/[134]

kalpyātha śuddhir vikalāvaśeṣaṃ 37cd
ṣaṣṭiś ca bhājyaḥ kudinānī hāraḥ//37cd//[135]
tajjaṃ phalaṃ syur vikalā guṇas tu 38
liptāgram asmāc ca kalā lavāgram/
evaṃ tadūrdhvaṃ ca tathādhimāsā-
vamāgrakābhyāṃ divasā ravīndvoḥ//38//[136]

grahasya vikalāvaśeṣād grahāhargaṇayor ānayanam/ tatra ṣaṣṭir bhājyaḥ/ kudinānī hāraḥ/ vikalāvaśeṣaṃ śuddhir iti prakalpya guṇāptī sādhye/ tatra labdhir vikalāḥ syuḥ/ guṇas tu kalāvaśeṣam/ evaṃ kalāvaśeṣaṃ śuddhiṃ prakalpya tatra labdhiḥ kalāḥ/ guṇo bhāgaśeṣam/ bhāgaśeṣaṃ śuddhis triṃśad bhājyaḥ kudinānī hāraḥ/ tatra phalaṃ bhāgā guṇo rāśiśeṣam/ dvādaśa bhājyaḥ kudinānī hāro rāśiśeṣaṃ śuddhiḥ/ tatra phalaṃ gatarāśayaḥ/ guṇo bhagaṇaśeṣam/ evaṃ kalpabhagaṇā bhājyaḥ kudinānī hāro bhagaṇaśeṣaṃ śuddhiḥ/ phalaṃ gatabhagaṇāḥ/ guṇo 'hargaṇaḥ syād iti/ asyodāharaṇāni ⟨golādhyāyāntargata⟩praśnādhyāye//38p1//[137]

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rūpe yadi vā viśuddhe L(ASS); pṛthak tayor AMGTPJJ(S)] pṛthak pṛthag J(H), syātāṃ kramād L.

[132]nighnyau AMT] nighne GPJL.

[133]bhā 17/ hā 15/ kṣe 1/ AM] $\begin{matrix}\text{bhā. 17/ kṣe. 1/}\\\text{hā. 15/}\end{matrix}$ G; jāte $\begin{matrix}5\\6\end{matrix}$ te eva G] jāte $\begin{matrix}5\\6\end{matrix}$ AM; evaṃ sarvatra] te eva/ evaṃ sarvatra G, te eva sarvatra AM.

[134]A includes this passage ('asya ... kiṃcid ucyate') in 37abp.

[135]vikalāvaśeṣaṃ AMGTPJ] vikalāvaśeṣaḥ L; bhājyaḥ MGTPJL] bhājya A.

[136]vikalā guṇas AMGPJL] vikalāguṇas T; tadūrdhvaṃ AMGT(cor)PJL] tadardhaṃ T; tathā AMGPJL] tadā T; kābhyāṃ AMGTJL] kābhyo P; divasā ravīndvoḥ AMGPJL] divasāravīndvoḥ T.

[137]tatra ṣaṣṭir T(K)P(K)] tadyathā/ ṣaṣṭir AM, tadyathā/ tatra ṣaṣṭir G; guṇāptī sādhye T(K)P(K)] sādhye guṇāptī AMG; labdhir vikalāḥ AMGP(K)] labdhirviphalāḥ T(K); kalāvaśeṣaṃ śuddhiṃ prakalpya tatra labdhiḥ kalāḥ/ guṇo bhāgaśeṣam T(K)P(K)] kalāvaśeṣaṃ śuddhiḥ/ ṣaṣṭirbhājyaḥ

evaṃ kalpādhimāsā bhājyaḥ/ ravidināni hāraḥ/ adhimāsaśeṣaṃ śuddhiḥ/ phalaṃ gatādhimāsāḥ/ guṇo gataravidivasāḥ//38p2//[138]

evaṃ yugāvamāni bhājyaḥ/ cāndradivasā hāraḥ/ avamaśeṣaṃ śuddhiḥ/ phalaṃ gatāvamāni/ guṇo gatacāndradivasā iti//38p3//[139]

atha saṃśliṣṭakuṭṭake karaṇasūtraṃ vṛttam/39p0/

eko haraś ced guṇakau vibhinnau 39
tadā guṇaikyaṃ parikalpya bhājyam/
agraikyam agraṃ kṛta uktavad yaḥ
saṃśliṣṭasaṃjñaḥ sphuṭakuṭṭako 'sau//39//[140]

udāharaṇam/E27p0/

kaḥ pañcanighno vihṛtas triṣaṣṭyā E27
saptāvaśeṣo 'tha sa eva rāśiḥ/
daśāhataḥ syād vihṛtas triṣaṣṭyā
caturdaśāgro vada rāśim enam//E27//[141]

atra guṇaikyaṃ bhājyaḥ/ agraikyaṃ śuddhir iti nyāsaḥ/ bhā 15/ hā 63/ kṣe 21/ pūrvavaj jāto guṇaḥ 14/ ayam eva rāśiḥ//E27p1//[142]

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kudināni hāraḥ/ phalaṃ kalāḥ/ guṇoṃśaśeṣam AM, kalāvaśeṣāllabdhiḥ kalā guṇo bhāgaśeṣam G; bhāgaśeṣaṃ śuddhis triṃśad bhājyaḥ kudināni hāraḥ/ tatra phalaṃ bhāgā (bhāgaḥ T(K)) guṇo rāśiśeṣam T(K)P(K)] ∅ AM, tadbhāgaśeṣaṃ śuddhiḥ/ kudināni hāraḥ/ triṃśadbhājyaḥ/ tatra labdhirbhāgāḥ/ guṇo rāśiśeṣam/ G; dvādaśa bhājyaḥ kudināni hāro rāśiśeṣaṃ śuddhiḥ T(K)P(K)G] evaṃ rāśiśeṣaṃ śuddhirdvādaśabhājyaḥ/ kudināni hāraḥ AM; tatra phalaṃ gatarāśayaḥ T(K)P(K)] phalaṃ gatarāśayaḥ AM, tatra phalaṃ rāśayaḥ G; evaṃ kalpabhagaṇā bhājyaḥ T(K)P(K)AM] bhagaṇā bhājyaḥ G; phalaṃ gatabhagaṇāḥ T(K)AMG] tatra phalaṃ gatabhagaṇāḥ P(K); praśnādhyāye T(K)P(K)G] tripraśnādhyāye AM.

[138]phalaṃ T(K)P(K)AM] labdhir G.

[139]yugāvamāni T(K)P(K)AM] kalpāvamāni G; cāndradivasā AMG] candradivasā T(K) P(K); hāraḥ/ avamaśeṣaṃ G] hara avamaśeṣaṃ T(K), haro 'vamaśeṣaṃ AM, haraḥ/ avamaśeṣaṃ P(K); gatacāndra T(K)P(K)G] gatacandra AM.

[140]vibhinnau AMGTPJL(ASS)] tu bhinnau L(VIS); kṛta uktavad AMGTPL] kṛtamuktavad J; sphuṭa AMGPJL] sphuṭha T.

[141]pañca AMGPJL] ṣacca T; triṣaṣṭyā (1st) AMGPJL] triṣaṣṭhyā T; saptāvaśeṣo GTPJL] saptāvaśaṣo AM; triṣaṣṭyā (2nd) AMGPJL] triṣaṣṭā T. JF are available up to this verse.

[142]bhājyaḥ G] bhājyo 'yam eva rāśiḥ AM; śuddhir iti nyāsaḥ] śuddhiriti/ nyāsaḥ AM, śuddhiḥ/ nyāsaḥ G; bhā 15/ hā 63/ kṣe 21/] bhā 15/ hā 63/ kṣepaḥ 21/ A, bhā 15/ hā 63/ kṣepaḥ 21/ M, bhājyaḥ 15/ hāraḥ 63/ kṣepaḥ 21/ G; pūrvavaj jāto MG] pūrvajjāto A; ayam eva rāśiḥ G] labdhiḥ 3 AM.

iti bhāskarīye bījagaṇite kuṭṭakaḥ//E27p2//[143]

II.6 varga-prakṛti[144]

II.6.1 Varga-prakṛti

atha vargaprakṛtiḥ//40p1//

tatra rūpakṣepapadārthaṃ tāvat karaṇasūtrāṇi sārdhaṣaḍ vṛttāni/40p0/[145]

iṣṭaṃ hrasvaṃ tasya vargaḥ prakṛtyā 40
kṣuṇṇo yukto varjito vā sa yena/
mūlaṃ dadyāt kṣepakaṃ taṃ dhanarṇaṃ
mūlaṃ tac ca jyeṣṭhamūlaṃ vadanti//40//
hrasvajyeṣṭhakṣepakān nyasya teṣāṃ 41
tān anyān vādho niveśya krameṇa/
sādhyāny ebhyo bhāvanābhir bahūni
mūlāny eṣāṃ bhāvanā procyate 'taḥ//41//
vajrābhyāsau jyeṣṭhalaghvos tadaikyaṃ 42
hrasvaṃ laghvor āhatiś ca prakṛtyā/
kṣuṇṇā jyeṣṭhābhyāsayug jyeṣṭhamūlaṃ
tatrābhyāsaḥ kṣepayoḥ kṣepakaḥ syāt//42//
hrasvaṃ vajrābhyāsayor antaraṃ vā 43
laghvor ghāto yaḥ prakṛtyā vinighnaḥ/
ghāto yaś ca jyeṣṭhayos tadviyogo
jyeṣṭhaṃ kṣepo 'trāpi ca kṣepaghātaḥ//43//[146]
iṣṭavargahṛtaḥ kṣepaḥ kṣepaḥ syād iṣṭabhājite/ 44
mūle te sto 'thavā kṣepaḥ kṣuṇṇaḥ kṣuṇṇe tadā pade//44//[147]
iṣṭavargaprakṛtyor yad vivaraṃ tena vā bhajet/ 45
dvighnam iṣṭaṃ kaniṣṭhaṃ tat padaṃ syād ekasaṃyutau//45//
tato jyeṣṭham ihānantyaṃ bhāvanātas tatheṣṭataḥ/46ab/[148] 46ab

udāharaṇam//E28p0/

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[143]bhāskarīye bījagaṇite] śrībhāskarācāryaviracite bījagaṇite AM, ∅ G; kuṭṭakaḥ G] kuṭṭakādhyāyaḥ AM.

[144]I divide this chapter in two sections, vargaprakṛti and cakravāla, according to the concluding remarks E28p5 and 55p.

[145]tatra ... sūtrāṇi AMG] ∅ TP; sārdhaṣaḍ vṛttāni AM] ∅ GTP.

[146]jyeṣṭhaṃ AMGP] jyeṣṭo T.

[147]hṛtaḥ AMGT] hataḥ P.

[148]ihānantyaṃ AMGP] ihānantya T; bhāvanātas TP] bhāvanābhis AMG.

ko vargo 'ṣṭahataḥ saikaḥ kṛtiḥ syād gaṇakocyatām/ E28
ekādaśaguṇaḥ ko vā vargaḥ saikaḥ kṛtiḥ sakhe//E28//[149]

prathamodāharaṇe nyāsaḥ/ pra 8/ kṣe 1/ atraikam iṣṭaṃ hrasvaṃ prakalpya jāte mūle sakṣepe ka 1 jye 3 kṣe 1/ eṣāṃ bhāvanārthaṃ nyāsaḥ/

pra 8	ka	1	jye	3	kṣe	1
	ka	1	jye	3	kṣe	1

'vajrābhyāsau jyeṣṭhalaghvoḥ' (BG 42a) ityādinā prathamakaniṣṭhadvitīyajyeṣṭhamūlābhyāsaḥ 3/ dvitīyakaniṣṭhaprathamajyeṣṭhamūlābhyāsaḥ 3/ anayor aikyaṃ 6 kaniṣṭhapadaṃ syāt/ kaniṣṭhayor āhatiḥ 1 prakṛtiguṇā 8 jyeṣṭhayor abhyāsena 9 anena yutā 17 jyeṣṭhapadaṃ syāt/ kṣepayor āhatiḥ kṣepakaḥ syāt 1/ prāṅmūlakṣepāṇām ebhiḥ saha bhāvanārthaṃ nyāsaḥ/

pra 8	ka	1	jye	3	kṣe	1
	ka	6	jye	17	kṣe	1

bhāvanayā labdhe mūle ka 35 jye 99 kṣe 1/ evaṃ padānām ānantyam//E28p1//[150]

dvitīyodāharaṇe rūpam iṣṭaṃ kaniṣṭhaṃ prakalpya tadvargāt prakṛtiguṇāt 11 rūpadvayam apāsya mūlaṃ jyeṣṭham 3/ atra bhāvanārthaṃ nyāsaḥ/

pra 11	ka	1	jye	3	kṣe	$\overset{\bullet}{2}$
	ka	1	jye	3	kṣe	$\overset{\bullet}{2}$

prāgval labdhe catuḥkṣepamūle ka 6 jye 20 kṣe 4/ 'iṣṭavargahṛtaḥ kṣepaḥ' (BG 44a) ityādinā jāte rūpakṣepamūle ka 3 jye 10 kṣe 1/ atas tulyabhāvanayā vā kaniṣṭhajyeṣṭhamūle jāte ka 60 jye 199 kṣe 1/ evam anantamūlāni//E28p2//[151]

athavā rūpaṃ kaniṣṭhaṃ prakalpya jāte pañcakṣepapade ka 1 jye 4 kṣe 5/ atas tulyabhāvanayā mūle ka 8 jye 27 kṣe 25/ 'iṣṭavargahṛtaḥ' (BG 44a) ityādinā pañcakam iṣṭaṃ prakalpya jāte rūpakṣepapade ka $\frac{8}{5}$ jye $\frac{27}{5}$ kṣe 1/ anayoḥ pūrvamūlābhyāṃ saha bhāvanārthaṃ nyāsaḥ/

pra 11	ka	$\frac{8}{5}$	jye	$\frac{27}{5}$	kṣe	1
	ka	3	jye	10	kṣe	1

bhāvanayā labdhe mūle ka $\frac{161}{5}$ jye $\frac{534}{5}$ kṣe 1/ athavā 'hrasvaṃ vajrābhyāsayor antaram' (BG 43a) ityādinā kṛtayā bhāvanayā jāte mūle ka $\frac{1}{5}$ jye $\frac{6}{5}$ kṣe 1/ evam anekadhā//E28p3//

'iṣṭavargaprakṛtyor yad vivaraṃ tena vā bhajed' (BG 45ab) ityādinā pakṣāntareṇa pade rūpakṣepe pratipādyete/ tatra prathamodāharaṇe rūpatrayam iṣṭaṃ

[149] kṛtiḥ sakhe GTP] kṛtirbhavet AM.

[150] kṣe 1 (1st) AM] kṣe G; prakalpya MG] prakalṣya A; vajrābhyāsau AM] atra sūtram vajrābhyāsau G; dvitīyakaniṣṭhaprathamajyeṣṭha AM] dvitīyajyeṣṭhaprathamakaniṣṭha G; 9 anena AM] anena 9 G.

[151] catuḥkṣepa AM] catuḥkṣepaka G.

prakalpitam 3/ asya vargaḥ 9/ prakṛtiḥ 8/ anayor antaram 1/ anena dvighnam iṣṭaṃ bhaktaḥ 6 jātaṃ rūpakṣepe kaniṣṭhapadam/ ataḥ pūrvavaj jyeṣṭham 17/ evaṃ dvitīyodāharaṇe 'pi rūpatrayam iṣṭaṃ prakalpya jāte kaniṣṭhajyeṣṭhe 3/ 10/ evam iṣṭavaśāt samāsāntarabhāvanābhyāṃ ca padānām ānantyam//E28p4//[152]

iti vargaprakṛtiḥ//E28p5//

II.6.2 Cakravāla

atha cakravāle karaṇasūtraṃ vṛttacatuṣṭayam/46cdp0/

hrasvajyeṣṭhapadakṣepān bhājyaprakṣepabhājakān//46cd// 46cd
kṛtvā kalpyo guṇas tatra tathā prakṛtitaś cyute/ 47
guṇavarge prakṛtyone 'thavālpaṃ śeṣakaṃ yathā//47//
tat tu kṣepahṛtaṃ kṣepo vyastaḥ prakṛtitaś cyute/ 48
guṇalabdhiḥ padaṃ hrasvaṃ tato jyeṣṭham ato 'sakṛt//48//[153]
tyaktvā pūrvapadakṣepāṃś cakravālam idaṃ jaguḥ/ 49
caturdvyekayutāv evam abhinne bhavataḥ pade//49//[154]
caturdvikṣepamūlābhyāṃ rūpakṣepārthabhāvanā/50ab/[155] 50ab

udāharaṇam/E29p0/

kā saptaṣaṣṭiguṇitā kṛtir ekayuktā E29
kā caikaṣaṣṭinihatā ca sakhe sarūpā/
syān mūladā yadi kṛtiprakṛtir nitāntaṃ
tvaccetasi pravada tāta tatā latāvat//E29//[156]

prathamodāharaṇe rūpaṃ kaniṣṭhaṃ trayam ṛṇakṣepaṃ ca prakalpya nyāsaḥ/ pra 67 ka 1 jye 8 kṣe $\dot{3}$/ hrasvaṃ bhājyaṃ jyeṣṭhaṃ prakṣepaṃ kṣepakaṃ bhājakaṃ ca prakalpya kuṭṭakārthaṃ nyāsaḥ/ bhā 1 hā 3 kṣe 8/ atra 'haratasṭe' (BG 33a) iti kṛte jātā vallī $\left|\begin{smallmatrix}0\\2\\0\end{smallmatrix}\right|$ labdhiguṇau $\begin{smallmatrix}0\\2\end{smallmatrix}$ / 'ūrdhvo vibhājyena' (BG 29c) 'adharo hareṇa' (BG 29d) iti taṣṭikaraṇe svasvataṣṭau labdhivaiṣamyāt svatakṣaṇābhyāṃ $\begin{smallmatrix}1\\3\end{smallmatrix}$ śuddhau $\begin{smallmatrix}1\\1\end{smallmatrix}$ / 'kṣepatakṣaṇalābhāḍhyā labdhiḥ' (BG 33cd) iti labdhiguṇau

[152]tena AM] tana G; iṣṭaṃ prakalpitam MG] iṣṭūṃ prakalpitam A; antaram 1/ MG] antam 1/ A; kaniṣṭhapadam/ ataḥ] kaniṣṭhapadamataḥ AM, kaniṣṭhaṃ padamataḥ G; dvitīyodāharaṇe 'pi MG] dvitīyodāhareṇe 'pi A; ānantyam MG] āntyam A.

[153]guṇalabdhiḥ AGTP] gaṇalabdhiḥ M.

[154]caturdvyeka AGTP] cartudvyeka M.

[155]caturdvikṣepa MGTP] catudvikṣepa A.

[156]nihatā GTP] guṇitā AM; tatā latāvat AMG] tatālatāvat TP.

$\begin{smallmatrix}3\\1\end{smallmatrix}$ / harasya carṇatvāl labdher ṛṇatve kṛte jātau labdhiguṇau $\begin{smallmatrix}\dot{3}\\1\end{smallmatrix}$ / guṇasya varge 1 prakṛteḥ śodhite śeṣaṃ 66 alpakaṃ na jātam/ ato rūpadvayam ṛṇam iṣṭaṃ prakalpya 'iṣṭāhatasvasvahareṇa' (BG 36a) ityādinā jātau labdhiguṇau $\begin{smallmatrix}\dot{5}\\7\end{smallmatrix}$ / atra guṇavarge 49 prakṛter viśodhite śeṣam 18/ kṣepeṇa $\dot{3}$ hṛtaṃ labdham $\dot{6}$/ ayam kṣepaḥ/ guṇavarge prakṛter viśodhite vyastaḥ syād iti dhanam 6/ labdhiḥ kaniṣṭhaṃ padam $\dot{5}$/ asyarṇatve dhanatve cottare karmaṇi na viśeṣo 'stīti jātaṃ dhanam 5/ asya varge prakṛtiguṇe ṣaḍyute jātaṃ mūlaṃ jyeṣṭham 41//E29p1//[157]

punar eṣāṃ kuṭṭakārthaṃ nyāsaḥ/ bhā 5 hā 6 kṣe 41/ vallī $\left|\begin{smallmatrix}0\\1\\41\\0\end{smallmatrix}\right|$ ato labdhiguṇau $\begin{smallmatrix}11\\5\end{smallmatrix}$ / guṇavarge 25 prakṛteś cyute śeṣe 42 kṣepeṇa 6 hṛte 7 'vyastaḥ prakṛtitaś cyute' (BG 48b) iti jātaḥ kṣepaḥ $\dot{7}$/ labdhiḥ kaniṣṭham 11/ ato jyeṣṭham 90//E29p2//[158]

punar eṣāṃ kuṭṭakārthaṃ nyāsaḥ/ bhā 11 hā $\dot{7}$ kṣe 90/ atra 'haratasṭe dhanakṣepe' (BG 33a) iti kṛte jāto guṇaḥ 5/ labdhayo viṣamā iti takṣaṇaśuddho jāto guṇaḥ 2/ asya kṣepaḥ $\dot{7}$/ ṛṇarūpeṇa $\dot{1}$ guṇitaṃ kṣepaṃ 7 guṇe prakṣipya jāto guṇaḥ 9/ asya varge prakṛtyone śeṣaṃ 14 kṣepeṇa $\dot{7}$ hṛtvā jātaḥ kṣepaḥ $\dot{2}$/ labdhiḥ kaniṣṭham 27/ ato jyeṣṭham 221//E29p3//[159]

ābhyāṃ tulyabhāvanārthaṃ nyāsaḥ/

$$\left|\begin{array}{cccccc} \text{ka} & 27 & \text{jye} & 221 & \text{kṣe} & \dot{2} \\ \text{ka} & 27 & \text{jye} & 221 & \text{kṣe} & \dot{2} \end{array}\right|$$

uktavan mūle ka 11934 jye 97684 kṣe 4/ catuḥkṣepapadena 2 anena bhakte jāte rūpakṣepamūle ka 5967 jye 48842 kṣe 1//E29p4//[160]

dvitīyodāharaṇe nyāsaḥ/ pra 61 ka 1 jye 8 kṣe 3/ kuṭṭakārthaṃ nyāsaḥ/ bhā 1 hā 3 kṣe 8/ 'haratasṭe dhanakṣepe' (BG 33a) iti labdhiguṇau $\begin{smallmatrix}3\\1\end{smallmatrix}$ / 'iṣṭāhata' (BG 36a) iti dvābhyām utthāpya jātau labdhiguṇau $\begin{smallmatrix}5\\7\end{smallmatrix}$ / guṇavarge 49 prakṛteḥ śodhite 12 'vyastaḥ' (BG 48b) ity ṛṇam $\dot{12}$/ idaṃ kṣepahṛtaṃ jātaḥ kṣepaḥ $\dot{4}$/ ataḥ prāgvaj

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[157]pra 67 ka 1 jye 8 kṣe $\dot{3}$] pra 67 kṣe 1/ ka 1 jye 8 kṣe $\dot{3}$ AMG; bhā 1 hā 3 kṣe 8/] bhā 1 hā $\dot{3}$ kṣepaḥ $\dot{8}$/ A, bhā 1 hā 3 kṣepaḥ 8/ M, $\begin{smallmatrix}\text{bhā. 1/ kṣe. 8/}\\\text{hā. 3/}\end{smallmatrix}$ G; lābhāḍhyā MG] lāḍhyā A; harasya ca AM] harasya G; labdher ṛṇatve] labdhe ṛṇatve AM, labdheḥ ṛṇatve G; viśodhite (twice) MG] viṃśodhite A; kaniṣṭhaṃ padam AM] kaniṣṭhapadam G; asyarṇatve dhanatve cottare karmaṇi na viśeṣo 'stīti jātaṃ dhanam 5/ MG(asya ṛṇatve, ca uttare)] ∅ A.

[158]bhā 5 hā 6 kṣe 41/ AM] $\begin{smallmatrix}\text{bhā}^\circ\ 5/\ \text{kṣe}^\circ\ 41/\\\text{hā}^\circ\ 6\end{smallmatrix}$ G; śeṣe AM] śeṣaṃ G.

[159]bhā 11/ hā $\dot{7}$/ kṣe 90/ AM] $\begin{smallmatrix}\text{bhā}^\circ\ 11/\ \text{kṣe}^\circ\ 90/\\\text{hā}^\circ\ \dot{7}/\end{smallmatrix}$ G; 5 MG] 2 A.

[160]padena] pade AMG.

jāte catuḥkṣepamūle ka 5 jye 39 kṣe $\dot{4}$//E29p5//[161]

'iṣṭavargahṛtaḥ kṣepaḥ kṣepaḥ syāt' (BG 44ab) ity upapannarūpaśuddhimūlayor bhāvanārthaṃ nyāsaḥ/

ka	$\frac{5}{2}$	jye	$\frac{39}{2}$	kṣe	$\dot{1}$
ka	$\frac{5}{2}$	jye	$\frac{39}{2}$	kṣe	$\dot{1}$

ato bhāvanayā jāte rūpakṣepamūle ka $\frac{195}{2}$ jye $\frac{1523}{2}$ kṣe 1//E29p6//[162]

anayoḥ punā rūpaśuddhipadābhyāṃ bhāvanārthaṃ nyāsaḥ/

ka	$\frac{5}{2}$	jye	$\frac{39}{2}$	kṣe	$\dot{1}$
ka	$\frac{195}{2}$	jye	$\frac{1523}{2}$	kṣe	1

ato jāte rūpaśuddhau mūle ka 3805 jye 29718 kṣe $\dot{1}$/ anayos tulyabhāvanayā jāte rūpakṣepamūle ka 226153980 jye 1766319049 kṣe 1//E29p7//[163]

atha rūpaśuddhau khilatvajñānaprakārāntaritapadānayanayoḥ karaṇasūtraṃ vṛttadvayam/50cdp0/

rūpaśuddhau khiloddiṣṭaṃ vargayogo guṇo na cet//50cd// 50cd
akhile kṛtimūlābhyāṃ dvidhā rūpaṃ vibhājitam/ 51
dvidhā hrasvapadaṃ jyeṣṭhaṃ tato rūpaviśodhane//51//[164]
pūrvavad vā prasādhyete pade rūpaviśodhane/52ab/ 52ab

udāharaṇam/E30p0/

trayodaśaguṇo vargo nirekaḥ kaḥ kṛtir bhavet/ E30
ko vāṣṭaguṇito vargo nireko mūlado vada//E30//[165]

atra prakṛtir dvikatrikayor vargayor yogaḥ 13/ ato dvikena rūpaṃ hṛtaṃ rūpaśuddhau kaniṣṭhaṃ padaṃ $\frac{1}{2}$ syāt/ asya vargāt prakṛtiguṇād ekonān mūlaṃ jyeṣṭham $\frac{3}{2}$ / athavā trikeṇa rūpaṃ hṛtaṃ kaniṣṭhaṃ $\frac{1}{3}$ syāt/ ato jyeṣṭham $\frac{2}{3}$ //E30p1//[166]

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[161] pra 61 ka 1 jye 8 kṣe 3/ kuṭṭakārthaṃ nyāsaḥ/ AM] ∅ G; bhā 1 hā 3 kṣe 8/ AM] bhā. 1/ kṣe. 8/ hā. 3/ G; kṣepahṛtaṃ AM] kṣepa-6-hṛtaṃ G; kṣe $\dot{4}$ G] ∅ AM.

[162] kṣepaḥ kṣepaḥ G] kṣepaḥ AM; ato bhāvanayā AM] anayor G.

[163] kṣe $\dot{1}$ (2nd) AG] ∅ M; kṣe 1 (2nd) G] ∅ AM.

[164] rūpaviśodhane AMGP] rūpaviśodhanam T.

[165] vargo (twice) AMGP] vargaḥ T.

[166] padaṃ $\frac{1}{2}$ syāt AM] padaṃ syāt $\frac{1}{2}$ G; jyeṣṭham $\frac{3}{2}$ AM] jyeṣṭham padam $\frac{3}{2}$ G; kaniṣṭhaṃ $\frac{1}{3}$ syāt AM] kaniṣṭhaṃ syāt $\frac{1}{2}$ G.

athavā kaniṣṭham 1/ asya vargāt prakṛtiguṇāc caturūnān mūlaṃ jyeṣṭham 3/ krameṇa nyāsaḥ/ ka 1 jye 3 kṣe $\dot{4}$/ 'iṣṭavargahṛtaḥ kṣepaḥ' (BG 44a) ityādinā jāte rūpaśuddhau pade ka $\frac{1}{2}$ jye $\frac{3}{2}$ kṣe $\dot{1}$/ athavā prakṛter nava tyaktvaivam eva jāte ka $\frac{1}{3}$ jye $\frac{2}{3}$ kṣe $\dot{1}$//E30p2//[167]

cakravālenābhinne vā/ eṣāṃ hrasvajyeṣṭhapadakṣepāṇāṃ bhinnānāṃ 'hrasvajyeṣṭhapadakṣepān' (BG 46c) ityādinā 'bhājyaprakṣepabhājakān' (BG 46d) prakalpya pūrvapadayor nyāsaḥ/ bhā $\frac{1}{2}$ hā $\dot{1}$ kṣe $\frac{3}{2}$ / atra bhājyabhājakakṣepān ardhenāpavartya jātāḥ bhā 1 hā $\dot{2}$ kṣe 3/ 'haratasṭe' (BG 33a) iti kuṭṭakena guṇalabdhī $\frac{1}{\dot{2}}$ atreṣṭam ṛṇaṃ rūpaṃ prakalpya jāto 'nyo guṇaḥ 3/ 'guṇavarge' (BG 47c) ityādinā kṣepaḥ 4/ labdhiḥ 3 kaniṣṭham/ ato jyeṣṭham 11/ krameṇa nyāsaḥ/ ka 3 jye 11 kṣe 4/ ato 'pi punar 'bhājyaprakṣepabhājakān' (BG 46d) ityādinā cakravālena labdho guṇaḥ 3/ 'guṇavarge' (BG 47c) ityādinā rūpaśuddhāv abhinne pade ka 5 jye 18 kṣe $\dot{1}$/ iha sarvatra padānāṃ rūpakṣepapadābhyāṃ bhāvanayānantyam//E30p3//[168]

evaṃ dvitīyodāharaṇe prakṛtiḥ 8/ prāgvaj jāte hrasvajyeṣṭhapade ka $\frac{1}{2}$ jye 1 kṣe $\dot{1}$//E30p4//[169]

udāharaṇam/E31p0/

ko vargaḥ ṣaḍguṇas tryāḍhyo dvādaśāḍhyo 'thavā kṛtiḥ/ E31
yuto vā pañcasaptatyā triśatyā vā kṛtir bhavet//E31//

atra rūpaṃ hrasvaṃ kṛtvā nyāsaḥ/ pra 6 ka 1 jye 3 kṣe 3/ atra 'kṣepaḥ kṣuṇṇaḥ kṣuṇṇe tadā pade' (BG 44cd) iti dviguṇite jāte dvādaśakṣepe 2/ 6/ pañcaguṇe pañcasaptatimite kṣepe 5/ 15/ daśaguṇe jāte triśatīkṣepe 10/ 30//E31p//[170]

athecchayānītapadayo rūpakṣepapadānayanadarśane karaṇasūtraṃ sārdhavṛttam/52cdp0/[171]

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[167] kṣe $\dot{4}$ G] kṣe 4 AM; ka $\frac{1}{2}$ jye $\frac{3}{2}$ kṣe $\dot{1}$] ka $\frac{1}{2}$ jye $\frac{3}{2}$ AM, ka $\frac{1}{3}$ jye $\frac{3}{2}$ kṣe $\dot{1}$ G; tyaktvaivam eva G] tyaktvevameva AM; ka $\frac{1}{3}$ jye $\frac{2}{3}$ kṣe $\dot{1}$] ka $\frac{1}{3}$ jye $\frac{2}{3}$ AM, ka $\frac{1}{2}$ jye $\frac{1}{2}$ kṣe $\dot{1}$ G.

[168] bhā $\frac{1}{2}$ hā $\dot{1}$ kṣe $\frac{3}{2}$ AM] bhā. $\frac{1}{2}$ kṣe. $\frac{3}{2}$/ hā. $\dot{1}$ G; bhā 1 hā $\dot{2}$ kṣe 3 AM] bhā. 1/ kṣe. 3/ hā. $\dot{2}$ G; guṇalabdhī G] guṇabdhī AM; $\frac{1}{\dot{2}}$] $\frac{1}{2}$ AMG; ṛṇaṃ rūpaṃ A] ṛṇarūpaṃ MG; 3 kaniṣṭham/ ato] 3 kaniṣṭhamato AM, 3 ato G; kṣe $\dot{1}$ G] ∅ AM.

[169] kṣe $\dot{1}$ G] ∅ AM.

[170] atra MG] atha A.

[171] athecchayā AG] athecchāyā M; padayo G] padayoḥ AM; kṣepapadānayana AM] kṣepadānayana G; karaṇa G] ∅ AM.

svabuddhyaiva pade jñeye bahukṣepaviśodhane//52cd// 52cd
tayor bhāvanayānantyaṃ rūpakṣepapadotthayā/ 53
vargacchinne guṇe hrasvaṃ tatpadena vibhājayet//53//

udāharaṇam/E32p0/

dvātriṃśadguṇito vargaḥ kaḥ saiko mūlado vada//E32//[172] E32

nyāsaḥ/ pra 32/ ataḥ prāgvat kaniṣṭhajyeṣṭhe $\frac{1}{2}$ / 3/ athavā 'vargacchinne guṇe hrasvaṃ tatpadena vibhājayet' (BG 53cd) iti prakṛtiḥ 32 catuścchinnā labdham 8/ asyāṃ prakṛtau kaniṣṭhajyeṣṭhe 1/ 3/ yena vargeṇa 4 prakṛtiś chinnā tasya padena 2 kaniṣṭhe bhakte jāte te eva pade ka $\frac{1}{2}$ jye 3//E32p//[173]

atha vargarūpāyāṃ prakṛtau bhāvanāvyatirekeṇānekapadānayane karaṇasūtraṃ vṛttam/54p0/

iṣṭabhakto dvidhā kṣepa iṣṭonāḍhyo dalīkṛtaḥ/ 54
guṇamūlahṛtaś cādyo hrasvajyeṣṭhe kramāt pade//54//

udāharaṇam/E33p0/

kā kṛtir navabhiḥ kṣuṇṇā dvipañcāśadyutā kṛtiḥ/ E33
ko vā caturguṇo vargas trayastriṃśadyutaḥ kṛtiḥ//E33//[174]

atra prathamodāharaṇe kṣepaḥ 52/ dvikeneṣṭena hṛto dviṣṭhaḥ/ 'iṣṭonāḍhyo dalīkṛtaḥ' (BG 54b) jātaḥ 12/ 14/ anayor ādyaḥ prakṛtimūlena bhakto jāte hrasvajyeṣṭhe 4/ 14/ athavā kṣepaṃ caturbhir vibhajyaivaṃ jāte hrasvajyeṣṭhe $\frac{3}{2}$ / $\frac{17}{2}$ //E33p1//[175]

dvitīyodāharaṇe kṣepam 33/ ekeneṣṭena vibhajyaivaṃ jāte hrasvajyeṣṭhe 8/ 17/ tribhir jāte 2/ 7//E33p2//

athavā prakṛtisamakṣepa udāharaṇam/E34p0/

trayodaśaguṇo vargaḥ kas trayodaśavarjitaḥ/ E34
trayodaśayuto vā syād varga eva nigadyatām//E34//[176]

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[172]There is no Anuṣṭubh hemistich to be coupled with this.

[173]te eva M] ta eva AG.

[174]pañcāśadyutā AMGP] pañcāśadhyutā T; triṃśadyutaḥ AMG] triṃśadhyutā T, triṃśadyutā P.

[175]dviṣṭhaḥ MG] diṣṭhaḥ A; $\frac{3}{2}$ / $\frac{17}{2}$] $\frac{3}{2}$/ $\frac{17}{2}$ AG, $\frac{3}{5}$/ $\frac{17}{5}$ M.

[176]vargaḥ kas TP] vargas AMG; varjitaḥ TP] vivarjitaḥ AMG.

prathamodāharaṇe prakṛtiḥ 13/ jāte kaniṣṭhajyeṣṭhe 1/ 0/ atra 'iṣṭavarga-prakṛtyor yad vivaram' (BG 45ab) ityādinā rūpakṣepamūle $\frac{3}{2}$ / $\frac{11}{2}$ / ābhyāṃ bhāvanayā trayodaśarṇakṣepamūle $\frac{11}{2}$ / $\frac{39}{2}$ / vaiṣām ṛṇakṣepapadānāṃ rūpa-śuddhipadābhyām ābhyāṃ $\frac{1}{2}$ / $\frac{3}{2}$ viśleṣyamāṇabhāvanayā trayodaśakṣepamūle $\frac{3}{2}$ / $\frac{13}{2}$ / vā 18/ 65//E34p//[177]

udāharaṇam/E35p0/

ṛṇagaiḥ pañcabhiḥ kṣuṇṇaḥ ko vargaḥ saikaviṃśatiḥ/ E35
vargaḥ syād vada ced vetsi kṣayagaprakṛtau vidhim//E35//[178]

nyāsaḥ/ pra $\dot{5}$/ atra jāte mūle 1/ 4/ vā 2/ 1/ rūpakṣepabhāvanayānantyam //E35p//

uktaṃ bījopayogīdaṃ saṃkṣiptaṃ gaṇitaṃ kila/ 55
ato bījaṃ pravakṣyāmi gaṇakānandakārakam//55//

iti bhāskarīye bījagaṇite vargaprakṛticakravālaḥ samāptaḥ//55p//[179]

II.7 Ekavarṇa-samīkaraṇa

athaikavarṇasamīkaraṇam//56p0//[180]

yāvattāvat kalpyam avyaktarāśer 56
mānaṃ tasmin kurvatoddiṣṭam eva/
tulyau pakṣau sādhanīyau prayatnāt
tyaktvā kṣiptvā vāpi saṃguṇya bhaktvā//56//
ekāvyaktaṃ śodhayed anyapakṣād 57
rūpāṇy anyasyetarasmāc ca pakṣāt/
śeṣāvyaktenoddhared rūpaśeṣaṃ
vyaktaṃ mānaṃ jāyate 'vyaktarāśeḥ//57//[181]
avyaktānāṃ dvyādikānām apīha 58
yāvattāvad dvyādinighnaṃ hṛtaṃ vā/
yuktonaṃ vā kalpayed ātmabuddhyā

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[177] viśleṣyamāṇabhāvanayā AMG] viśeṣasamabhāvanayā T(K)P(K).

[178] kṣuṇṇaḥ GTP] kṣuṇaḥ AM.

[179] bhāskarīye] śrībhāskara AM, śrībhāskarīye G; vargaprakṛti AM] ∅ G; vālaḥ samāptaḥ AM] vālaṃ samāptam G.

[180] athaikavarṇasamīkaraṇam/ AM] ∅ G.

[181] ekāvyaktaṃ AGTP] ekāvyektaṃ M; ca AGTP] cā M.

mānaṃ kvāpi vyaktam evaṃ viditvā//58//

prathamam ekavarṇasamīkaraṇaṃ bījam/ dvitīyam anekavarṇasamīkaraṇaṃ bījam/ yatra varṇasya dvayor vā bahūnāṃ vargādigatānāṃ samīkaraṇaṃ tan madhyamāharaṇam/ yatra bhāvitasya samīkaraṇaṃ tad bhāvitam iti bījacatuṣṭayaṃ vadanty ācāryāḥ//58p1//[182]

tatra prathamaṃ tāvad ucyate/ pṛcchakena pṛṣṭe saty udāharaṇe yo 'vyaktarāśis tasya mānaṃ yāvattāvad ekaṃ dvyādi vā prakalpya tasminn avyaktarāśāv uddeśakālāpavat sarvaṃ guṇanabhajanatrairāśikapañcarāśikaśreḍhīphalakṣetravyavahārādi gaṇakena kāryam/ tathā kurvatā dvau pakṣau prayatnena samau kāryau/ yady ālāpe samau pakṣau na stas tadaikatare nyūne pakṣe kiṃcit prakṣipya tato 'dhikapakṣāt tāvad eva viśodhya vā nyūnaṃ pakṣaṃ kenacit saṃguṇya vādhikaṃ pakṣaṃ tāvataiva bhaktvā samau kāryau/ tatas tayor ekasya pakṣasyāvyaktam anyapakṣasyāvyaktāc chodhyam avyaktavargādikam api/ anyapakṣarūpāṇītarapakṣarūpebhyaḥ śodhyāni/ yadi karaṇyaḥ santi tadā tā apy uktaprakāreṇa śodhyāḥ/ tato 'vyaktarāśiśeṣeṇa rūpaśeṣe bhakte yal labhyate tad ekasyāvyaktasya mānaṃ vyaktaṃ jāyate/ tena kalpito 'vyaktarāśir utthāpyaḥ//58p2//[183]

yatrodāharaṇe dvyādayo 'vyaktarāśayo bhavanti tadā tasyaikaṃ yāvattāvat prakalpyānyeṣāṃ dvyādibhir iṣṭair guṇitaṃ bhaktaṃ veṣṭai rūpair ūnaṃ yutaṃ vā yāvattāvad eva kalpyam//58p3//[184]

athavaikasya yāvattāvad anyeṣāṃ vyaktāny eva mānāni prakalpyāni/ 'evaṃ viditvā' (BG 58d) iti/ yathā kriyā nirvahati tathā buddhimatā jñātvā śeṣāṇām avyaktāni vyaktāni vā kalpyānīty arthaḥ//58p4//[185]

udāharaṇam/E36p0/

ekasya rūpatriśatī ṣaḍ aśvā E36
aśvā daśānyasya tu tulyamaulyāḥ/
ṛṇaṃ tathā rūpaśataṃ ca tasya
tau tulyavittau ca kim aśvamaulyam//E36//[186]
yad ādyavittasya dalaṃ dviyutaṃ E37
tattulyavitto yadi vā dvitīyaḥ/

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[182]bhāvitasya samīkaraṇaṃ G] bhāvitasya AM.

[183]dvyādi G] dvyādiṃ AM; śreḍhīphalakṣetravyavahārādi AM] śreṇīkṣetrādikaṃ G; samau pakṣau AM] pakṣau samau G; tato 'dhikapakṣāt tāvad eva viśodhya ... tāvataiva bhaktvā AM] tatastyaktvā vā kenacitsaṃguṇya bhaktvā vā G; tadā tā apy uktaprakāreṇa AM] tadoktaprakāreṇa G.

[184]yutaṃ AM] yuktaṃ G; kalpyam AM] prakalpyam G.

[185]prakalpyāni AM] prakalpāni G; evaṃ GT(K)P(K)] sarvaṃ AM; kalpyānīty arthaḥ AG] kalpyānātyarthaḥ M.

[186]maulyāḥ TP] mūlyāḥ AMG; maulyam TP] mūlyam AMG.

ādyo dhanena triguṇo 'nyato vā
pṛthak pṛthaṅ me vada vājimaulyam//E37//[187]

atrāśvamaulyam ajñātam/ tasya mānaṃ yāvattāvad ekaṃ prakalpitam yā 1/ tatra trairāśikam/ yady ekasya yāvattāvan mūlyaṃ tadā ṣaṇṇāṃ kim iti/ phalam icchāguṇaṃ pramāṇabhaktaṃ labdhaṃ ṣaṇṇām aśvānāṃ mūlyam yā 6/ atra rūpaśatatraye prakṣipte jātam ādyasya dhanam yā 6 rū 300/ evaṃ daśānāṃ maulyam yā 10/ atra rūpaśate carṇagate prakṣipte jātaṃ dvitīyasya dhanam yā 10 rū 100/ etau samadhanāv iti pakṣau svata eva samau jātau/ samaśodhanārthaṃ nyāsaḥ/

yā	6	rū	300
yā	10	rū	100

atha 'ekāvyaktaṃ śodhayed anyapakṣāt' (BG 57a) ity ādyapakṣāvyakte 'nyapakṣāvyaktāc chodhite śeṣam yā 4/ dvitīyapakṣarūpeṣv ādyapakṣarūpebhyaḥ śodhiteṣu śeṣam rū 400/ avyaktarāśiśeṣeṇa yā 4 rūpaśeṣe rū 400 uddhṛte labdham ekasya yāvattāvato mānaṃ vyaktam 100/ yady ekāśvasyedaṃ maulyaṃ tadā ṣaṇṇāṃ kim iti trairāśikena labdhaṃ ṣaṇṇāṃ maulyaṃ 600/ rūpaśatatrayayutaṃ 900 jātam ādyasya dhanam/ evaṃ dvitīyasyāpi 900//E37p1//[188]

atha dvitīyodāharaṇe prathamadvitīyayos te eva dhane

yā	6	rū	300
yā	10	rū	100

atrādyapakṣadhanārdhena dviyuktena tulyam anyasya dhanam udāhṛtam/ ata ādyadhanārdhe dviyute 'thavānyadhane dvihīne dviguṇe kṛte pakṣau samau bhavataḥ/ tathā kṛte śodhanārthaṃ nyāsaḥ/

yā	3	rū	152
yā	10	rū	100

athavā

yā	6	rū	300
yā	20	rū	204

ubhayor api śodhanādye kṛte labdhaṃ yāvattāvanmānam 36/ anena pūrvavad utthāpane kṛte jāte dhane 516/ 260//E37p2//[189]

atha tṛtīyodāharaṇe te eva dhane/ atrādyadhanatryaṃśaḥ paradhanam iti paraṃ triguṇīkṛtya nyāsaḥ/

yā	6	rū	300
yā	30	rū	300

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[187] A places E37 between E37p1 and E37p2 with the introductory phrase, 'dvitīyodāharaṇam.' maulyam AMTP] mūlyam G.

[188] maulyam (here and hereafter) AM] mūlyam G; kim iti (1st) AM] kimiti nyāsaḥ pra. 1/ pha° yā 1/ i° 6/ G; yā 4 (2nd) MG] yā 4 A; uddhṛte G] uddhate AM; ekāśvasyedaṃ AM] ekasyāśvasyedaṃ G.

[189] te eva MG] ta eva A; dviyute AM] dviyukte G.

samakriyayā labdhaṃ yāvattāvanmānam 25/ anenotthāpite jāte dhane 450/ 150//E37p3//[190]

udāharaṇam/E38p0/

māṇikyāmalanīlamauktikamitiḥ pañcāṣṭa sapta kramād E38
ekasyānyatarasya sapta nava ṣaṭ tadratnasaṃkhyā sakhe/
rūpāṇāṃ navatir dviṣaṣṭir anayos tau tulyavittau tathā
bījajña pratiratnajāni sumate maulyāni śīghraṃ vada//E38//[191]

atrāvyaktānāṃ bahutve kalpitāni māṇikyādīnāṃ maulyāṇi yā 3/ yā 2/ yā 1/ yady ekasya ratnasyedaṃ maulyaṃ tadoddiṣṭānāṃ kim iti labdhānāṃ yāvattāvatāṃ yoge svasvarūpayute jātau pakṣau

yā	38	rū	90
yā	45	rū	62

ete anayor dhane iti samaśodhane kṛte labdhaṃ yāvattāvanmānam 4/ anenotthāpitāni māṇikyādīnāṃ maulyāni 12/ 8/ 4/ evaṃ sarvadhanam 242//E38p1//[192]

athavā māṇikyamānaṃ yāvattāvan nīlamuktāphalayor maulye vyakte eva kalpite 5/ 3/ ataḥ samīkaraṇena labdhaṃ yāvattāvanmānam 13/ anenotthāpite jātaṃ samadhanam 216/ evaṃ kalpanāvaśād anekadhā//E38p2//

udāharaṇam/E39p0/

eko bravīti mama dehi śataṃ dhanena E39
tvatto bhavāmi hi sakhe dviguṇas tato 'nyaḥ/
brūte daśārpayasi cen mama ṣaḍguṇo 'haṃ
tvattas tayor vada dhane mama kiṃpramāṇe//E39//[193]

atra kalpite ādyadhane

yā	2	rū	$\dot{1}00$
yā	1	rū	100

anayoḥ parasya śate gṛhīta ādyo dviguṇitaḥ syād ity ekālāpo ghaṭate/ athādyād daśāpanīya daśabhiḥ paradhanaṃ yutaṃ ṣaḍguṇaṃ syād ity ādyaṃ ṣaḍguṇīkṛtya nyāsaḥ/

yā	12	rū	$6\dot{6}0$
yā	1	rū	110

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[190] te eva MG] ta eva A; atrādya AM] ādya G; samakriyayā MG] samakiyayā A; jāte dhane 450 AM] jāte 450 G.

[191] pratiratnajāni AMP] pratiratnajāti GT.

[192] | yā 38 rū 90 / yā 45 rū 62 |] yā 15 yā 16 yā 7 rū 90 / yā 21 yā 18 yā 6 rū 62 | AMG; sarvadhanam AG] sarmadhanam M.

[193] kiṃpramāṇe MP] kiṃ pramāṇe AGT.

ataḥ samīkaraṇena labdhaṃ yāvattāvanmānam 70/ anenotthāpite jāte dhane 40/ 170//E39p//[194]

udāharaṇam/E40p0/

māṇikyāṣṭakam indranīladaśakaṃ muktāphalānāṃ śataṃ E40
yat te karṇavibhūṣaṇe samadhanaṃ krītaṃ tvadarthe mayā/
tadratnatrayamaulyasaṃyutimitis tryūnaṃ śatārdhaṃ priye
maulyaṃ brūhi pṛthag yadīha gaṇite kalyāsi kalyāṇini//E40//[195]

atra samadhanaṃ yāvattāvat 1/ yadāṣṭānāṃ māṇikyānām idaṃ maulyaṃ tadaikasya kim ity evaṃtrairāśikena sarvatra maulyāni yā $\frac{1}{8}$ / yā $\frac{1}{10}$ / yā $\frac{1}{100}$ / eṣāṃ yogaḥ saptacatvāriṃśatā sama iti samaśodhanārthaṃ nyāsaḥ/

yā	$\frac{47}{200}$	rū	0
yā	0	rū	47

etau pakṣau samacchedīkṛtya chedagame samīkaraṇena labdhaṃ yāvattāvanmānam 200/ anenotthāpitāni jātāni ratnamaulyāni 25/ 20/ 2/ samadhanam 200/ evaṃ karṇabhūṣaṇe ratnamaulyam 600//E40p1//[196]

atra samacchedīkṛtya śodhanārtham ādyapakṣeṇa parapakṣe hriyamāṇe chedāṃśaviparyāse kṛte parasya chedo guṇo 'ṃśo haraś ceti tulyatvāt tayor nāśo bhavatīti chedagamaḥ kriyate//E40p2//[197]

udāharaṇam/E41p0/

pañcāṃśo 'likulāt kadambam agamat tryaṃśaḥ śilīndhraṃ tayor E41
viśleṣas triguṇo mṛgākṣi kuṭajaṃ dolāyamāno 'paraḥ/
kānte ketakamālatīparimalaprāptaikakālapriyā-
dūtāhūta itas tato bhramati khe bhṛṅgo 'lisaṃkhyāṃ vada//
E41//[198]

atrālikulapramāṇaṃ yāvattāvat 1/ ataḥ kadambādigatālipramāṇaṃ yāvattāvat $\frac{14}{15}$ / etad dṛṣṭena bhramareṇa yutam alipramāṃam iti nyāsaḥ/

yā	$\frac{14}{15}$	rū	1
yā	1	rū	0

[194]$\dot{6}\dot{6}\dot{0}$] 360 AM, 600 G.

[195]indranīla AGTP] indranāla M; kalyāsi AMG] kalpāsi TP.

[196]tadaikasya G] tadekasya AM; $\frac{1}{8}$ MG] $\frac{1}{4}$ A.

[197]bhavatīti AM] bhaviṣyatīti G.

[198]viśleṣas AMGPL] viśleṣat T; kuṭajaṃ dolāyamāno AMGTPL(ASS)] kuṭaje ḍolāyamāno L(VIS); priyā AMGL] priyāda T, priyād PT(cor); dūtāhūta itas tato AMGTPL(ASS)] nirdhūtaḥ paritaḥ sthito L(VIS); saṃkhyāṃ AMGPL] saṃkhyā T.

etau samacchedīkṛtya chedagame pūrvaval labdhaṃ yāvattāvanmānam 15/ etad alipramāṇam//E41p//[199]

athānyoktam apy udāharaṇaṃ kriyālāghavārthaṃ pradarśyate/E42p0/

pañcakaśatadattadhanāt phalasya vargaṃ viśodhya pariśiṣṭam/ E42
dattaṃ daśakaśatena tulyaḥ kālaḥ phalaṃ ca tayoḥ//E42//[200]

atra kāle yāvattāvat kalpite kriyā na nirvahatīty ataḥ kalpitāḥ pañca māsāḥ/ mūladhanaṃ yāvattāvat 1/ asmāt pañcarāśike nyāsaḥ/

1	5
100	yā 1
5	

labdhaṃ phalaṃ yā $\frac{1}{4}$ / asya vargaḥ yāva $\frac{1}{16}$ / mūladhanāt samacchedena śodhite jātaṃ dvitīyamūladhanam yāva $\overset{\bullet}{1}\frac{}{16}$ yā 16 / atrāpi māsapañcakena pañcarāśike kṛte nyāsaḥ/

1	5
100	yāva $\overset{\bullet}{1}\frac{}{16}$ yā 16
10	

labdhaṃ phalam yāva $\overset{\bullet}{1}\frac{}{32}$ yā 16 / etat pūrvaphalasyāsya yā $\frac{1}{4}$ samam iti pakṣau yāvattāvatāpavartya samaśodhanārthaṃ pakṣayor nyāsaḥ/

yā $\overset{\bullet}{1}\frac{}{32}$	rū 16
yā 0	rū $\frac{1}{4}$

prāgval labdhaṃ yāvattāvanmānam 8/ etan mūladhanam//E42p1//[201]

athavā prathamapramāṇaphalena dvitīyapramāṇaphale vibhakte yal labhyate tadguṇaguṇitena dvitīyamūladhanena tulyam eva prathamamūladhanaṃ syāt/

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[199] yā $\frac{14}{15}$ rū 1 (in the table) AM] yā $\frac{16}{15}$ rū 15 G.

[200] viśodhya MGTP] viśovya A.

[201] pañcarāśike G] pañcarāśikena AM; $\begin{array}{|cc|}\hline 1 & 5 \\ 100 & \text{yā } 1 \\ 5 & \\ \hline\end{array}$ A(here and hereafter without enclosure)] $\begin{array}{|cc|}\hline 1 & 5 \\ 100 & \text{yā } 1 \\ 5 & 0 \\ \hline\end{array}$ M, $\begin{array}{cc}\hline 1 & 5 \\ \hline 100 & \text{yā } 1 \\ \hline 5 & 0 \\ \hline\end{array}$ G; yāva $\overset{\bullet}{1}\frac{}{16}$ yā 16 AG] yāva $\overset{\bullet}{1}\frac{}{16}$ yā 16 M; $\begin{array}{|cc|}\hline 1 & 5 \\ 100 & \text{yāva } \overset{\bullet}{1}\frac{}{16} \text{ yā } 16 \\ 10 & \\ \hline\end{array}$ AM(here and hereafter without enclosure)] $\begin{array}{cc}\hline 1 & 5 \\ \hline 100 & \text{yāva } \overset{\bullet}{1}\frac{}{16} \text{ yā } 16 \\ \hline 10 & 0 \\ \hline\end{array}$ G; samaśodhanārthaṃ AM] samaśodhanāya G; $\begin{array}{|cc|}\hline \text{yā } \overset{\bullet}{1}\frac{}{32} & \text{rū } 16 \\ \text{yā } 0 & \text{rū } \frac{1}{4} \\ \hline\end{array}$ AM] $\begin{array}{|cc|}\hline \text{yā } \overset{\bullet}{1}\frac{}{32} & \text{rū } 16 \\ \text{yā } 1 & \text{rū } \frac{1}{4} \\ \hline\end{array}$ G.

katham anyathā same kāle samaṃ phalaṃ syāt/ ato dvitīyasyāyaṃ guṇaḥ 2/ ekaguṇaṃ dvitīyamūladhanam ekonaguṇaguṇitaṃ phalavarge vartate/ ata ekonaguṇeneṣṭakalpitakalāntarasya varge bhakte dvitīyamūladhanaṃ syāt/ etat phalavargayutaṃ prathamamūladhanaṃ syāt//E42p2//[202]

atra kalpitaphalavargaḥ 4/ ataḥ prathamadvitīyamūladhane 8/ 4/ phalam 2/ yadi śatasya pañca kalāntaraṃ tadāṣṭānāṃ kim iti labdham ekamāse 'ṣṭānāṃ phalam $\frac{2}{5}$ / yady anenaiko māsas tadā dvikena kim iti labdhā māsāḥ 5//E42p3//[203]

udāharaṇam/E43p0/

ekakaśatadattadhanāt phalasya vargaṃ viśodhya pariśiṣṭam/ E43
pañcakaśatena dattaṃ tulyaḥ kālaḥ phalaṃ ca tayoḥ//E43//[204]

atra guṇakaḥ 5/ ekonaguṇena 4 iṣṭaphalasya varge 16 bhakte jātaṃ dvitīyadhanam 4/ idaṃ phalavargayutaṃ jātaṃ prathamadhanam 20/ ato 'nupātadvayena kālaḥ 20//E43p1//[205]

evaṃ svabuddhyaivedaṃ sidhyati kiṃ yāvattāvatkalpanayā/ athavā buddhir eva bījam/ tathā ca gole mayoktam/

'naiva varṇātmakaṃ bījaṃ na bījāni pṛthak pṛthak/ Q2
ekam eva matir bījam analpā kalpanā yataḥ'//Q2//[206]

//E43p2//

udāharaṇam/E44p0/

māṇikyāṣṭakam indranīladaśakaṃ muktāphalānāṃ śataṃ E44
sadvajrāṇi ca pañca ratnavaṇijāṃ yeṣāṃ caturṇāṃ dhanam/
saṃgasnehavaśena te nijadhanād dattvaikam ekaṃ mitho
jātās tulyadhanāḥ pṛthag vada sakhe tadratnamaulyāni me//
E44//[207]

atra yāvattāvadādayo varṇā avyaktānāṃ mānāni kalpyanta ity upalakṣaṇam/ tannāmāṅkitāni kṛtvā samīkaraṇaṃ kāryaṃ matimadbhiḥ/ tad yathā/ anyonyam ekaikaṃ ratnaṃ dattvā samadhanā jātās teṣāṃ mānāni

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[202]ekaguṇaṃ AM] ∅ G.

[203]atra AM] ataḥ G.

[204]ekaka AMGT] eka P; pañcaka AMGP] ṣaṃcaka T.

[205]iṣṭaphalasya A] iṣṭaphalasyāsya MG.

[206]Cited from GA, praśna 5. varṇātmakaṃ MG, SS] varṇātmikaṃ A.

[207]nijadhanād AMGPL] nijadhanā T; dattvaikam AMGPL(ASS)] datvaikam TL(VIS); sakhe AMGPL] sarave T; maulyāni AMGTP] mūlyāni L.

mā	5	nī	1	mu	1	va	1
mā	1	nī	7	mu	1	va	1
mā	1	nī	1	mu	97	va	1
mā	1	nī	1	mu	1	va	2

samānāṃ samakṣepe samaśuddhau samataiva syād ity ekaikaṃ māṇikyādiratnaṃ pṛthak pṛthag ebhyo viśodhya śeṣāṇi samāny eva jātāni mā 4/ nī 6/ mu 96/ va 1/ yad ekasya vajrasya maulyaṃ tad eva māṇikyacatuṣṭayasya tad eva nīlaṣaṭkasya tad eva muktāphalānāṃ ṣaṇṇavateḥ/ ata iṣṭaṃ samadhanaṃ prakalpya pṛthag ebhiḥ śeṣair vibhajya maulyāni labhyante/ tathā kalpiteṣṭena 96 jātāni maulyāni māṇikyādīnām 24/ 16/ 1/ 96//E44p//[208]

udāharaṇam/E45p0/

pañcakaśatena dattaṃ mūlaṃ sakalāntaraṃ gate varṣe/ E45
dviguṇaṃ ṣoḍaśahīnaṃ labdhaṃ kiṃ mūlam ācakṣva//E45//[209]

atra mūladhanaṃ yāvattāvat 1/ ataḥ pañcarāśikena

1	12
100	yā 1
5	

kalāntaraṃ yā $\frac{3}{5}$ / etan mūlayutaṃ jātam yā $\frac{8}{5}$ / dviguṇamūladhanasya ṣoḍaśahīnasya yā 2 rū $\overset{\bullet}{16}$ samam iti karaṇena

yā	2	rū	$\overset{\bullet}{16}$
yā	$\frac{8}{5}$	rū	0

labdhaṃ mūlam 40/ kalāntaraṃ ca 24//E45p//[210]

udāharaṇam/E46p0/

yat pañcakadvikacatuṣkaśatena dattaṃ E46
khaṇḍais tribhir navatiyuk triśatī dhanaṃ tat/
māseṣu saptadaśapañcasu tulyam āptaṃ
khaṇḍatraye 'pi saphalaṃ vada khaṇḍasaṃkhyām//E46//[211]

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[208]table AM] mā 5 nī 1 mu 1 va 1 / nī 7 mā 1 mu 1 va 1 / mu 97 mā 1 nī 1 va 1 / va 2 mā 1 nī 1 mu 1 G; tad eva (2nd) G] ∅ AM; ebhiḥ MG] ebhi A.

[209]kiṃ mūlam ācakṣva GTP] mūlaṃ samācakṣva AM.

[210]yāvattāvat 1 G] yāvat 1 AM; pañcarāśikena MG] pañcārāśikena A; 1 12 / 100 yā 1 / 5] 1 12 / 100 yā / 5 A, 1 12 / 100 yā 1 / 5 0 M, 1 \| 12 / 100 \| yā 1 / 5 \| 0 G; $\frac{8}{5}$ (1st) AM] $\frac{5}{8}$ G; ṣoḍaśahīnasya AM] ṣoḍaśonasya G; karaṇena AM] samīkaraṇena G.

[211]navatiyuk AMGT(cor)P] bhavatiyuk T; traye 'pi AMGP] trayopi T; saphalaṃ AMTP] saphalāṃ G.

atra saphalasya khaṇḍasya samadhanasya pramāṇaṃ yāvattāvat 1/ yady ekena māsena pañca phalaṃ śatasya tadā māsasaptakena kim iti labdhaṃ śatasya phalam 35/ etac chate prakṣipya jātam 135/ yady asya saphalasya śataṃ mūlaṃ tadā yāvattāvanmitasya saphalasya kim iti labdhaṃ prathamakhaṇḍapramāṇam yā $\frac{20}{27}$ / punar yadi māsena dvau phalaṃ śatasya tadā daśabhir māsaiḥ kim ityādyuktaprakāreṇa dvitīyakhaṇḍam yā $\frac{5}{3}$ / evaṃ tṛtīyam yā $\frac{5}{3}$ / eṣām aikyam yā $\frac{65}{27}$ / sarvadhanasyāsya 390 samaṃ kṛtvāptayāvattāvanmānena 162 anenotthāpitāni khaṇḍāni 120/ 135/ 135/ sakalāntaraṃ samam etat 162//E46p//[212]

udāharaṇam/E47p0/

purapraveśe daśado dvisaṃguṇaṃ E47
vidhāya śeṣaṃ daśabhuk ca nirgame/
dadau daśaivaṃ nagaratraye 'bhavat
trinighnam ādyaṃ vada tat kiyad dhanam//E47//[213]

atra dhanam yā 1/ asyālāpavat sarvaṃ kṛtvā puratrayanivṛttau jātaṃ dhanam yā 8 rū $\dot{2}8\dot{0}$/ etad ādyasya triguṇitasya yā 3 samaṃ kṛtvāptaṃ yāvattāvanmānam 56//E47p//[214]

udāharaṇam/E48p0/

sārdhaṃ taṇḍulamānakatrayam aho drammeṇa mānāṣṭakaṃ E48
mudgānāṃ ca yadi trayodaśamitā etā vaṇik kākiṇīḥ/
ādāyārpaya taṇḍulāṃśayugalaṃ mudgaikabhāgānvitaṃ
kṣipraṃ kṣiprabhujo vrajema hi yataḥ sārtho 'grato yāsyati//
E48//[215]

atra taṇḍulamānam yā 2/ mudgamānam yā 1/ yadi sārdhamānatrayeṇaiko drammo labhyate tadānena yā 2 kim iti labdhaṃ taṇḍulamaulyam yā $\frac{4}{7}$ / yadi mānāṣṭakenaiko drammas tadānena yā 1 kim iti labdhaṃ mudgamaulyam yā $\frac{1}{8}$ / anayor yogaḥ yā $\frac{39}{56}$ trayodaśakākiṇīsama iti drammajātyā $\frac{13}{64}$ sāmyakaraṇāl labdhaṃ yāvattāvanmānam $\frac{7}{24}$ / anenotthāpite taṇḍulamudgamūlye $\frac{1}{6}$ / $\frac{7}{192}$ /

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[212]saphalasya (1st) AM] phalasya G; $\frac{5}{3}$ (twice) AM] $\frac{5}{6}$ G; kṛtvāpta] kṛtvā AMG; anenotthāpitāni AM] utthāpitāni G; 162 MG] 136 A.

[213]daśabhuk ca AMGP] daśabhukta T.

[214]$\dot{2}8\dot{0}$ AG] 280 M.

[215]aho AMGTPL(ASS)] iha L(VIS); ca AMGTPL(ASS)] tu L(VIS); vaṇik MGTPL] vaṇikt A; taṇḍulāṃśa AMGTL] tandulāṃśa P; yataḥ AMGTL(ASS)] yutaḥ P, vayaṃ L(VIS).

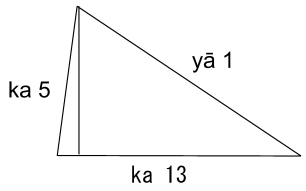
taṇḍulamudgamānabhāgāś ca $\frac{7}{12}$ / $\frac{7}{24}$ //E48p//[216]
udāharaṇam/E49p0/

svārdhapañcāṃśanavamair yuktāḥ ke syuḥ samās trayaḥ/ E49
anyāṃśadvayahīnā ye ṣaṣṭiśeṣāś ca tān vada//E49//[217]

atra samarāśimānaṃ yāvattāvat 1/ ato vilomavidhinā 'atha svāṃśādhikone' (L 49a) ityādinā rāśayaḥ yā $\frac{2}{3}$ / yā $\frac{5}{6}$ / yā $\frac{9}{10}$ / ihānyabhāgadvayenonāḥ sarve 'py evaṃ śeṣāḥ syuḥ yā $\frac{2}{5}$ / etat ṣaṣṭisamaṃ kṛtvāptayāvattāvanmānena 150 utthāpitā jātā rāśayaḥ 100/ 125/ 135//E49p//[218]
udāharaṇam/E50p0/

trayodaśa tathā pañca karaṇyau bhujayor mitī/ E50
bhūr ajñātā ca catvāraḥ phalaṃ bhūmiṃ vadāśu me//E50//[219]

atra bhūmer yāvattāvatkalpane kriyā prasaratīti svecchayā tryasre ka 13 bhūmiḥ kalpyate phalaviśeṣābhāvāt/ ato 'tra kalpitaṃ tryasram/ nyāsaḥ/



atra

'lambaguṇaṃ bhūmyardhaṃ spaṣṭaṃ tribhuje phalaṃ bhavati' (L 166)

iti vyatyayena phalāl lambo jātaḥ ka $\frac{64}{13}$ / etadvargaṃ bhujakaraṇī5 vargāt rū 5 asmād apāsya rū $\frac{1}{13}$ / mūlaṃ jātāvādhā ka $\frac{1}{13}$ / imāṃ bhūmer apāsya 'yogaṃ karaṇyor mahatīṃ prakalpya' (BG 13a) iti jātānyāvādhā ka $\frac{144}{13}$ / asyā vargāt rū $\frac{144}{13}$ lambavarga rū $\frac{64}{13}$ yutāt rū $\frac{208}{13}$ mūlaṃ jāto bhujaḥ 4/ iyam eva

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[216]yā 2 (1st) AM] yāvattāvat 2 G; tadānena yā 2 G] tadā yā 2 anena AM; tadānena yā 1 G] tadā yā 1 anena AM.

[217]hīnā ye P] hīnāśca AMG, hīnāye T.

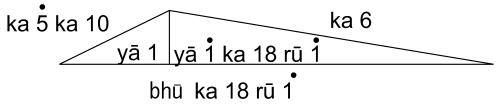
[218]svāṃśādhikone AM(-na ity...)] svāṃśādhikonena G; $\frac{9}{10}$ AM] $\frac{6}{10}$ G; dvayenonāḥ AM] dvayonāḥ G.

[219]karaṇyau GTP] karaṇyo AM; ajñātā ca AMG] ajñātā T, ajñātātra P; bhūmiṃ AMGP] bhūmi T.

bhūmiḥ//E50p//[220]
udāharaṇam/E51p0/

daśapañcakaraṇyantaram eko bāhuḥ paraś ca ṣaṭkaraṇī/ E51
bhūr aṣṭādaśakaraṇī rūponā lambam ācakṣva//E51//[221]

atrāvādhājñāne lambajñānam iti laghvāvādhā yā 1/ etadūnā bhūr anyāvādhāpramāṇam iti/ tathā nyāsaḥ/



svāvādhāvargaṃ svabhujavargād apāsya jāto lambavargaḥ yāva 1 rū 15 ka 200/ dvitīyāvādhāvargaṃ yāva 1 yā ka 72 yā 2 rū 19 ka 72 svabhujavargāt rū 6 apāsya jāto dvitīyo lambavargaḥ yāva 1 yā 2 yā ka 72 rū 13 ka 72/ etau samāv iti samaśodhane kṛte jātau pakṣau

rū	28	ka	512
yā	2	yā ka	72

atra bhājakasyāvyaktaśeṣasya yākārasya prayojanābhāvād apagame kṛte bhājyabhājakau jātau/

rū	28	ka	512
rū	2	ka	72

atra

'dhanarṇatāvyatyayam īpsitāyāś chede karaṇyā asakṛd vidhāya' (BG 16)

iti dvisaptatimitakaraṇyā dhanatvaṃ prakalpya ka 4 ka 72/ anayā bhājye guṇite jātam ka 36864 ka 3136 ka 56448 ka 2048/ etāsv etayoḥ ka 36864 ka 3136 mūle

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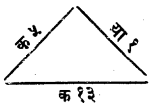
[220]svecchayā G] svecchāyā AM; ka 13 AG] 13 M; ato 'tra MG] atro 'tra A; nyāsaḥ/ (Fig.) atra lambaguṇaṃ A] (Fig.) nyāsaḥ/ atra lambaguṇaṃ M, nyāsaḥ/ atra lambaguṇaṃ (Fig.) G; phalāl lambo MG] phalallambo A; bhujakaraṇī5 vargāt G] bhuja-5-karaṇīvargāt AM; asmād AM] ∅ G; prakalpya MG] prakvalpya A; rū $\begin{smallmatrix}64\\13\end{smallmatrix}$ AM] rū $\begin{smallmatrix}64\\16\end{smallmatrix}$ G; mūlaṃ (2nd) AM] malaṃ G.

Fig. BGE50p-1a: 

Fig. BGE50p-1g: 

[221]lambam GTP] lambamānam (Gīti meter) AM.

192/ 56/ anayor yogaḥ rū 136/ śeṣakaraṇyor anayoḥ ka 56448 ka 2048 antaraṃ yoga iti jāto yogaḥ ka 36992/ bhājake ca ka 4624/ anayā bhājye hṛte labdhaṃ yāvattāvanmānam rū 2 ka 8/ iyam eva laghvāvādhā/ etadūnā bhūr anyāvādhā rū 1 ka 2/ yāvattāvanmānena lambavargāv utthāpya svāvādhāvargaṃ svabhujavargād apāsya vā jāto lambavargaḥ rū 3 ka 8/ etasya mūlasamam eva lambamānam rū 1 ka 2//E51p//[222]

udāharaṇam/E52p0/

asamānasamacchedān rāśīṃs tāṃś caturo vada/ E52
yadaikyaṃ yadghanaikyaṃ vā yeṣāṃ vargaikyasammitam//
E52//[223]

atra rāśayaḥ yā 1/ yā 2/ yā 3/ yā 4/ eṣāṃ yogaḥ yā 10 vargayogenānena yāva 30 sama iti pakṣau yāvattāvatāpavartya nyāsaḥ/

$$\left|\begin{array}{cccc} \text{yā} & 30 & \text{rū} & 0 \\ \text{yā} & 0 & \text{rū} & 10 \end{array}\right|$$

samaśodhanādinā prāgvallabdhayāvattāvanmānenotthāpitā rāśayaḥ $\frac{1}{3}$ / $\frac{2}{3}$ / $\frac{3}{3}$ / $\frac{4}{3}$ //E52p1//[224]

atha dvitīyodāharaṇe rāśayaḥ yā 1/ yā 2/ yā 3/ yā 4/ eṣāṃ ghanaikyam yāgha 100/ etad vargaikyamānena yāva 30 samam iti pakṣau yāvattāvadvargeṇāpavartya prāgvallabdhayāvattāvanmānenotthāpitā jātā rāśayaḥ $\frac{3}{10}$ / $\frac{6}{10}$ / $\frac{9}{10}$ / $\frac{12}{10}$ //E52p2//[225]

udāharaṇam/E53p0/

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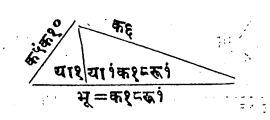
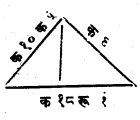
[222]yā 1 MG] yā A; tathā nyāsaḥ/ (Fig.) M] tathā— nyāsaḥ— (Fig.) A, tathā (Fig.) nyāsaḥ G; ka 5 ka 10 (in figure) AM] ka 10 ka 5 G; yā 1 (in figure) AM] ∅ G; yā 1 ka 18 rū 1 (in figure) AM] ∅ G; bhū ka 18 rū 1 (in figure)] bhū = ka 18 rū 1 AM, ka 18 rū 1 G; svabhujavargād (1st) AM] bhujavargād G; 512 (1st table) AM] 152 G; 2nd table] ∅ AM, rū 28 ka 152 / rū 2 ka 72 G; īpsitāyāś chede karaṇyā asakṛd vidhāya iti AM] īpsitāyāḥ— ityādinā G; 36864 (1st) G] 36864 AM; svāvādhāvargaṃ (2nd) G] svavādhāvargaṃ AM.

Fig. BGE51p-1a:  Fig. BGE51p-1g: 

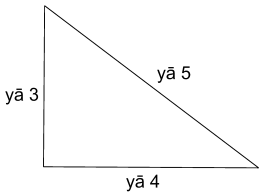
[223]cchedān rāśīṃs AMT(cor)P] prajña rāśīṃs G, a variant mentioned by Kṛṣṇa, cchedānrarśāṃs T.

[224]eṣāṃ AM] yeṣāṃ G.

[225]yā 2/ yā 3/ MG] yā 3/ yā 2/ A; yāgha 100 AG] yāva 100 M; yāvattāvadvargeṇā G] yāvadvargeṇā AM.

tryasrakṣetrasya yasya syāt phalaṃ karṇena sammitam/ E53
doḥkoṭiśrutighātena samaṃ yasya ca tad vada//E53//

nyāsaḥ/



atreṣṭakṣetrabhujānāṃ yāvattāvadguṇitānāṃ nyāsaḥ/ yā 3/ yā 4/ yā 5/ atra ca bhujakoṭighātārdhaṃ phalam yāva 6/ etat karṇenānena yā 5 samam iti pakṣau yāvattāvatāpavartya prāgval labdhena yāvattāvanmānenotthāpitā jātā bhujakoṭikarṇāḥ $\frac{5}{2}$ / $\frac{10}{3}$ / $\frac{25}{6}$ / evam iṣṭavaśād anye 'pi//E53p1//[226]

atha dvitīyodāharaṇe kalpitaṃ tad eva kṣetram/ yasya phalam yāva 6/ etad doḥkoṭikarṇaghātenānena yāgha 60 samam iti pakṣau yāvattāvadvargeṇāpavartya samīkaraṇena prāgvaj jātā doḥkoṭikarṇāḥ $\frac{3}{10}$ / $\frac{2}{5}$ / $\frac{1}{2}$ / evam iṣṭavaśād anye 'pi//E53p2//[227]

udāharaṇam/E54p0/

yutau vargo 'ntare vargo yayor ghāte ghano bhavet/ E54
tau rāśī śīghram ācakṣva dakṣo 'si gaṇite yadi//E54//[228]

atra rāśī yāva 4/ yāva 5/ yoge 'ntare ca yathā vargaḥ syāt tathā kalpitau/ atrānayor ghātaḥ yāvava 20/ eṣa ghana itīṣṭayāvattāvaddaśakasya ghanena samīkaraṇe pakṣau yāvattāvadghanenāpavartya prāgvaj jātau rāśī 10000/ 12500//E54p//[229]

udāharaṇam/E55p0/

ghanaikyaṃ jāyate vargo vargaikyaṃ ca yayor ghanaḥ/ E55
tau ced vetsi tadāhaṃ tvāṃ manye bījavidāṃ varam//E55//

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[226]nyāsaḥ/ (1st) AM] ∅ G;

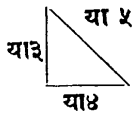
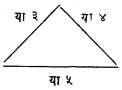


Fig. BGE53p-1a:

Fig. BGE53p-1g:



[227]yasya AM] asya G; yāvattāvadvargeṇā G] yāvadvargeṇā AM; $\frac{3}{10}$ / $\frac{2}{5}$ / AM] $\frac{2}{5}$ / $\frac{3}{10}$ / G.

[228]ghāte AMGT(cor)P] dhāte T.

[229]yāva 4/ yāva 5/] yāva 5/ yāva 4/ AMG.

atra kalpitau rāśī yāva 1/ yāva 2/ anayor ghanayogaḥ yāvagha 9/ eṣa svayam eva vargo jātaḥ/ asya mūlam yāgha 3//E55p1//

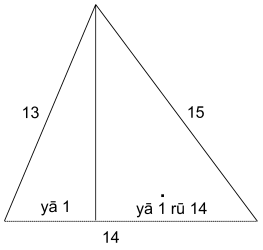
nanu yāvattāvadvargaghano 'yaṃ rāśir na ghanavargaḥ/ katham asya ghanātmakaṃ mūlam iti ced ucyate/ yāvān eva ghanavargas tāvān eva vargaghanaḥ syād ity ata eva dvigatacaturgataṣaḍgatāṣṭagatā vargāḥ syuḥ/ eṣām ekadvitricaturgatāni mūlāni yathākramaṃ syuḥ/ evaṃ triṣaṇṇavagatā ghanāḥ/ ekadvitrigatāni teṣāṃ mūlāni/ evaṃ sarvatra jñātavyam//E55p2//[230]

atha rāśyor vargayogaḥ yāvava 5/ ayaṃ ghana itīṣṭayāvattāvatpañcaghanasamaṃ kṛtvā pakṣau yāvattāvadghanenāpavartya prāgvaj jātau rāśī 625/ 1250/ evam avyaktāpavartanaṃ yathā saṃbhavati tathā cintyam//E55p3//[231]

udāharaṇam/E56p0/

yatra tryasrakṣetre dhātrī manusammitā sakhe bāhū/ E56
ekaḥ pañcadaśānyas trayodaśa vadāvalambakaṃ tatra//E56//[232]

āvādhājñāne sati lambajñānam iti laghvāvādhā yāvattāvanmitā kalpitā yā 1/ etadūnā caturdaśānyāvādhā yā $\dot{1}$ rū 14/ nyāsaḥ/



svāvādhāvargonau svabhujavargau samāv iti samaśodhanārthaṃ nyāsaḥ/

yāva	$\dot{1}$	yā	0	rū	169
yāva	$\dot{1}$	yā	28	rū	29

anayoḥ samavargagame labdhaṃ yāvattāvanmānam 5/ anenotthāpite āvādhe 5/ 9/ lambavargayoś cotthāpitayor ubhayataḥ sama eva lambaḥ 12/ atrotthāpanaṃ vargasya vargeṇa ghanasya ghanenaiveti sudhiyā jñātavyam//E56p//[233]

udāharaṇam/E57p0/

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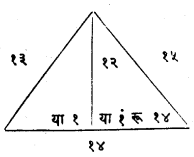
[230] ṣaḍgatāṣṭagatā MG] ṣaḍagatāṣṭagatā A.

[231] prāgvaj jātau MG] prāgvajātau A.

[232] tryasrakṣetre AMG] tryasre kṣetre TP.

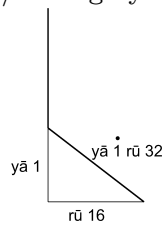
[233] etadūnā AM] etadūnāś G; svabhujavargau AM] svabhujavargau tau G.

Fig. BGE56p-1a: 

Fig. BGE56p-1g: 

yadi samabhuvi veṇur dvitripāṇipramāṇo E57
gaṇaka pavanavegād ekadeśe sa bhagnaḥ/
bhuvi nṛpamitahasteṣv aṅga lagnaṃ tadagraṃ
kathaya katiṣu mūlād eṣa bhagnaḥ kareṣu //E57//[234]

atra vaṃśādharakhaṇḍaṃ koṭiḥ/ tatpramāṇam yā 1/ etadūnā dvātriṃśad ūrdhvakhaṇḍaṃ karṇaḥ yā $\dot{1}$ rū 32/ mūlāgrayor antaraṃ bhujaḥ rū 16/ nyāsaḥ/



bhujakoṭivargayogaḥ yāva 1 rū 256/ karṇavargasyāsya yāva 1 yā $\dot{6}\dot{4}$ rū 1024 sama iti samavargagame prāgvadāptayāvattāvanmānena 12 utthāpitau koṭikarṇau 12/ 20/ evaṃ bhujakoṭiyutāv api//E57p//[235]

atra koṭikarṇāntare bhuje ca jñāta udāharaṇam/E58p0/[236]

cakrakrauñcākulitasalile kvāpi dṛṣṭaṃ taḍāge E58
toyād ūrdhvaṃ kamalakalikāgraṃ vitastipramāṇam/
mandaṃ mandaṃ calitam anilenāhataṃ hastayugme
tasmin magnaṃ gaṇaka kathaya kṣipram ambupramāṇam//
E58//[237]

atra nalapramāṇaṃ jalagāmbhīryam iti tatpramāṇam yā 1/ iyaṃ koṭiḥ/ sā kalikāmānayutā jātaḥ karṇaḥ $\overset{\text{yā } 2}{2}\overset{\text{rū } 1}{}$ / hastadvayaṃ bhujaḥ rū 2/ nyāsaḥ/

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[234]dvitri AMGTPL(ASS)] danta L(VIS); sa bhagnaḥ AMGTL] subhagnaḥ P; aṅga lagnaṃ AMGTPL(ASS)] eva lagnas L(VIS); tadagraṃ AMTPL] tadīyaṃ G.

[235]ūrdhvaṃ khaṇḍaṃ karṇaḥ yā $\dot{1}$ rū 32 G] ūrdhvakhaṇḍaṃ yā $\dot{1}$ rū 32 karṇaḥ AM; rū 16 AM] rū 12 G; rū 16 (in figure) AM] 16 G.

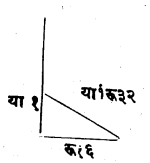
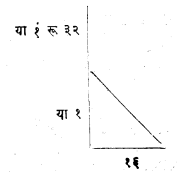
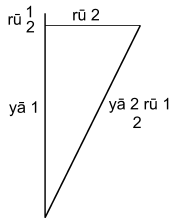
Fig. BGE57p-1a: 

Fig. BGE57p-1g: 

[236]atra AM] atha G; jñāta G] jñāte AM.

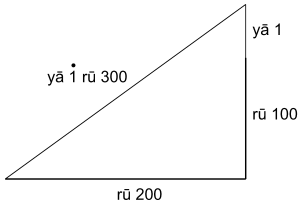
[237]cakra AMGTPL(ASS)] cañcat L(VIS); krauñcākulita GTPL] kroñcākulita AM; taḍāge GTPL(ASS)] tāḍāge AM, taṭāke L(VIS); calitam anilenāhataṃ AMGTPL(ASS)] calitapavanenāhataṃ L(VIS); kathaya MTPL] gaṇaya AG; ambu GTP] ambhaḥ AML.



atrāpi doḥkoṭivargayogaṃ karṇavargasamaṃ kṛtvā labdhaṃ jalagāmbhīryam $\frac{15}{4}$ / karṇamānam $\frac{17}{4}$ //E58p//[238]
udāharaṇam/E59p0/

vṛkṣād dhastaśatocchrayāc chatayuge vāpīṃ kapiḥ ko 'py agād E59
uttīryātha paro drutaṃ śrutipathāt proḍḍīya kiṃcid drumāt/
jātaivaṃ samatā tayor yadi gatāv uḍḍīnamānaṃ kiyad
vidvaṃś cet supariśramo 'sti gaṇite kṣipraṃ tad ācakṣva me//
E59//[239]

atra samagatiḥ 300/ uḍḍīnamānam yā 1/ etadyuto vṛkṣocchrāyaḥ koṭiḥ/ yāvattāvadūnā samagatiḥ karṇaḥ/ taruvāpyantaraṃ bhujaḥ/ nyāsaḥ/



bhujakoṭivargaikyaṃ karṇavargasamaṃ kṛtvā labdham uḍḍīnamānam 50//E59p//[240]

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[238] yā 2 rū $\frac{1}{2}$ AM] yā 1 rū $\frac{1}{2}$ G; bhujaḥ rū 2 AM] bhujaḥ 2 G; nyāsaḥ/ (Fig.) atrāpi ... karṇavargasamaṃ A] (Fig.) atrāpi ... karṇavargasamaṃ M, nyāsaḥ atrāpi ... karṇavargasamaṃ (Fig.) G; rū $\frac{1}{2}$ (in figure) AM] $\frac{1}{2}$ G; rū 2 (in figure) AM] 2 G; yā 2 rū $\frac{1}{2}$ (in figure) AM] ∅ G.

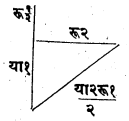
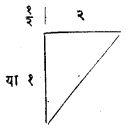
Fig. BGE58p-1a: 

Fig. BGE58p-1g: 

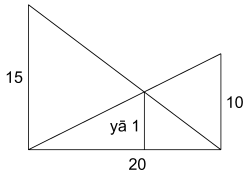
[239] vṛkṣād MGTPL] vṛddhād A; śatocchrayāc MGTPL] śatoca yāc A; vāpīṃ AMGTPL(ASS)] vāpyāṃ L(VIS); uttīryātha AMGTPL(ASS)] uḍḍīyātha L(VIS); śrutipathāt proḍḍīya AMGTPL(VIS)] śrutipathenoḍḍīya L(ASS); yadi gatāv uḍḍīna AMGL(ASS)] yadi gatāvuḍḍīya TP, yutirapi proḍḍīya L(VIS); vidvaṃś cet supariśramo AMGTPL(ASS)] vidvan vetsi pariśramo L(VIS).

[240] yā 1 AM] yāvattāvat 1 G; nyāsaḥ/ (Fig.) bhuja ... 50// AM] bhuja ... 50// nyāsaḥ (Fig.) G; yā $\dot{1}$ rū 300 (in figure) M] yāṃ 1 rū 300 A, ∅ G; rū 100 (in figure) AM] 100 G; rū 200 (in figure)

udāharaṇam/E60p0/

pañcadaśadaśakarocchrayaveṇvor ajñātamadhyabhūmikayoḥ/ itaretaramūlāgragasūtrayuter lambamānam ācakṣva//E60//[241] E60

atra kriyāvataraṇārtham iṣṭaṃ veṇvantarabhūmānaṃ kalpitam 20/ sūtrasaṃpātāl lambamānam yā 1/ nyāsaḥ/



yadi pañcadaśakoṭyā viṃśatir bhujas tadā yāvattāvanmitakoṭyā kim iti labdhā laghuvaṃśāśritāvādhā yā $\frac{4}{3}$ / punar yadi daśamitakoṭyā viṃśatir bhujas tadā yāvattāvanmitakoṭyā kim iti bṛhadvaṃśāśritāvādhā yā 2/ anayor yogaṃ yā $\frac{10}{3}$ viṃśatisamaṃ kṛtvā labdho lambaḥ 6/ utthāpanenāvādhe ca 8/ 12//E60p1//[242]

athavā vaṃśasaṃbandhenāvādhe tadyutir bhūmir iti yadi vaṃśadvayayogena 25 anenāvādhāyogo 20 labhyate tadā vaṃśābhyāṃ 15/ 10/ kim iti jāte āvādhe 12/ 8/ atrānupātāt sama eva lambaḥ 6/ kiṃ yāvattāvatkalpanayā//E60p2//[243]

athavā vaṃśayor vadho yogahṛto yatra kutrāpi vaṃśāntare lambaḥ syād iti kiṃ bhūmikalpanayāpi/ etad bhuvi sūtrāṇi prasārya buddhimatohyam//E60p3//

iti bhāskarīye bījagaṇita ekavarṇasamīkaraṇaṃ samāptam//E60p4//[244]

AM] 200 G; karṇavargasamaṃ AM] karṇasamaṃ G.

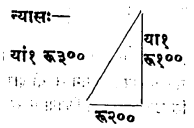


Fig. BGE59p-1a:

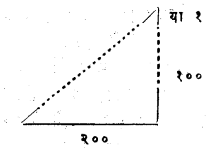


Fig. BGE59p-1g:

[241]karocchraya AMGTL] karocchrāya P; madhyabhūmikayoḥ AMGTPL(ASS)] bhūmimadhyakayoḥ L(VIS); lambamānam AMGTPL(ASS)] lambam L(VIS).

[242]atra ... yā 1/ nyāsaḥ/ (Fig.) yadi M] (Fig.) atra ... yā 1/ nyāsaḥ/ yadi A, atra ... yā 1 (Fig.) nyāsaḥ yadi G; 20 (in figure) AM] ∅ G; yā 1 (in figure) G] ∅ AM; yāvattāvanmitakoṭyā (twice) G] yāvanmitakoṭyā AM; viṃśatir (2nd) AM] viṃśati G.

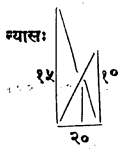


Fig. BGE60p-1a:

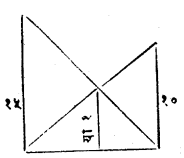


Fig. BGE60p-1g:

[243]25 anenāvādhā AM] anena 25 āvādhā G; 12/ 8/] 8/ 12/ AMG.

[244]bhāskarīye] śrībhāskarīya AM, śrībhāskarīye G; gaṇita G] gaṇite AM.

II.8 Ekavarṇa-madhyamāhararaṇa

athaikavarṇamadhyamāharaṇam//59p1//[245]

athāvyaktavargādisamīkaraṇam/ tac ca madhyamāharaṇam iti vyāvarṇayanty ācāryāḥ/ yato 'tra vargarāśāv ekasya madhyamasyāharaṇam iti/ atra sūtraṃ vṛttatrayam/59p0/[246]

avyaktavargādi yadāvaśeṣaṃ 59
pakṣau tadeṣṭena nihatya kiṃcit/
kṣepyaṃ tayor yena padapradaḥ syād
avyaktapakṣo 'sya padena bhūyaḥ//59//[247]
vyaktasya mūlasya samakriyaivam 60
avyaktamānaṃ khalu labhyate tat/
na nirvahaś ced ghanavargavargeṣv
evaṃ tadā jñeyam idaṃ svabuddhyā//60//[248]
avyaktamūlarṇagarūpato 'lpaṃ 61
vyaktasya pakṣasya padaṃ yadi syāt/
ṛṇaṃ dhanaṃ tac ca vidhāya sādhyam
avyaktamānaṃ dvividhaṃ kvacit tat//61//[249]

yatra pakṣayoḥ samaśodhane saty ekasmin pakṣe 'vyaktavargādikaṃ syād anyapakṣe rūpāṇy eva tatra dvāv api pakṣau kenacid ekeneṣṭena tathā guṇyau bhājyau vā tathā kiṃcit samaṃ kṣepyaṃ śodhyaṃ vā yathāvyaktapakṣo mūladaḥ syāt/ tasmin pakṣe mūlada itarapakṣeṇārthān mūladena bhavitavyaṃ yataḥ samau pakṣau/ samayoḥ samayogādau samataiveti/ atas tatpadayoḥ punaḥ samīkaraṇenāvyaktasya mānaṃ syāt//61p1//

atha yady evaṃ kṛte ghanavargavargādiṣu satsu kathaṃcid avyaktapakṣamūlābhāvāt kriyā na nirvahati tadā buddhyaivāvyaktamānaṃ jñeyam/ yato buddhir eva pāramārthikaṃ bījam//61p2//

atha yady avyaktapakṣamūle yāny ṛṇarūpāṇi tebhyo 'lpāni vyaktapakṣamūlarūpāṇi syus tadā tāni dhanagatāny ṛṇagatāni kṛtvāvyaktamitiḥ sādhyā sā caivaṃ dvidhā bhavati kvacit//61p3//[250]

atra śrīdharācāryasūtram/Q3p0/

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[245] athaikavarṇamadhyamāharaṇam/ A] ∅ MG.

[246] atra AM] tatra G.

[247] pakṣo 'sya AMG] pa o 'sya T, pado 'sya T(cor), pakṣasya P.

[248] mūlasya AMT] pakṣasya GP; ced ghana AMG] ceddhana TP.

[249] kvacit tat GP] kvacitsyāt AM, kvacittu T.

[250] dhanagatāny ṛṇagatāni AM] dhanagatāni G; bhavati kvacit AM] bhavati G.

‘caturāhatavargasamai rūpaiḥ pakṣadvayaṃ guṇayet/ Q3
avyaktavargarūpair yuktau pakṣau tato mūlam’//Q3//[251]

//61p4//[252]
udāharaṇam/E61p0/

alikuladalamūlaṃ mālatīṃ yātam aṣṭau E61
nikhilanavamabhāgāś cālinī bhṛṅgam ekaṃ/

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[251]Cited from Śrīdhara’s lost work on bījagaṇita. samai AMGP(K)] sama T(K) (T(K) reads samai in another quotation, p. 190, ll. 23–24); avyakta ... mūlam (2nd line of the verse) AM] pūrvāvyaktasya kṛteḥ samarūpāṇi kṣipet tayor eva GT(K)P(K). Śrīdhara’s verse cited in AM, composed in Upagīti meter, refers to taking the square roots of both sides of the equation, while the same cited in GT(K)P(K), composed in Udgīti meter, does not. Sūryadāsa cites exactly the same verse as the one cited in AM in his commentary on E61. I cite here his comment on Śrīdhara’s verse from PPM(Wai) 9772/11-2/551, fol. 62b, l. 4 – fol. 63a, l. 5:

atha ‘avyaktavargādi yadāvaśeṣam’ (BG 59a) iti sūtrakramāt pakṣau kenacit saṃguṇya kiṃcit prakṣipya mūlaṃ grāhyam iti prāpte kena guṇanīyaṃ kiṃ ca kṣepyam iti vyākulitacittānāṃ mugdhachātrāṇāṃ saṃśayāpanodārthaṃ śrīdharācāryaḥ svagaṇite sūtraṃ viracitavān/ tad yathā/ (Q3 is cited here)//

asyārthaḥ/ ‘pakṣadvaya’-śeṣaṃ ‘caturāhatavargasamai rūpair’ ‘guṇayet’/ tataḥ pakṣau ‘avyaktavargarūpair yuktau’ kāryau/ ‘tato mūlaṃ’ grāhyam ity arthaḥ//

pūrvasamaśodhanānantaraṃ yad avyaktavargādy avaśeṣakam urvaritaṃ tatra pṛthag avyaktavargāṅkaṃ caturguṇaṃ vidhāya tatpramitavargarūpaiḥ pakṣadvayaṃ guṇayet/ tato ’vyaktavargāgre yaḥ kevalāvyakta āsīt tasya vargapramitāni rūpāṇi pakṣadvaye ’pi yathāsthānaṃ yojayet/ evaṃ kṛte sati pakṣadvaye ’pi vargarāśayo bhavanti/ tatas tebhyaḥ sakāśān mūlaṃ grāhyam/ evaṃ pakṣadvayamūlayoḥ parasparaṃ samaśodhanena yāvattāvanmānaṃ labhyate//

nanv atra ‘caturāhatavargasamair’ ity anenaiva caritārthatvād ‘rūpa’-padam anarthakam iti cen na/ pakṣadvaye ’pi mūlāsaṃbhavāt/ yataś ‘caturāhatavargasamaiḥ’ pṛthag vyaktapakṣe guṇanīye tadvargavargaghanādayo ’pi bhaveyus tathāpi ca mūlagrahaṇe kriyamāṇe kriyāvicchittiḥ/ ato rūpapadagrahaṇam//

atha śrīdharoktamūlaprakāre kriyājāḍyadarśanāt tatra mugdhān praty āyāso mā bhūd ity etadartham asmābhiḥ svagaṇite pakṣadvayasya vargīkaraṇavyatirekeṇāpi siddhamūlānayanaprakāro ’pihitaḥ/ sa yathā/

avyaktavargo dviguṇo vidheyaś cāvyakta evaṃ parikalpya rūpam/
varṇāhato ’nyo dviguṇaś ca rūpavargānvitas tatpadam atra mūlam// iti//

Read enaṃ for evaṃ in the 1st line of Sūryadāsa’s verse. For the algorithm given in the verse see under Q3 in Appendix 1.

[252]MG place 61p4 before 61p1.

niśi parimalalubdhaṃ padmamadhye niruddhaṃ
pratiraṇati raṇantaṃ brūhi kānte 'lisaṃkhyām//E61//[253]

atrālikulapramāṇam yāva 2/ etadardhamūlam yā 1/ nikhilanavamabhāgā aṣṭau yāva $\frac{16}{9}$ / mūlabhāgaikyaṃ dṛṣṭāliyugalayutaṃ rāśisamam iti pakṣau samacchedīkṛtya chedagame nyāsaḥ/

yāva	18	yā	0	rū	0
yāva	16	yā	9	rū	18

śodhane kṛte jātau pakṣau

yāva	2	yā	•9	rū	0
yāva	0	yā	0	rū	18

etāv aṣṭabhiḥ saṃguṇya tayor ekāśītirūpāṇi prakṣipya mūle gṛhītvā tayoḥ samīkaraṇārthaṃ nyāsaḥ/

yā	4	rū	•9
yā	0	rū	15

prāgval labdhaṃ yāvattāvanmānam 6/ asya vargeṇotthāpitā jātālikulasaṃkhyā 72//E61p//[254]

udāharaṇam/E62p0/

pārthaḥ karṇavadhāya mārgaṇagaṇaṃ kruddho raṇe saṃdadhe E62
tasyārdhena nivārya tacharagaṇaṃ mūlaiś caturbhir hayān/
śalyaṃ ṣaḍbhir atheṣubhis tribhir api chatraṃ dhvajaṃ kārmukaṃ
cicchedāsya śiraḥ śareṇa kati te yān arjunas saṃdadhe//E62//[255]

atra bāṇasaṃkhyā yāva 1/ asyārdham yāva $\frac{1}{2}$ / caturguṇitāni mūlāni yā 4/ vyaktamārgaṇagaṇaḥ rū 10/ eṣām aikyam asya yāva 1 samaṃ kṛtvā labdhayāvattāvanmānena 10 utthāpitā jātā bāṇasaṃkhyā 100//E62p//[256]

udāharaṇam/E63p0/

vyekasya gacchasya dalaṃ kilādir E63
āder dalaṃ tatpracayaḥ phalaṃ ca/
cayādigacchābhihatiḥ svasapta-
bhāgādhikā brūhi cayādigacchān//E63//

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[253]alikuladalamūlaṃ mālatīṃ yātam aṣṭau nikhilanavamabhāgāś AMGTPL(ASS)] alikuladalamabdhestīrayātaṃ tathāṣṭau dalitanavamabhāgāś L(VIS); parimalalubdhaṃ AMGTPL(ASS)] padadalahīnaṃ L(VIS); niruddhaṃ AMGPL] nibaddhaṃ T.

[254]yā 1 AM] yāva 1 G; aṣṭabhiḥ AM] aṣṭābhiḥ G; samīkaraṇārthaṃ AM] sāmyakaraṇārthaṃ G; prāgval G] pragval AM.

[255]yān AMGTPL(VIS)] yām L(ASS); saṃdadhe (2nd) MGTPL] saṃdagdhe A.

[256]caturguṇitāni AM] ∅ G.

atra gacchaḥ yā 4 rū 1/ ādiḥ yā 2/ pracayaḥ yā 1/ eṣāṃ ghātaḥ svasaptabhāgādhikaḥ yāgha $\overset{64}{7}$ yāva $\overset{16}{7}$ / phalam idaṃ 'vyekapadaghnacaya' (L 121) iti śreḍhīgaṇitasyāsya yāgha 8 yāva 10 yā 2 samam iti pakṣau yāvattāvatāpavartya samacchedīkṛtya chedagame śodhane ca kṛte jātau pakṣau

yāva	8	yā	54	rū	0
yāva	0	yā	0	rū	14

etayor aṣṭaguṇayoḥ saptaviṃśativarga 729 yutayor mūle

yā	8	rū	$\dot{27}$
yā	0	rū	29

punar anayoḥ samīkaraṇenāptayāvattāvanmānena 7 utthāpitā ādyuttaragacchāḥ 14/ 7/ 29//E63p//[257]

udāharaṇam/E64p0/

kaḥ khena vihṛto rāśir ādyayukto navonitaḥ/ E64
vargitaḥ svapadenāḍhyaḥ khaguṇo navatir bhavet//E64//[258]

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[257] $\dot{54}$ AM] 54 G; punar anayoḥ MG] punarayo A.

[258] rāśir ādyayukto navonitaḥ AM (see E64p1)] rāśiḥ koṭyā yukto 'thavonitaḥ GP (see E64p3), rāśiḥrādyāyukto thavonitaḥ T (see E64p2). E64p2 treats the same equation as accepted by T as a variant reading (pāṭha) but it would be strange if the author himself refers to a 'variant reading' of his own verse. It is also curious that Kṛṣṇa in T comments on the form accepted by T and in P the form accepted by P. See also the next footnote. Sūryadāsa solves the same equation as treated in E64p1 (reading 'bhājitaḥ' for 'vihṛtaḥ') but here also we come across a curious situation: he takes the word 'ādya' (E64b) in the sense of 'the first one' in his solution but in the sense of 'the preceding one' in his verification (ālāpa-yojanā) if 'asyādyaḥ 8' is not a scribal error for 'asyādyaḥ 9'. I cite here his comment on E64 from PPM(Wai) 9772/11-2/551, fol. 64a, l. 11 – fol. 64b, l. 10:

atha prākkathitaśūnyaṣaḍvidhakartavyatāpradarśanārtham udāharaṇam āha/ 'kaḥ khena bhājita' (E64a) iti/ spaṣṭam//

evam atrājñātarāśer mānam yā 1/ ayaṃ khena bhājitaḥ $\overset{1}{0}$ / atra khaharatvaṃ kalpitam eva/ tato 'yam ādyenānena yā 1 yuto jātaḥ ⟨yā⟩ 2/ ayaṃ navonitaḥ yā 2 rū $\dot{9}$/ vargitaś ca yāva 4 yā $\dot{36}$ rū 81/ ayaṃ svapadenānena yā 2 rū $\dot{9}$ yathāsthānaṃ yuto jātaḥ yāva 4 yā $\dot{34}$ rū 72/ ayaṃ śūnyaguṇitaḥ san navatisamo bhavatīti śūnyena guṇane prāpta ācāryaḥ pāṭīgaṇite viśeṣam uktavān/ (L 46abc = Q5abc (see E65p2) with 'jñeyaḥ' for 'vicintyaḥ' is cited here) iti/ evaṃ 'kaḥ khena bhājito rāśir' (E64a) ity atra pūrvaṃ śūny⟨o⟩ hāra āsīt/ idānīṃ śūnya eva guṇaka utpannaḥ/ ata ubhayos tulyatvān nāśe kṛte rāśir avikṛta eva sthitaḥ/ tathākṛto 'yaṃ navatisama iti samaśodhanāya nyāsaḥ/

yāva	4	yā	$\dot{34}$	rū	72
yāva	0	yā	0	rū	90

samaśodhanād idam eva pakṣaśeṣam

[259]atra rāśiḥ yā 1/ ayaṃ khahṛtaḥ yā $\overset{1}{0}$ / asya khaharatvaṃ kalpitam eva/ ādyena yā 1 yukto jātaḥ yā 2/ navonitaḥ yā 2 rū $\dot{9}$/ vargitaḥ yāva 4 yā $\dot{3}6$ rū 81/ svapadena yā 2 rū $\dot{9}$ yutaḥ yāva 4 yā $\dot{3}4$ rū 72/ ayaṃ śūnyaguṇo navatisama iti śūnyena guṇane prāpte 'śūnye guṇake jāte khaṃ hāraś cet' (L 46ab) iti pūrvaśūnyo hara idānīṃ guṇas tasmād ubhayor guṇaharayor nāśaḥ/ evaṃ pakṣau

yāva	4	yā	$\dot{3}4$	rū	72
yāva	0	yā	0	rū	90

samaśodhanāt pakṣaśeṣe

yāva	4	yā	$\dot{3}4$	rū	0
yāva	0	yā	0	rū	18

etau pakṣau ṣoḍaśabhiḥ saṃguṇya catustriṃśadvargatulyāni rūpāṇi prakṣipya mūle gṛhītvā pakṣayoḥ śodhanārthaṃ nyāsaḥ/

yā	8	rū	$\dot{3}4$
yā	0	rū	38

uktavaj jāto rāśiḥ 9//E64p1//[260]

atra vādyayukto 'thavonita iti pāṭhe rāśiḥ yā 1/ khahṛtaḥ $\overset{\text{yā } 1}{0}$ / ādyena yā 1 yuktonīkaraṇāya khaharatvāt samacchedīkaraṇena śūnyenaiva yuktonitaḥ sa eva $\overset{\text{yā } 1}{0}$ / vargitaḥ $\overset{\text{yāva } 1}{0}$ / svapadenāḍhyaḥ $\overset{\text{yāva1 yā } 1}{0}$ / ayaṃ khaguṇaḥ/ pūrvaṃ khaharatvād guṇaharayor nāśe kṛte jātaḥ yāva 1 yā 1/ ayaṃ navatisama iti samaśodhanārthaṃ nyāsaḥ/

yāva	1	yā	1	rū	0
yāva	0	yā	0	rū	90

yāva	4	yā	$\dot{3}4$
	rū	18	

atroktavad utpannayoḥ pakṣamūlayoḥ samaśodhanāya nyāsaḥ

yā	8	rū	$\dot{3}4$
yā	0	rū	38

atrāptaṃ yāvattāvanmānam 9/ ayam eva rāśir iti siddham//

atrālāpayojanā/ tatra rāśiḥ 9/ ayaṃ khena bhājitaḥ san jātaḥ khaharaḥ $\overset{9}{0}$ / asyādyaḥ 8/ anena samacchidā yuto jātaḥ $\overset{9}{0}$ / yataḥ 'asmin vikāraḥ khahare na rāśāv' (BG 6a) iti pūrvam evoktam/ athāyaṃ $\overset{9}{0}$ navonitaḥ san khaharatvāt punas tathaiva jātam $\overset{9}{0}$ / asau vargitaḥ $\overset{81}{0}$ / svapadenānena $\overset{9}{0}$ yuto jātaḥ $\overset{90}{0}$ / punaḥ khaguṇaḥ san jātā navatiḥ 90//

[259]AM have E64p1 and E64p2 but not E64p3; G places E64p3 before E64p1 and its editor cites E64p2 from a certain 'printed book' (mudrita-pustaka).

[260]rū $\dot{9}$ (1st) AM] rū 9 G; rū $\dot{9}$ (2nd) G] rū 9 AM; $\left|\begin{array}{cccc} \text{yā} & 8 & \text{rū} & \dot{3}4 \\ \text{yā} & 0 & \text{rū} & 38 \end{array}\right|$ A] yā 8 rū $\dot{3}4$ = yā 0 rū 38/ M, $\left|\begin{array}{cccc} \text{yā} & 8 & \text{rū} & 34 \\ \text{yā} & 0 & \text{rū} & 38 \end{array}\right|$ G.

samaśodhane kṛte pakṣāv imau caturbhiḥ saṃguṇyaikaṃ kṣiptvā mūle

yā	2	rū	1
yā	0	rū	19

atra samaśodhanāj jātaḥ prāgvad rāśiḥ 9//E64p2//[261]

atra rāśiḥ yā 1/ ayaṃ khahṛtaḥ yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ / ayaṃ koṭyā yukta ūnito vāvikṛta eva khaharatvāt/ athāyaṃ yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ vargitaḥ yāva $\begin{smallmatrix}1\\0\end{smallmatrix}$ svapadena yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ yuktaḥ yāva $\begin{smallmatrix}1\\0\end{smallmatrix}$ yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ / ayaṃ khaguṇo jātaḥ yāva 1 yā 1 guṇaharayos tulyatvena nāśāt/ athāyaṃ navatisama iti samaśodhane pakṣau caturbhiḥ saṃguṇya rūpaṃ prakṣipya prāgvaj jāto rāśiḥ 9//E64p3//[262]

udāharaṇam/E65p0/

kaḥ svārdhasahito rāśiḥ khaguṇo vargito yutaḥ/ E65
svapadābhyāṃ khabhaktaś ca jātāḥ pañcadaśocyatām//E65//[263]

atra rāśiḥ yā 1/ ayaṃ svārdhayutaḥ yā $\begin{smallmatrix}3\\2\end{smallmatrix}$ / 'khaguṇaḥ khaṃ' (Q4c = L45c) na kāryaḥ kiṃtu 'khaguṇa' eva 'cintyaḥ' 'śeṣavidhau' (Q4d = L45d) kartavye yā $\begin{smallmatrix}3\\2\end{smallmatrix}$ / vargitaḥ yāva $\begin{smallmatrix}9\\4\end{smallmatrix}$ / svapadābhyāṃ yā 3 yuto jātaḥ $\begin{smallmatrix}\text{yāva } 9 \text{ yā } 12\\4\end{smallmatrix}$ / ayaṃ khabhaktaḥ/ atrāpi prāgvad guṇaharayos tulyatvān nāśe kṛte 'vikṛto rāśiḥ/ taṃ ca pañcadaśasamaṃ kṛtvā samacchedīkṛtya chedagame śodhanāj jātau pakṣau

yāva	9	yā	12	rū	0
yāva	0	yā	0	rū	60

etau caturyutau kṛtvā mūle gṛhītvā punaḥ samaśodhanāl labdhaṃ yāvattāvanmānam 2//E65p1//[264]

tathā cāsmatpāṭīgaṇite/Q4p0/

'⟨yoge khaṃ kṣepasamaṃ
vargādau khaṃ khabhājito rāśiḥ/⟩
khaharaḥ syāt khaguṇaḥ khaṃ Q4
khaguṇaś cintyaś ca śeṣavidhau'//Q4//
'śūnye guṇake jāte khaṃ hāraś cet punas tadā rāśiḥ/ Q5
avikṛta eva vicintyaḥ sarvatraivaṃ vipaścidbhiḥ'//Q5//[265]

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[261] atra vādyayukto AM] athavādyayukto G; pāṭhe AM] pāṭhe tu G; $\begin{smallmatrix}\text{yā } 1\\0\end{smallmatrix}$ (twice) AM] yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ G; $\begin{smallmatrix}\text{yāva } 1\\0\end{smallmatrix}$ AM] yāva $\begin{smallmatrix}1\\0\end{smallmatrix}$ G; $\begin{smallmatrix}\text{yāva}1\ \text{yā } 1\\0\end{smallmatrix}$ AM] yāva $\begin{smallmatrix}1\\0\end{smallmatrix}$ yā $\begin{smallmatrix}1\\0\end{smallmatrix}$ G; samaśodhanārthaṃ AM] samaśodhanāya G.

[262] vāvikṛta] vāvikṛt G; yāva $\begin{smallmatrix}1\\0\end{smallmatrix}$ yā $\begin{smallmatrix}1\\0\end{smallmatrix}$] yāva 1 yā 1 G.

[263] jātāḥ AMG] jātaḥ TP.

[264] yutaḥ AM] yuktaḥ G; khaguṇa eva cintyaḥ AM] khaguṇaścintyaḥ G; yā 3 AM] yā $\begin{smallmatrix}6\\2\end{smallmatrix}$ G; taṃ ca G] tacca AM.

[265] Cited from L 45–46. vicintyaḥ sarvatraivaṃ vipaścidbhiḥ AM] jñeyaḥ sarvatraivaṃ vipaścidbhiḥ G, jñeyas tathaiva khenonitaś ca yutaḥ L.

//E65p2//
udāharaṇam/E66p0/

rāśir dvādaśanighno rāśighanāḍhyaś ca kaḥ samā yasya/ E66
rāśikṛtiḥ ṣaḍguṇitā pañcatriṃśadyutā vidvan//E66//[266]

atra rāśiḥ yā 1/ ayaṃ dvādaśaguṇito rāśighanāḍhyaś ca yāgha 1 yā 12/ ayaṃ yāva 6 rū 35 anena sama iti śodhane kṛte jātam ādyapakṣe yāgha 1 yāva $\dot{6}$ yā 12/ anyapakṣe rū 35/ anayor ṛṇarūpāṣṭakaṃ prakṣipya ghanamūle

yā	1	rū	$\dot{2}$
yā	0	rū	3

punar anayoḥ samīkaraṇena jāto rāśiḥ 5//E66p//[267]
udāharaṇam/E67p0/

ko rāśir dviśatīkṣuṇṇo rāśivargayuto hataḥ/ E67
dvābhyāṃ tenonito rāśivargavargo 'yutaṃ bhavet/
rūponaṃ vada taṃ rāśiṃ vetsi bījakriyāṃ yadi//E67//

atra rāśiḥ yā 1/ dviśatīkṣuṇṇaḥ yā 200/ rāśivargayuto jātaḥ yāva 1 yā 200/ ayaṃ dvābhyāṃ guṇitaḥ yāva 2 yā 400/ anenāyaṃ rāśivargavarga ūnito jātaḥ yāvava 1 yāva $\dot{2}$ yā $\dot{4}00$/ ayaṃ rūponāyutasama iti samaśodhane kṛte jātau pakṣau/

yāvava	1	yāva	$\dot{2}$	yā	$\dot{4}00$	rū	0
yāvava	0	yāva	0	yā	0	rū	9999

atrādyapakṣe kila yāvattāvaccatuḥśatīṃ rūpādhikāṃ prakṣipya mūlaṃ labhyate/ paraṃ tāvati kṣipte nānyapakṣasya mūlam asti/ evaṃ kriyā na nirvahati/ ato 'tra svabuddhiḥ/ iha pakṣayor yāvattāvadvargacatuṣṭayaṃ yāvattāvaccatuḥśatīṃ rūpaṃ ca prakṣipya mūle

yāva	1	yā	0	rū	1
yāva	0	yā	2	rū	100

punar anayoḥ samīkaraṇena prāgval labdhaṃ yāvattāvanmānam 11/ ityādi buddhimatā jñeyam//E67p//[268]
udāharaṇam/E68p0/

vanāntarāle plavagāṣṭabhāgaḥ
saṃvargito valgati jātarāgaḥ/ E68

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[266] samā yasya GT] samo yaḥ syāt AM, samo yasya P.

[267] yāgha 1 (2nd) AG] yāgha $\dot{1}$ M; anayor ṛṇa MG] anayo ṛṇa A.

[268] rāśivargavarga G] yāvava 1 rāśivargavarga AM; | yāva 1 yā 0 rū 1 / yāva 0 yā 2 rū 100 | AM] yāva 1 rū 1 / yā 2 rū 100 G.

phūtkāranādapratinādahṛṣṭā
dṛṣṭā girau dvādaśa te kiyantaḥ//E68//[269]

atra kapiyūtham yā 1/ asyāṣṭāṃśavargo dvādaśayuto yūthasama iti pakṣau

yāva	1	yā	0	rū	768
yāva	0	yā	64 1	rū	0

etau samacchedīkṛtya chedagame śodhane ca kṛte jātau pakṣau

yāva	1	yā	64	rū	0
yāva	0	yā	0	rū	768

iha pakṣayor dvātriṃśadvargaṃ 1024 prakṣipya mūle

yā	1	rū	32
yā	0	rū	16

atrāvyaktapakṣarṇarūpebhyo 'lpāni vyaktapakṣarūpāṇi santi/ tāni dhanam ṛṇaṃ ca kṛtvā labdhaṃ dvividhaṃ yāvattāvanmānam 48/ 16//E68p//[270]

udāharaṇam/E69p0/

yūthāt pañcāṃśakas tryūno vargito gahvaraṃ gataḥ/ E69
dṛṣṭaḥ śākhāmṛgaḥ śākhām ārūḍho vada te kati//E69//[271]

atra yūthapramāṇam yā 1/ atra pañcāṃśakas tryūnaḥ | yā 1 rū 15 / 5 | vargitaḥ | yāva 1 yā 30 rū 225 / 25 | etaddṛṣṭena yutaḥ | yāva 1 yā 30 rū 250 / 25 | yūthasama iti pakṣau samacchedīkṛtya chedagame śodhane ca kṛte jātau

yāva	1	yā	55	rū	0
yāva	0	yā	0	rū	250

etau caturbhiḥ saṃguṇya pañcapañcāśadvargaṃ 3025 prakṣipya mūle

yā	2	rū	55
yā	0	rū	45

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[269] plavagāṣṭa MGTP] plapagāṣṭa A; phūt AM] brūt GTP.

[270] yā 1 AM] yāvattāvat 1 G; | yāva 1 yā 0 rū 768 / 64 / yāva 0 yā 1 rū 0 | AM] | yāva 1 / 64 yā 0 rū 768 / yāva 0 yā 1 rū 0 | G; etau AM] anayoḥ G; śodhane MG] sodhane A; pakṣayor MG] ṣakṣayor A; 1024 AM] ∅ G; santi MG] sagti A.

[271] śākhām AMGP] śāravām T.

atrāpi prāgval labdhaṃ dvividhaṃ mānam 50/ 5/ dvitīyam atra na grāhyam anupapannatvāt/ na hi vyakta ṛṇagate lokasya pratītir astīti//E69p//[272]

udāharaṇam/E70p0/

karṇasya trilavenonā dvādaśāṅgulaśaṅkubhā/ E70
caturdaśāṅgulā jātā gaṇaka brūhi tāṃ drutam//E70//

atra chāyā yā 1/ iyaṃ karṇatryaṃśonā caturdaśāṅgulā jātā/ ato vaiparītyenāsyāś caturdaśa viśodhya śeṣaṃ karṇatryaṃśaḥ yā 1 rū $\dot{1}4$/ ayaṃ triguṇo jātaḥ karṇaḥ yā 3 rū $\dot{4}2$/ asya vargaḥ yāva 9 yā $2\dot{5}2$ rū 1764 karṇavargeṇānenā yāva 1 rū 144 sama iti samaśodhane kṛte jātau pakṣau

yāva	8	yā	$2\dot{5}2$	rū	0
yāva	0	yā	0	rū	$16\dot{2}0$

etau pakṣau dvābhyāṃ saṃguṇyarṇatriṣaṣṭivargaṃ prakṣipya mūle

yā	4	rū	$6\dot{3}$
yā	0	rū	27

pakṣayoḥ punaḥ samīkaraṇaṃ kṛtvā prāgval labdhaṃ dvividhaṃ yāvattāvanmānam $\frac{45}{2}$ / 9/ utthāpite chāye ca $\frac{45}{2}$ / 9/ dvitīyacchāyā caturdaśabhyo nyūnā/ ato 'nupapannatvān na grāhyā/ ata uktaṃ 'dvividhaṃ kvacid' (BG 61d) iti//E70p1//[273]

atra padmanābhabīje/Q6p0/

'vyaktapakṣasya cen mūlam anyapakṣarṇarūpataḥ/ Q6
alpaṃ dhanarṇagaṃ kṛtvā dvividhotpadyate mitiḥ'//Q6//[274]

iti yat paribhāṣitaṃ tasya vyabhicāro 'yam//E70p2//

udāharaṇam/E71p0/

catvāro rāśayaḥ ke te mūladā ye dvisaṃyutāḥ/ E71
dvayor dvayor yathāsannaghātāś cāṣṭādaśānvitāḥ//E71//
mūladāḥ sarvamūlaikyād ekādaśayutāt padam/ E72

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[272]yā 1 (1st) AM] yāvattāvat 1 G; $\left|\begin{array}{c}\text{yā } 1 \text{ rū } \dot{1}5\end{array}\right|$ AM] yā $\frac{1}{5}$ rū $\frac{15}{5}$ G; $\left|\begin{array}{c}\text{yāva } 1 \text{ yā } \dot{3}0 \text{ rū } 225\\ 25\end{array}\right|$ AM] yāva $\frac{1}{25}$ yā $\frac{\dot{3}0}{25}$ rū $\frac{225}{25}$ G; $\left|\begin{array}{c}\text{yāva } 1 \text{ yā } \dot{3}0 \text{ rū } 250\\ 25\end{array}\right|$ AM] yāva $\frac{1}{25}$ yā $\frac{30}{25}$ rū $\frac{250}{25}$ G; pakṣau AM] ∅ G; etau AM] ∅ G; mānam AM] yāvattāvanmānam G.

[273]caturdaśa G] caturdaśaṃ AM.

[274]Cited from Padmanābha's lost work on bījagaṇita. Kṛṣṇa does not refer to this meta-rule of Padmanābha, while Sūryadāsa does. According to him, Q6d reads: 'dvidhā mānaṃ kvacid bhavet'

trayodaśa sakhe jātaṃ bījajña vada tān mama//E72//[275]

atra rāśir yena yuto mūlado bhavati sa kila rāśikṣepaḥ/ mūlayor antaravargeṇa hato rāśikṣepo vadhakṣepo bhavati/ tayo rāśyor vadhas tena yuto 'vaśyaṃ mūladaḥ syād ity arthaḥ/ rāśimūlānāṃ yathāsannaṃ dvayor dvayor vadhā rāśikṣeponā rāśivadhamūlāni bhavanti//E72p1//[276]

atrodāharaṇe rāśikṣepād vadhakṣepo navaguṇaḥ/ navānāṃ mūlaṃ trayaḥ/ atas tryuttarāṇi rāśimūlāni/

yā	1	rū	0
yā	1	rū	3
yā	1	rū	6
yā	1	rū	9

eṣāṃ dvayor dvayor vadhā rāśikṣeponāḥ santaḥ rāśivadhānām aṣṭādaśayutānāṃ mūlāni bhavanti/ ata uktavad vadhamūlāni/

					•
yāva	1	yā	3	rū	2
yāva	1	yā	9	rū	16
yāva	1	yā	15	rū	52

eṣāṃ pūrvamūlānāṃ ca sarveṣāṃ yogaḥ yāva 3 yā 31 rū 84/ idam ekādaśayutaṃ trayodaśavargasamaṃ kṛtvā

yāva	3	yā	31	rū	95
yāva	0	yā	0	rū	169

pakṣaśeṣe dvādaśabhiḥ saṃguṇya tayor ekatriṃśadvargaṃ 961 nikṣipya mūle/

yā	6	rū	31
yā	0	rū	43

punar anayoḥ samīkaraṇāl labdhena yāvattāvanmānena 2 anenotthāpitāni rāśimūlāni 2/ 5/ 8/ 11/ eṣāṃ vargā rāśikṣeponā arthād rāśayo bhavanti 2/ 23/ 62/ 119//E72p2//[277]

atrādyaparibhāṣā/Q7p0/

'rāśikṣepād vadhakṣepo yadguṇas tatpadottaram/ Q7
avyaktā rāśayaḥ kalpyā vargitāḥ kṣepavarjitāḥ'//Q7//[278]

(PPM(Wai) 9772/11-2/551, fol. 68a, ll. 1–2).

[275]sakhe AMGP] sarave T.

[276]hato AM] hṛto G.

[277](1st table) AG] yā 1 rū 0/ yā 1 rū 3/ yā 1 rū 6/ yā 1 rū 9/ M; trayodaśavargasamaṃ kṛtvā (3rd table) G] trayodaśavarga (3rd table) samaṃ kṛtvā AM; pakṣaśeṣe] pakṣaśeṣaṃ AMG; samīkaraṇāl labdhena yāvattāvanmānena AM] samīkaraṇena labdhayāvattāvanmānena G; rāśikṣeponā G] rāśayaḥ kṣepīnā AM.

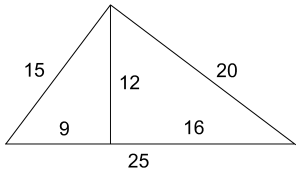
[278]Source unidentified. avyaktā MG] adhyaktā A, avyakta TP; varjitāḥ MGTP] vajitāḥ A.

iyaṃ kalpanā gaṇite 'tiparicitasya//E72p3//[279]

udāharaṇam/E73p0/

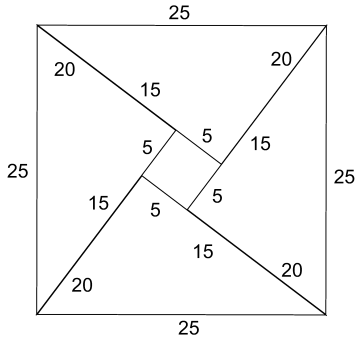
kṣetre tithinakhais tulye doḥkoṭī tatra kā śrutiḥ/ E73
upapattiś ca rūḍhasya gaṇitasyāsya kathyatām//E73//[280]

atra karṇaḥ yā 1/ etattryasraṃ parivartya yāvattāvatkarṇo bhūḥ kalpitā/ bhujakoṭī tu bhujau/ tatra yo lambas tadubhayato ye tryasre tayor api bhujakoṭī pūrvarūpe bhavataḥ/ atas trairāśikam/ yadi yāvattāvati karṇe 'yaṃ 15 bhujas tadā bhujatulye karṇe ka iti labdho bhujaḥ syāt/ sā bhujāśritāvādhā $\frac{225}{\text{yā } 1}$ / punar yadi yāvattāvati karṇa iyaṃ 20 koṭis tadā koṭitulye karṇe keti jātā koṭyāśritāvādhā $\frac{400}{\text{yā } 1}$ / āvādhāyutir yāvattāvatkarṇasamā kriyate/ tāvad bhujakoṭivargayogasya padaṃ karṇamānam upapadyate 25/ anenotthāpite jāte āvādhe 9/ 16/ ato lambaḥ 12/ kṣetradarśanam/



//E73p1//[281]

athānyathā vā kathyate/ karṇaḥ yā 1/ doḥkoṭighātārdhaṃ tryasrakṣetrasya phalam 150/ etadviṣamatryasracatuṣṭayena karṇasamacaturbhujaṃ kṣetram anyat karṇajñānārthaṃ kalpitam/



[279]'tiparicitasya G] 'tiparicitā syāt AM.

[280]nakhais AMGP] naravais T; śrutiḥ MGTP] śruti A.

[281]karṇo AM] karṇe G; labdho AM] labdhaṃ G; koṭitulye AM] koṭi-20-tulye G; upapadyate 25] upapadyate AM, utpadyate 25 G; kṣetradarśanam AM] nyāsaḥ G.

Fig. BGE73p-1a:

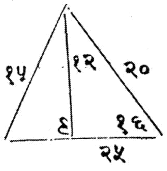
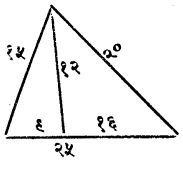


Fig. BGE73p-1g:

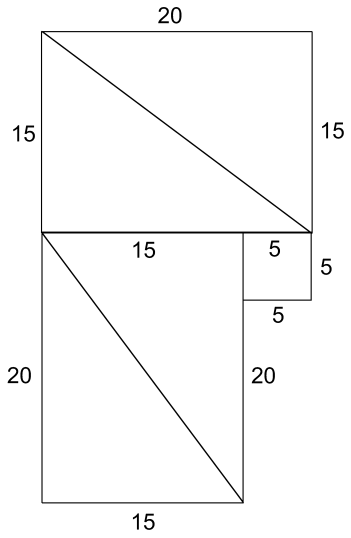


evaṃ madhye caturbhujam utpannam/ atra koṭibhujāntarasamaṃ bhujamānam 5/ asya phalam 25/ bhujakoṭivadho dviguṇas tryasrāṇāṃ caturṇāṃ phalam 600/ etadyogaḥ sarvaṃ bṛhatkṣetraphalam 625/ etad yāvattāvadvargasamaṃ kṛtvā labdhaṃ karṇamānam 25/ yatra vyaktasya na padaṃ tatra karaṇīgataḥ karṇaḥ//E73p2//[282]

etatkaraṇasūtraṃ vṛttam/62p0/

doḥkoṭyantaravargeṇa dvighno ghātaḥ samanvitaḥ/ 62
vargayogasamaḥ sa syād dvayor avyaktayor yathā//62//[283]

ato lāghavārthaṃ doḥkoṭivargayogasya padaṃ karṇa ity upapannam/ tatra tāny api kṣetrasya khaṇḍāny anyathā vinyasya darśanam/



//62p//[284]

udāharaṇam/E74p0/

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[282]karṇasamacaturbhujaṃ] karṇasamaṃ caturbhujaṃ AMG; kalpitam AM] kalpitam nyāsaḥ G; several numerals in the figure are missing in G; caturṇāṃ phalam 600/ etadyogaḥ sarvaṃ AM] caturṇāmetadyogaḥ 600 sarvaṃ G; bṛhat MG] vṛhat A; yāvattāvadvargasamaṃ AM] yāvattāvatsamaṃ G; karṇaḥ MG] karṇaḥ 5 A.

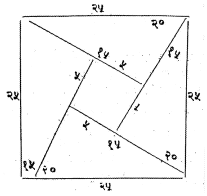
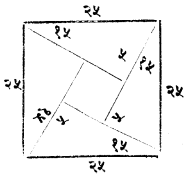
Fig. BGE73p-2a: 

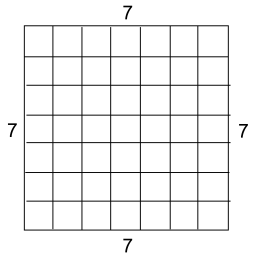
Fig. BGE73p-2g: 

[283]koṭyantara AMGP] koṭayantara T; yogasamaḥ AMGP] yogassamaḥ T.

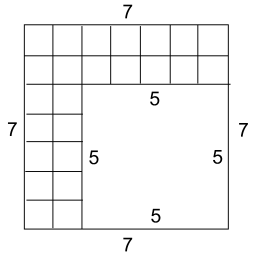
[284]yogasya padaṃ AM] yogapadaṃ G; several numerals in the figure are missing in G.

bhujāt tryūnāt padaṃ vyekaṃ koṭikarṇāntaraṃ sakhe/ E74
yatra tatra vada kṣetre doḥkoṭiśravaṇān mama//E74//

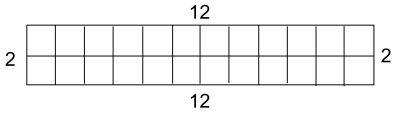
atra koṭikarṇāntaram iṣṭam 2/ ato vilomena bhujaḥ 12/ tad yathā/ kalpitam iṣṭam 2/ asya sarūpasya 3 vargaḥ 9/ triyutaḥ 12/ asya vargaḥ 144/ tat koṭikarṇavargāntaram/ ato rāśyor vargāntaraṃ yogāntaraghātasamaṃ syāt/ vargo hi samacaturasrakṣetraphalam/ ayaṃ kila saptavargaḥ 49/



asmāt pañcavargaṃ 25 viśodhya śeṣasya 24 darśanam/



ihāntaraṃ dvau 2/ yogo dvādaśa 12/ yogāntaraghātasama 24 koṣṭhakāni vartante/ taddarśanam/



ity upapannaṃ vargāntaraṃ yogāntaraghātasamam iti/ ata idaṃ vargāntaraṃ 144 kalpitakoṭikarṇāntareṇa 2 bhaktaṃ jātam 72/ ayaṃ 'yogo' dvidhā 'antareṇonayuto 'rdhitaḥ' (L 56) iti saṃkramaṇena jātau koṭikarṇau 35/ 37/ evam ekena bhujakoṭikarṇāḥ 7/ 24/ 25/ tribhiḥ 19/ $\frac{176}{3}$ / $\frac{185}{3}$ / caturbhir vā 28/ 96/ 100/ evam

Fig. BG62p-1a:

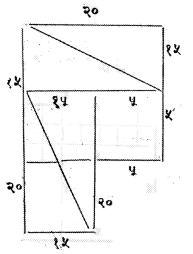
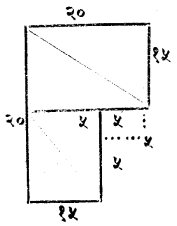


Fig. BG62p-1g:

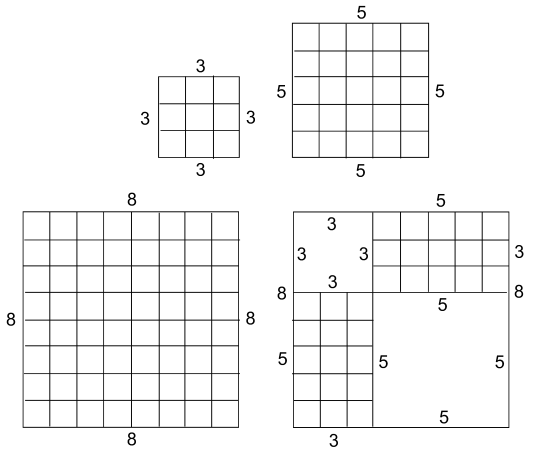


anekadhā/ evaṃ sarvatra//E74p//[285]

asya sūtraṃ vṛttam/63p0/

vargayogasya yad rāśyor yutivargasya cāntaram/ 63
dvighnaghātasamānaṃ syād dvayor avyaktayor yathā//63//

atra rāśī 3/ 5/ anayor yutivargaḥ 64/ tayor vargau 9/ 25/ anayor yogaḥ 34/ etayoḥ 64/ 34/ antaram 30/ idaṃ rāśyor ghātena 15 dvighnena 30 samaṃ bhavatīty upapannam/ teṣāṃ svarūpāṇi yathā/



//63p//[286]

[285]49 AM] ∅ G; sama 24 koṣṭhakāni vartante AM(varttante)] samakoṣṭhakā varttante 24 G; caturbhir vā MG] catubhirvā A; sarvatra AM] sarvatra 3 G.

Fig. BGE74p-1a:

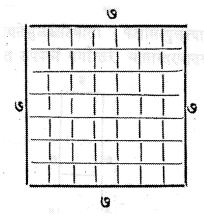


Fig. BGE74p-1g:

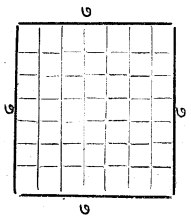


Fig. BGE74p-2a:

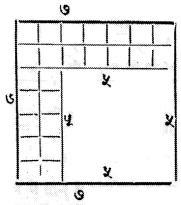


Fig. BGE74p-2g:

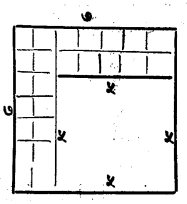


Fig. BGE74p-3a:

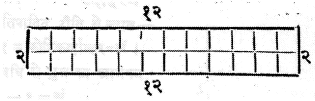
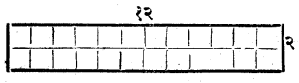


Fig. BGE74p-3g:

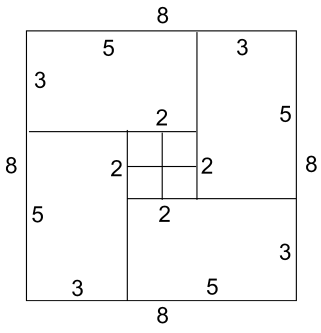


[286]yathā/ AM] yathā— nyāsaḥ G; two figures (with sides 3 and 5) are missing in G; several numerals

anyat karaṇasūtraṃ vṛttam/64p0/

caturguṇasya ghātasya yutivargasya cāntaram/
rāśyantarakṛtes tulyaṃ dvayor avyaktayor yathā//64// 64

atra rāśī 3/ 5/ anayor yutivargāt caturṣu koṇeṣu ghātacatuṣṭaye 'panīte madhye rāśyantaravargasamāni koṣṭhakāni dṛśyanta ity upapannam/ taddarśanam/



//64p//[287]

udāharaṇam/E75p0/

catvāriṃśad yutir yeṣāṃ doḥkoṭiśravasāṃ vada/
bhujakoṭivadho yeṣu śataṃ viṃśatisaṃyutam//E75//[288] E75

atra kila bhujakoṭyor vadho dviguṇaḥ 240/ tad yutivargasya vargayogasya cāntaram/ yo hi vargayogaḥ sa eva karṇavargaḥ/ ato bhujakoṭiyutivargasya karṇavargasya

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in the remaining two figures in G are missing.

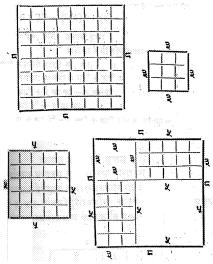

Fig. BG63p-1a:

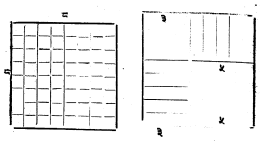

Fig. BG63p-1g:

[287]samāni koṣṭhakāni AM] samāḥ koṣṭhakāḥ G; 2 (above the central square in the figure) AM] 9 G.

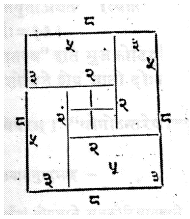

Fig. BG64p-1a:

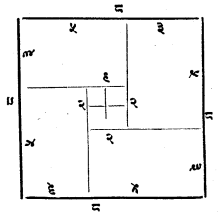

Fig. BG64p-1g:

[288]yutir yeṣāṃ AMGP] yutiyaṣāṃ T.

cāntaram idaṃ 240 yogāntaraghātasamaṃ syāt/ ata idam antaraṃ 240 yogenānena 40 bhaktaṃ jātaṃ bhujakoṭiyutikarṇāntaram 6/ 'yogo 'ntareṇonayuto 'rdhitaḥ' (L 56) ityādinā saṃkramaṇena jāto bhujakoṭiyogaḥ 23/ karṇaḥ 17/ 'caturguṇasya ghātasya' (BG 64) iti bhujakoṭiyutivargād asmāt 529 caturguṇaghāte 'smin 480 śodhite śeṣaṃ jāto doḥkoṭyantaravargaḥ 49/ asya mūlam 7/ idaṃ doḥkoṭivivaram/ 'yogo 'ntareṇonayuto 'rdhitaḥ' (L 56) iti jāte bhujakoṭī 8/ 15//E75p//[289]

udāharaṇam/E76p0/

yogo doḥkoṭikarṇānāṃ ṣaṭpañcāśad vadhas tathā/ E76
ṣaṭśatī saptabhiḥ kṣuṇṇā yeṣāṃ tān me pṛthag vada//E76//[290]

atra karṇaḥ yā 1/ asya vargaḥ yāva 1/ sa eva bhujakoṭivargayogaḥ/ atra doḥkoṭikarṇayoge karṇone jāto bhujakoṭiyogaḥ yā $\dot{1}$ rū 56/ trayāṇāṃ ghāte karṇabhakte jāto bhujakoṭivadhaḥ $\frac{4200}{\text{yā } 1}$ / atha

'vargayogasya yad rāśyor yutivargasya cāntaram/
dvighnaghātasamānaṃ syāt' (BG 63abc)

iti vargayogaḥ yāva 1/ yutivargaḥ yāva 1 yā $\dot{1}\dot{1}2$ rū 3136/ anayor antaram yā $\dot{1}\dot{1}2$ rū 3136/ etad dvighnaghātasyāsya $\frac{8400}{\text{yā } 1}$ samam iti samacchedīkṛtya chedagame jātau pakṣau

yāva	$\dot{1}\dot{1}2$	yā	3136	rū	0
yāva	0	yā	0	rū	8400

etau dvādaśādhikaśatenāpavartya śodhitau jātau

yāva	$\dot{1}$	yā	28	rū	0
yāva	0	yā	0	rū	75

etāv ṛṇarūpeṇa saṃguṇya caturdaśavargasamarūpāṇi prakṣipya mūle

yā	1	rū	$\dot{1}4$
yā	0	rū	11

uktavac chodhane kṛte labdhaṃ yāvattāvanmānam 25/ atra vikalpena dvitīyaṃ karṇamānam 3 utpadyate/ etad anupapannatvān na grāhyam/ atra trayāṇāṃ ghātaḥ 4200/ karṇa 25 bhakto jāto bhujakoṭivadhaḥ 168/ tatheyaṃ bhujakoṭiyutiḥ 31/ 'caturguṇasya ghātasya' (BG 64) ityādinā jātaṃ doḥkoṭyantaram 17/ 'yogo 'ntareṇonayuto 'rdhitaḥ' (L 56) ityādinā jāte bhujakoṭī 7/ 24//E76p1//[291]

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[289] vargayogasya G] vargayosya AM; karṇavargasya MG] ∅ A.

[290] śatī AMGP] śato T; kṣuṇṇā GTP] kṣuṇā AM.

[291] trayāṇāṃ (1st) AM] tathā trayāṇāṃ G; $\frac{4200}{\text{yā } 1}$ AM] $\frac{\text{rū } 4200}{\text{yā } 1}$ G; etad dvighna MG] aitad-dvighna A; $\frac{8400}{\text{yā } 1}$ AM] $\frac{\text{rū } 8400}{\text{yā } 1}$ G; caturdaśavarga MG] caturdaśadharga A; 3 utpadyate AM] utpadyate 3 G; na grāhyam MG] na/ grāhyam A; 4200 G] 42000 AM; yutiḥ 31 AM] yutīḥ 31 G.

evaṃ sarvatra/ kriyopasaṃhāraṃ kṛtvā matimadbhiḥ kvāpi yuktyaivodāharaṇam ānīyate/ avyaktakalpanayā tu mahatī kriyā bhavati//E76p2//

iti bhāskarīye bījagaṇite 'vyaktavargādisamīkaraṇaṃ samāptam//E76p3//[292]

II.9 Anekavarṇa-samīkaraṇa

athānekavarṇasamīkaraṇaṃ bījam//65p1//

tatra sūtraṃ sārdhavṛttatrayam/65p0/[293]

ādyaṃ varṇaṃ śodhayed anyapakṣād 65
anyān rūpāṇy anyataś cādyabhakte/
pakṣe 'nyasminn ādyavarṇonmitiḥ syād
varṇasyaikasyonmitīnāṃ bahutve//65//[294]
samīkṛtacchedagame tu tābhyas 66
tadanyavarṇonmitayaḥ prasādhyāḥ/
antyonmitau kuṭṭavidher guṇāptī
te bhājyatadbhājakavarṇamāne//66//
anye 'pi bhājye yadi santi varṇās 67
tanmānam iṣṭaṃ parikalpya sādhye/
vilomakotthāpanato 'nyavarṇa-
mānāni bhinnaṃ yadi mānam evam//67//
bhūyaḥ kāryaḥ kuṭṭako 'trāntyavarṇaṃ 68
tenotthāpyotthāpayed vyastam ādyān//68//[295]

idam anekavarṇasamīkaraṇaṃ bījam/ ye 'trodāharaṇe dvitryādayo 'vyaktarāśayo bhavanti teṣāṃ yāvattāvadādayo varṇā māneṣu kalpyās te 'tra pūrvācāryaiḥ kalpitāḥ/ yāvattāvatkālakanīlakapītakalohitakaharitakaśvetakacitrakakapilakapiṅgalakadhūmrakapāṭalakaśavalakaśyāmalakamecaketyādi/ athavā kādīny akṣarāṇy avyaktānāṃ saṃjñā asaṃkarārthaṃ kalpyāḥ/ ataḥ prāgvad uddeśakālāpavad vidhiṃ kurvatā gaṇakena pakṣau samau kāryau pakṣā vā samāḥ kāryāḥ/ tataḥ

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[292]bhāskarīye AM] śrībhāskarīye G; bījagaṇite 'vyaktavargādisamīkaraṇaṃ] bījagaṇite 'vyaktavargādisamīkaraṇaṃ (ekavarṇasaṃbandhi madhyamāharaṇaṃ) AM, bījagaṇita ekavarṇasaṃbandhi madhyamāharaṇaṃ G. The parentheses in AM seem to indicate that the words have been supplied by the editors.

[293]tatra G] yatra AM.

[294]varṇonmitiḥ AMGP] varṇonmitaḥ T.

[295]The former half of a Śālinī verse. The latter half is verse 70. kuṭṭako 'trāntyavarṇaṃ AMGTP] kuṭṭakādanyavarṇas, a variant mentioned by Kṛṣṇa; tenotthāpyotthāpayed vyastam ādyān AMG] tenotthāpyotthāpayedvyastamādyāt P, tenotthāpayedvyastamādyān T, tenotthāpyotthāpayedantimādyān, a variant mentioned by Kṛṣṇa.

sūtrāvatāro 'yam//68p1//[296]

tayoḥ samayor ekasmāt pakṣād itarapakṣasyādyaṃ varṇaṃ śodhayet/ tadanyavarṇān rūpāṇi cetarasmāt pakṣāc chodhayet/ tata ādyavarṇaśeṣeṇetarapakṣe bhakte bhājakavarṇonmitiḥ/ bahuṣu pakṣeṣu yayor yayoḥ sāmyam asti tayor evaṃ kṛte saty anyā unmitayaḥ syuḥ/ tatas tāsūnmitiṣv ekavarṇonmitayo yady anekadhā tatas tāsāṃ madhye dvayor dvayoḥ samīkṛtacchedagamena 'ādyaṃ varṇaṃ śodhayet' (BG 65a) ityādinānyavarṇonmitayaḥ syuḥ//68p2//[297]

evaṃ yāvattāvatsaṃbhavaḥ/ tato 'ntyonmitau bhājyavarṇe yo 'ṅkaḥ sa bhājyarāśir yo bhājakaḥ sa bhājakaḥ/ rūpāṇi kṣepaḥ/ ataḥ kuṭṭakavidhinā yo guṇa utpadyate tad bhājyavarṇamānam/ yā labdhis tad bhājakavarṇamānam/ tayor mānayor dṛḍhabhājakabhājyāv iṣṭena varṇena guṇitau kṣepakau kalpyau/ tataḥ svasvamānena sakṣepeṇa pūrvavarṇonmitau varṇāv utthāpya svacchedena haraṇe yal labhyate tat pūrvavarṇasya mānam/ evaṃ 'vilomakotthāpanato 'nyavarṇamānāni' (BG 67cd) bhavanti/ yadi tv antyonmitau dvyādayo varṇā bhavanti tadā teṣām iṣṭāni mānāni kṛtvā svasvamānais tān utthāpya rūpeṣu prakṣipya kuṭṭakaḥ kāryaḥ//68p3//[298]

atha yadi vilomakotthāpane kriyamāṇe pūrvavarṇonmitau tanmitir bhinnā labhyate tadā kuṭṭakavidhinā yo guṇa utpadyate sakṣepaḥ sa bhājyavarṇamānam/ tenāntyavarṇamāneṣu taṃ varṇam utthāpya pūrvonmitiṣu vilomakotthāpanaprakāreṇānyavarṇamānāni sādhyāni/ iha yasya varṇasya yan mānam āgataṃ vyaktam avyaktaṃ vyaktāvyaktaṃ vā tasya mānasya vyaktāṅkena guṇane kṛte tadvarṇākṣarasya nirasanam utthāpanam ucyate//68p4//[299]

udāharaṇāni/Q8p0/

'māṇikyāmalanīlamauktikamitir'//Q8//[300] Q8

iti/ atra māṇikyādīnāṃ maulyāni yāvattāvadādīni prakalpya tadguṇaratnasaṃkhyāṃ ca kṛtvā rūpāṇi ca prakṣipya samaśodhanārthaṃ nyāsaḥ/

yā	5	kā	8	nī	7	rū	90
yā	7	kā	9	nī	6	rū	62

'ādyaṃ varṇaṃ śodhayet' (BG 65a) ityādinā jātā yāvattāvadunmitir ekaiva

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[296]ye 'trodāharaṇe] yatrodāharaṇe AMG; haritaka AG] hārataka M; uddeśakālāpavad AM] udeśakālāpavad G; pakṣau MG] pakṣā A.

[297]rūpāṇi cetarasmāt pakṣāc G] rūpāṇi ca itarapakṣāc AM; '... śodhayet' ityādinā G(-dity-)] ...śodhiyedityādinā AM.

[298]yadi tv antyonmitau MG] yadi tvanyonmitau A.

[299]yo guṇa utpadyate sakṣepaḥ AM] yo guṇa utpadyate sa kṣepaḥ G, yo guṇaḥ sakṣepa utpadyate T(K)P(K); varṇonmitau MG] varṇenmitau A.

[300]Cited from BG E38. māṇikyāmalanīlamauktikamitir iti AM] ∅ G (the editor of G supplies the full verse of BG E38 here in a pair of parentheses without a verse number).

kā	$\dot{1}$	nī	1	rū	28
		yā	2		

ekatvād iyam evāntyā/ ato 'tra kuṭṭakaḥ kāryaḥ/ iha bhājye varṇadvayaṃ vartate/ ato nīlakamānam iṣṭaṃ rūpaṃ 1 kalpitam/ anena nīlakam utthāpya rūpeṣu prakṣipya jātam

kā	$\dot{1}$	rū	29
	yā	2	

ataḥ kuṭṭakavidhinā 'haratașṭe dhanakṣepe' (BG 33a) ityādinā guṇāptī sakṣepe

pī	2	rū	1
pī	1	rū	14

atra śūnyena pītakam utthāpya jātāni māṇikyādīnāṃ maulyāni 14/ 1/ 1/ athavaikena 13/ 3/ 1/ dvābhyāṃ vā 12/ 5/ 1/ tribhir vā 11/ 7/ 1/ evam iṣṭavaśād ānantyam//68p5//[301]

'eko bravīti mama dehi śatam'//Q9//[302] Q9

iti/ atra dhane yā 1/ kā 1/ paradhanāc chatam apāsya pūrvadhane śataṃ prakṣipya jātaṃ yā 1 rū 100/ kā 1 rū $\dot{1}\dot{0}0$/ paradhanād ādyaṃ dviguṇam iti paradhanena dviguṇena samaṃ kṛtvā labdhā yāvattāvadunmitiḥ

kā	2	rū	$\dot{3}00$
	yā	1	

punar ādyadhanād daśasv apanīteṣu paradhane kṣipteṣu jātam

yā	1	rū	$\dot{1}0$
kā	1	rū	10

ādyād aparaḥ ṣaḍguṇa ity ādyaṃ ṣaḍguṇaṃ parasamaṃ kṛtvā labdhaṃ yāvattāvadunmitiḥ

kā	1	rū	70
	yā	6	

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[301] unmitir ekaiva | kā $\dot{1}$ nī 1 rū 28 / yā 2 | G(here and hereafter without enclosure)] unmitiḥ — yā = $\frac{\text{kā } \dot{1} \text{ nī } 1 \text{ rū } 28}{2}$ iyamekaiva AM (here and hereafter, AM greatly modify the original expression of unmiti in accordance with the modern algebraic notation; G also inserts a horizontal bar between the two rows but otherwise preserves the original form); iha AM] ha G; rūpaṃ 1 AM] rūpaṃ G; | kā $\dot{1}$ rū 29 / yā 2 | G] yā = $\frac{\text{kā } \dot{1} \text{ rū } 29}{2}$ AM; athavaikena AM] athavaikena pītakena G.

[302] Cited from BG E39. eko bravīti mama dehi śatam iti] udāharaṇam/ eko ... iti AM, ∅ G (the editor of G supplies 'udāharaṇam' and the full verse of BG E39 here in a pair of parentheses without a verse number).

anayoḥ kṛtasamacchedayoś chedagame samīkaraṇam/ tatrānena vaikavarṇatvāt pūrvabījenāgataṃ kālakavarṇamānam 170/ anena yāvattāvadunmānadvaye 'pi kālakam utthāpya rūpāṇi prakṣipya svacchedena vibhajya labdhaṃ yāvattāvanmānam 40//68p6//[303]

udāharaṇam/E77p0/

aśvāḥ pañcaguṇāṅgamaṅgalamitā yeṣāṃ caturṇāṃ dhanāny E77
uṣṭrāś ca dvimuniśrutikṣitimitā aṣṭadvibhūpāvakāḥ/
teṣām aśvatarā vṛṣā munimahīnetrendusaṃkhyāḥ kramāt
sarve tulyadhanāś ca te vada sapady aśvādimaulyāni me//E77//[304]

atrāśvādīnāṃ maulyāni yāvattāvadādīni prakalpya tadguṇitāyām aśvādisaṃkhyāyāṃ jātāni caturṇāṃ dhanāni/

yā	5	kā	2	nī	8	pī	7
yā	3	kā	7	nī	2	pī	1
yā	6	kā	4	nī	1	pī	2
yā	8	kā	1	nī	3	pī	1

etāni samānīty eṣāṃ prathamadvitīyayoḥ sāmyakaraṇāl labdhā yāvattāvadunmitiḥ

kā	5	nī	$\overset{\bullet}{6}$	pī	$\overset{\bullet}{6}$
		yā	2		

dvitīyatṛtīyayor apy evaṃ labdhā yāvattāvadunmitiḥ

kā	3	nī	1	pī	$\overset{\bullet}{1}$
		yā	3		

evaṃ tṛtīyacaturthayoḥ

kā	3	nī	$\overset{\bullet}{2}$	pī	1
		yā	2		

punar āsāṃ madhye prathamadvitīyayoḥ samīkṛtacchedagame sāmyakaraṇena labdhā kālakonmitiḥ

nī	20	pī	16
	kā	9	

evaṃ dvitīyatṛtīyayor api

nī	8	pī	$\overset{\bullet}{5}$
	kā	3	

anayoḥ samacchedīkṛtayoḥ sāmyakaraṇena labdhaṃ nīlakonmānam

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[303] $\begin{array}{|cccc} \text{kā} & 2 & \text{rū} & \overset{\bullet}{300} \\ & \text{yā} & 1 & \end{array}$ G] yā = kā 2 rū $\overset{\bullet}{300}$ AM; unmitiḥ $\begin{array}{|cccc} \text{kā} & 1 & \text{rū} & 70 \\ & \text{yā} & 6 & \end{array}$ G] unmānam yā = $\frac{\text{kā } 1 \text{ rū } 70}{6}$ AM; 170 G] kā = 170 AM; yāvattāvanmānam] yāvattāvadunmānam AMG; 40 G] yā = 40 AM.

[304] mahī AMGP] mahi T; saṃkhyāḥ AMTP] saṃkhyā G.

$$\left|\begin{array}{cc} \text{pī} & 31 \\ \text{nī} & 4 \end{array}\right|$$

'antyonmitau kuṭṭakavidher guṇāptī' (BG 66c) iti kuṭṭakakaraṇena labdho guṇakaḥ sakṣepaḥ lo 4 rū 0/ etat pītakamānam/ labdhiḥ lo 31 rū 0/ etan nīlakamānam/ kālakonmāne nīlakapītakau svasvamānenotthāpya svacchedena vibhajya labdhaṃ kālakamānam lo 76 rū 0/ atha yāvattāvanmāne kālakādīn svasvamānenotthāpya svacchedena vibhajya labdhaṃ yāvattāvanmānam lo 85 rū 0/ lohite rūpeṇeṣṭenotthāpite jātāni yāvattāvadādīnāṃ parimāṇāni 85/ 76/ 31/ 4/ dvikeneṣṭena 170/ 152/ 62/ 8/ trikeṇa 255/ 228/ 93/ 12/ evam iṣṭavaśād ānantyam//E77p//[305]

udāharaṇam/E78p0/

tribhiḥ pārāvatāḥ pañca pañcabhiḥ sapta sārasāḥ/ E78
saptabhir nava haṃsāś ca navabhir barhiṇāṃ trayam//E78//[306]
drammair avāpyate drammaśatena śatam ānaya/ E79
eṣāṃ pārāvatādīnāṃ vinodārthaṃ mahīpateḥ//E79//[307]

atra pārāvatādīnāṃ maulyāni yāvattāvadādīni prakalpya tato 'nupātena pārāvatādīn ānīya tena śatena samakriyā kāryā/ athavā tripañcādīni maulyāni pañcasaptādīñ jīvāṃś ca yāvattāvadādibhiḥ saṃguṇya samakriyā kāryā/ tad yathā/ yā 3 kā 5 nī 7 pī 9/ etāni maulyāni śatasamāni kṛtvā labdhaṃ yāvattāvanmānam

$$\left|\begin{array}{ccccccccc} \text{kā} & \overset{\bullet}{5} & \text{nī} & \overset{\bullet}{7} & \text{pī} & \overset{\bullet}{9} & \text{rū} & 100 \\ & & & \underset{\text{yā}}{3} & & & & \end{array}\right|$$

punaḥ yā 5 kā 7 nī 9 pī 3/ etān jīvān śatasamān kṛtvā labdhaṃ yāvattāvanmānam

$$\left|\begin{array}{ccccccccc} \text{kā} & \overset{\bullet}{7} & \text{nī} & \overset{\bullet}{9} & \text{pī} & \overset{\bullet}{3} & \text{rū} & 100 \\ & & & \underset{\text{yā}}{5} & & & & \end{array}\right|$$

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[305] yāvattāvadādīni AM] yāvattāvadīni G; tadguṇitāyām aśvādisaṃkhyāyāṃ] tadguṇaguṇitāyāmaśvādisaṃkhyāyāṃ MG, tadguṇaguṇitāmaśvādisaṃkhyāṃ A; $\begin{smallmatrix}\text{yā}\\ \text{yā}\\ \text{yā}\\ \text{yā}\end{smallmatrix}$ (in the 1st enclosure) G] $\begin{smallmatrix}\text{pradha=yā}\\ \text{dvidha=yā}\\ \text{tṛdha =yā}\\ \text{cadha =yā}\end{smallmatrix}$ AM; nī 3 (in the 1st enclosure) AM] nī 2 G; $\left|\begin{array}{ccccccc} \text{kā} & 5 & \text{nī} & \overset{\bullet}{6} & \text{pī} & \overset{\bullet}{6} \\ & & \underset{\text{yā}}{2} & & & & \end{array}\right|$ G] yā = $\frac{\text{kā } 5 \text{ nī } \overset{\bullet}{6} \text{ pī } \overset{\bullet}{6}}{2}$ AM; apy evaṃ AM] api G; $\left|\begin{array}{ccccccc} \text{kā} & 3 & \text{nī} & 1 & \text{pī} & \overset{\bullet}{1} \\ & & \underset{\text{yā}}{3} & & & & \end{array}\right|$ G] yā = $\frac{\text{kā } 3 \text{ nī } 1 \text{ pī } \overset{\bullet}{1}}{3}$ AM; $\left|\begin{array}{ccccccc} \text{kā} & 3 & \text{nī} & \overset{\bullet}{2} & \text{pī} & 1 \\ & & \underset{\text{yā}}{2} & & & & \end{array}\right|$ G] yā = $\frac{\text{kā } 3 \text{ nī } \overset{\bullet}{2} \text{ pī } 1}{2}$ AM; labdhā (3rd) AM] ∅ G; $\left|\begin{array}{cccccc} \text{nī} & 20 & \text{pī} & 16 \\ \text{kā} & & 9 & & & \end{array}\right|$ G] kā = $\frac{\text{nī } 20 \text{ pī } 16}{9}$ AM; $\left|\begin{array}{cccccc} \text{nī} & 8 & \text{pī} & \overset{\bullet}{5} \\ \text{kā} & & 3 & & & \end{array}\right|$ G] kā = $\frac{\text{nī } 8 \text{ pī } \overset{\bullet}{5}}{3}$ AM; sāmyakaraṇena (2nd) MG] samyakaraṇena A; $\left|\begin{array}{cccc} \text{pī} & 31 \\ \text{nī} & 4 \end{array}\right|$ G] nī = $\frac{\text{pī } 31}{4}$ AM; kālakonmāne] kālakonmānena AMG.

[306] barhiṇāṃ trayam AMG] barhiṇas trayaḥ TP (Kṛṣṇa refers to and recommends the former).

[307] drammair AMGP] drasmair T; drammaśatam AMGP] drasmaśatam T (here and hereafter T spells drasma for dramma).

anayoḥ kṛtasamacchedayoś chedagame labdhaṃ kālakamānam

nī	$\dot{2}$	pī	$\dot{9}$	rū	50
		kā	1		

atra bhājye varṇadvayaṃ vartata iti pītakamānam iṣṭaṃ rūpacatuṣṭayaṃ kalpitam/ anena pītakam utthāpya rūpeṣu prakṣipya jātam

nī	$\dot{2}$	rū	14
	kā	1	

ataḥ kuṭṭakavidhinā labdhiguṇau sakṣepau

lo	$\dot{2}$	rū	14
lo	1	rū	0

yāvattāvadunmāne svasvamānena kālakādīn utthāpya svasvacchedena vibhajya labdhaṃ yāvattāvanmānam lo 1 rū $\dot{2}$/ lohitakam iṣṭena rūpatrayeṇotthāpya jātāni yāvattāvadādīnāṃ mānāni 1/ 8/ 3/ 4/ ebhir maulyāni jīvāś cotthāpitāḥ

maulyāni	3	40	21	36
pakṣiṇaḥ	5	56	27	12

athavā catuṣkeṇeṣṭena mānāni 2/ 6/ 4/ 4/ utthāpite

maulyāni	6	30	28	36
jīvāś ca	10	42	36	12

athavā pañcakena mānāni 3/ 4/ 5/ 4/ utthāpite

maulyāni	9	20	35	36
jīvāś ca	15	28	45	12

evam iṣṭavaśād anekadhā//E79p//[308]

udāharaṇam/E80p0/

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[308] maulyāni yāvattāvadādīni prakalpya tato 'nupātena pārāvatādīn ānīya tena śatena samakriyā kāryā/ athavā tripañcādīni maulyāni pañcasaptādīñ jīvāṃś ca yāvattāvadādibhiḥ saṃguṇya G(mūlyāni for maulyāni)] maulyāni mūlyaguṇitayāvattāvadādīni prakalpya tato 'nupātena AM; kā $\dot{5}$ nī $\dot{7}$ pī $\dot{9}$ rū 100 / yā 3 G] yā = $\frac{\text{kā } \dot{5} \text{ nī } \dot{7} \text{ pī } \dot{9} \text{ rū } 100}{3}$ AM; kā $\dot{7}$ nī $\dot{9}$ pī $\dot{3}$ rū 100 / yā 5 G] yā = $\frac{\text{kā } \dot{7} \text{ nī } \dot{9} \text{ pī } \dot{3} \text{ rū } 100}{5}$ A(120 for 100)M; nī $\dot{2}$ pī $\dot{9}$ rū 50 / kā 1 G] kā = nī $\dot{2}$ pī $\dot{9}$ rū 50 AM; mānam iṣṭaṃ MG] mānaniṣṭaṃ A; kalpitam/ AM] kalpitam 4 G; nī $\dot{2}$ rū 14 / kā 1 66 G] kā = nī $\dot{2}$ rū 14 AM; lo $\dot{2}$ rū 14 / lo 1 rū 0 G] lo $\dot{2}$ rū 14 = la° / lo 1 rū 0 = gu° AM; lo 1 rū $\dot{2}$] yā = lo 1 rū $\dot{2}$/ AM, lo 1 rū 2 G; maulyāni 3 40 21 36 / pakṣiṇaḥ 5 56 27 12 G] (pārāvatādayaḥ śatāntarvarttinaḥ) pakṣiṇaḥ 5/ 56/ 27/ 12/ / maulyāni 3/ 40/ 21/ 36/ AM; utthāpite maulyāni 6 30 28 36 / jīvāś ca 10 42 36 12 G] utthāpite jātāḥ pakṣiṇaḥ śatāntarvarttinaḥ 10/ 42/ 36/ 12/ maulyāni 6/ 30/ 28/ 36/ AM; utthāpite maulyāni 9 20 35 36 / jīvāś ca 15 28 45 12 G(mūlyāni)] ebhirutthāpane kṛte jātāḥ pa 15/ 28/ 45/ 12/ / mau 9/ 20/ 35/ 36/ A(15 for 35)M.

ṣaḍbhaktaḥ pañcāgraḥ pañcavibhakto bhavec catuṣkāgraḥ/ E80
caturuddhṛtas trikāgro dvyagras trisamuddhṛtaḥ kaḥ syāt//E80//[309]

atra rāśiḥ yā 1/ ayaṃ 'ṣaḍbhaktaḥ pañcāgraḥ' iti ṣaḍbhir bhāge hriyamāṇe kālako labhyata iti kālakaguṇito haraḥ svāgreṇa pañcakena yuto yāvattāvatā sama iti sāmyakaraṇena yāvattāvadunmitiḥ

kā	6	rū	5
	yā	1	

evaṃ pañcādihareṣu nīlakādayo labhyanta iti jātā yāvattāvadunmitayaḥ

nī	5	rū	4
	yā	1	

pī	4	rū	3
	yā	1	

lo	3	rū	2
	yā	1	

āsāṃ prathamadvitīyayoḥ samīkaraṇena labdhā kālakonmitiḥ

nī	5	rū	1•
	kā	6	

evaṃ dvitīyatṛtīyayoḥ samīkaraṇena labdhā nīlakonmitiḥ

pī	4	rū	1•
	nī	5	

evaṃ tṛtīyacaturthayoḥ samīkaraṇena labdhā pītakonmitiḥ

lo	3	rū	1•
	pī	4	

ataḥ kuṭṭakāl labdhe lohitakapītakayor māne sakṣepe

ha	4	rū	3	lo
ha	3	rū	2	pī

nīlakonmāne pītakaṃ svamānenotthāpya jātam

ha	12	rū	7
	nī	54	

atra svacchedena haraṇe nīlakamānaṃ bhinnaṃ labhyata iti kṛtvābhinnaṃ kartuṃ 'bhūyaḥ kāryaḥ kuṭṭakaḥ' (BG 68a) iti punaḥ kuṭṭakāt sakṣepo guṇaḥ śve 5 rū 4/ etad dharitakamānam/ anena lohitakapītakayor mānayor haritakam utthāpya jāte lohitakapītakayor māne

śve	20	rū	19	lo
śve	15	rū	14	pī

idānīṃ nīlakonmāne pītakaṃ svamānenotthāpya svacchedena vibhajya labdhaṃ nīlakamānam abhinnam śve 12 rū 11/ anena kālakamāne nīlakaṃ svamānenotthāpya

[309] catuṣkāgraḥ AMGP] caturagraḥ T; uddhṛtas AMP] uddhatas GT; samuddhṛtaḥ AMGP] samuddhata T.

svacchedena vibhajya labdhaṃ kālakamānam śve 10 rū 9/ ebhir mānair yāvattāvadunmitiṣu kālakādīn utthāpya labdhaṃ yāvattāvanmānam śve 60 rū 59//E80p1//[310]

athavā 'ṣaḍbhaktaḥ pañcāgraḥ' iti prāgvaj jāto rāśiḥ kā 6 rū 5/ ayam eva pañcāpahṛtaś caturagra iti labdhaṃ nīlakaṃ prakalpya tadguṇitahareṇa svāgrayutena nī 5 rū 4 samīkaraṇena jātaṃ kālakamānam

$$\left|\begin{array}{cccc} \text{nī} & 5 & \text{rū} & \dot{1} \\ & \text{kā} & 6 & \end{array}\right|$$

etat kālakamānaṃ bhinnaṃ labhyata iti kuṭṭakenābhinnakālakonmānam pī 5 rū 4/ anena pūrvarāśim kā 6 rū 5 utthāpya jātam pī 30 rū 29/ punar ayaṃ caturbhaktas tryagra iti prāgvat sāmye kṛte jātam

$$\left|\begin{array}{cccc} \text{lo} & 4 & \text{rū} & \dot{26} \\ & \text{pī} & 30 & \end{array}\right|$$

atrāpi kuṭṭakāl labdhaṃ pītakamānam ha 2 rū 1/ anena pūrvarāśau pī 30 rū 29 utthāpite jāto rāśiḥ ha 60 rū 59/ punar ayaṃ tribhakto dvyagra iti svata eva jātaḥ/ śūnyaikadvyādyutthāpanād bahudhā//E80p2//[311]

udāharaṇam/E81p0/

syuḥ pañcasaptanavabhiḥ kṣuṇṇeṣu hṛteṣu keṣu viṃśatyā/ E81
rūpottarāṇi śeṣāṇy avāptayaś cāpi śeṣasamāḥ//E81//[312]

atra śeṣāṇi yā 1/ yā 1 rū 1/ yā 1 rū 2/ etā eva labdhayaḥ/ prathamo rāśiḥ kā 1/ asmāt pañcaguṇitād rāśer labdhiguṇaṃ haram apāsya jātaṃ śeṣam kā 5 yā $\dot{20}$/ etad yāvattāvatsamaṃ kṛtvā labdhā yāvattāvadunmitiḥ

$$\left|\begin{array}{cc} \text{kā} & 5 \\ \text{yā} & 21 \end{array}\right|$$

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[310] guṇito AM] guṇo G; $\left|\begin{array}{cccc} \text{kā} & 6 & \text{rū} & 5 \\ & \text{yā} & 1 & \end{array}\right|$ G] yā = kā 6 rū 5 AM; $\left|\begin{array}{cccc} \text{nī} & 5 & \text{rū} & 4 \\ & \text{yā} & 1 & \end{array}\right|$ $\left|\begin{array}{cccc} \text{pī} & 4 & \text{rū} & 3 \\ & \text{yā} & 1 & \end{array}\right|$ $\left|\begin{array}{cccc} \text{lo} & 3 & \text{rū} & 2 \\ & \text{yā} & 1 & \end{array}\right|$ G] yā = nī 5 rū 4 = pī 4 rū 3 = lo 3 rū 2 AM(lā 3 for lo 3); $\left|\begin{array}{cccc} \text{nī} & 5 & \text{rū} & \dot{1} \\ & \text{kā} & 6 & \end{array}\right|$ G] kā = $\frac{\text{nī } 5 \text{ rū } \dot{1}}{6}$ AM; $\left|\begin{array}{cccc} \text{pī} & 4 & \text{rū} & \dot{1} \\ & \text{nī} & 5 & \end{array}\right|$ G] nī = $\frac{\text{pī } 4 \text{ rū } \dot{1}}{5}$ AM; $\left|\begin{array}{cccc} \text{lo} & 3 & \text{rū} & \dot{1} \\ & \text{pī} & 4 & \end{array}\right|$ G] pī = $\frac{\text{lo } 3 \text{ rū } \dot{1}}{4}$ AM; pītakaṃ G] ∅ AM; $\left|\begin{array}{cccc} \text{ha} & 12 & \text{rū} & 7 \\ & \text{nī} & 54 & \end{array}\right|$ G] nī = $\frac{\text{ha } 12 \text{ rū } 7}{5}$ AM; kāryaḥ kuṭṭakaḥ iti G] kuṭṭakaḥ kārya iti A, kuṭṭaka kārya iti M; mānayor] māne AMG; śve 12 rū 11 AM] śve 12 ha 11 G; mānair MG] mārnair A.

[311] pañcāpahṛtaś AM] pañcahṛtaś G; kālakamānam $\left|\begin{array}{cccc} \text{nī} & 5 & \text{rū} & \dot{1} \\ & \text{kā} & 6 & \end{array}\right|$ G] kālakamānam kā = $\frac{\text{nī } 5 \text{ rū } \dot{1}}{6}$ AM; kuṭṭakenābhinnakālakonmānam G] kuṭṭakenābhinnaṃ kālakonmānam AM; $\left|\begin{array}{cccc} \text{lo} & 4 & \text{rū} & \dot{26} \\ & \text{pī} & 30 & \end{array}\right|$ G] pī = $\frac{\text{lo } 4 \text{ rū } \dot{26}}{30} = \frac{\text{lo } 2 \text{ rū } \dot{13}}{15}$ A($\dot{13}$ for $\dot{1}\dot{3}$)M; rāśau pī 30 rū 29 utthāpite AM] rāśā pī 39 rū 20 vutthāpite G.

[312] keṣu AMGP] ∅ T.

atha dvitīyo rāśiḥ nī 1/ asmāt saptaguṇād rūpādhikayāvattāvadguṇaharam apāsya jātam nī 7 yā $\dot{2}0$ rū $\dot{2}0$/ etad asya yā 1 rū 1 samaṃ kṛtvā labdhā yāvattāvadunmitiḥ

nī	7	rū	$\dot{2}1$
	yā	21	

evaṃ tṛtīyaḥ pī 1/ asmān navaguṇāl labdhi yā 1 rū 2 guṇaharam apāsya śeṣaṃ pī 9 yā $\dot{2}1$ rū $\dot{4}0$/ idam asya yā 1 rū 2 samaṃ kṛtvā labdhā yāvattāvadunmitiḥ

pī	9	rū	$\dot{4}2$
	yā	21	

āsāṃ prathamadvitīyayor dvitīyatṛtīyayoḥ sāmyakaraṇena labdhe kālakanīlakayor unmitī

nī	7	rū	$\dot{2}1$	pī	9	rū	$\dot{2}1$
	kā	5			nī	7	

atra nīlakonmitau kuṭṭakena nīlakapītakayor māne kṛtvā kālakonmitau nīlake svamānenotthāpite kālakamānaṃ bhinnaṃ labhyata iti kuṭṭakenābhinne kālaka-lohitakayor māne

ha	63	rū	42	kā
ha	5	rū	3	lo

atra nīlakapītakayor lohitake svamānenotthāpite jāte tanmāne

ha	45	rū	33	nī
ha	35	rū	28	pī

yathākrameṇa nyāsaḥ/

ha	63	rū	42	kā
ha	45	rū	33	nī
ha	35	rū	28	pī

atha yāvattāvadunmitiṣu kālakādīn svasvamānenotthāpya svacchedena vibhajya labdhaṃ yāvattāvanmānam ha 15 rū 10/ atra śeṣasame phale na hi śeṣaṃ bhāga-hārādhikaṃ bhavitum arhati/ ato haritakaṃ śūnyenaivotthāpya jātā rāśayaḥ 42/ 33/ 28/ agrāṇi ca 10/ 11/ 12/ etā eva labdhayaḥ//E81p//[313]

udāharaṇam/E82p0/

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[313] yā $\dot{2}0$ (1st) AM] yā 20 G; $\begin{array}{|cc|}\hline \text{kā} & 5 \\ \text{yā} & 21 \\ \hline\end{array}$ G] yā = $\frac{\text{kā } 5}{21}$ AM; rūpādhika MG] rapādhika A; $\begin{array}{|cccc|}\hline \text{nī} & 7 & \text{rū} & \dot{2}1 \\ & \text{yā} & 21 & \\ \hline\end{array}$ G] yā = $\frac{\text{nī } 7 \text{ rū } \dot{2}1}{21}$ AM; labdhi yā 1 rū 2 guṇa AM] labdhi (yā 1 rū 2) guṇa G; $\begin{array}{|cccc|}\hline \text{pī} & 9 & \text{rū} & \dot{4}2 \\ & \text{yā} & 21 & \\ \hline\end{array}$ G] yā = $\frac{\text{pī } 9 \text{ rū } \dot{4}2}{21}$ AM; $\begin{array}{|cccc|}\hline \text{nī} & 7 & \text{rū} & \dot{2}1 \\ & \text{kā} & 5 & \\ \hline\end{array}$ $\begin{array}{|cccc|}\hline \text{pī} & 9 & \text{rū} & \dot{2}1 \\ & \text{nī} & 7 & \\ \hline\end{array}$ G] kā = $\frac{\text{nī } 7 \text{ rū } \dot{2}1}{5}$, nī = $\frac{\text{pī } 9 \text{ rū } \dot{2}1}{7}$ AM; kālakalohitakayor AG] kālakālohitakayor M; $\begin{array}{|ccccc|}\hline \text{ha} & 63 & \text{rū} & 42 & \text{kā} \\ \text{ha} & 5 & \text{rū} & 3 & \text{lo} \\ \hline\end{array}$ G] kā = ha 63 rū 42, lo = ha 5 rū 3 AM; $\begin{array}{|ccccc|}\hline \text{ha} & 45 & \text{rū} & 33 & \text{nī} \\ \text{ha} & 35 & \text{rū} & 28 & \text{pī} \\ \hline\end{array}$ G] kā = ha 63 rū 42, nī = ha 45 rū 33, pī = ha 35 rū 28 AM; $\begin{array}{|ccccc|}\hline \text{ha} & 63 & \text{rū} & 42 & \text{kā} \\ \text{ha} & 45 & \text{rū} & 33 & \text{nī} \\ \text{ha} & 35 & \text{rū} & 28 & \text{pī} \\ \hline\end{array}$ G] kā = ha 63 rū 42, nī = ha 45 rū 33, pī = ha 35 rū 28 AM; ha 15 rū 10 G] yā = ha 15 rū 10 AM; ato AM] atra G; śūnyenaivotthāpya AM] śūnyenotthāpya G.

ekāgro dvihṛtaḥ kaḥ syād dvikāgras trisamuddhṛtaḥ/ E82
trikāgraḥ pañcabhir bhaktas tadvad eva hi labdhayaḥ//E82//[314]

atra rāśiḥ yā 1/ ayaṃ dvihṛta ekāgra iti tatphalaṃ ca dvihṛtam ekāgram iti phalapramāṇam kā 2 rū 1/ etadguṇaṃ haraṃ svāgreṇa yutaṃ tasya yā 1 samaṃ kṛtvā labdhaṃ yāvattāvanmānam kā 4 rū 3/ asyaikālāpo ghaṭate/ punar api trihṛto dvyagra iti tatphalaṃ ca nī 3 rū 2/ etadguṇaharam agrayutaṃ ca nī 9 rū 8/ idam asya kā 4 rū 3 samaṃ kṛtvā kālakamānaṃ bhinnaṃ kuṭṭakenābhinnaṃ jātam pī 9 rū 8/ anena kālakam utthāpya jāto rāśiḥ pī 36 rū 35/ asyālāpadvayaṃ ghaṭate/ punar ayaṃ pañcabhaktas tryagra iti tatphalaṃ ca lo 5 rū 3/ idaṃ haraguṇam agrayutam asya pī 36 rū 35 samaṃ kṛtvā pītakamānaṃ bhinnaṃ kuṭṭakenābhinnaṃ kṛtvā jātam ha 25 rū 3/ anena pītakam utthāpya jāto rāśiḥ ha 900 rū 143/ haritakasya śūnyādinotthāpanenānekavidhaḥ//E82p//[315]

udāharaṇam/E83p0/

kau rāśī vada pañcaṣaṭkavihṛtāv ekadvikāgrau yayor E83
dvyagraṃ tryuddhṛtam antaraṃ navahṛtā pañcāgrā syād yutiḥ/
ghātaḥ saptahṛtaḥ ṣaḍagra iti tau ṣaṭkāṣṭakābhyāṃ vinā
vidvan kuṭṭakavedikuñjaraghaṭāsaṃghaṭṭasiṃho 'si cet//E83//[316]

atra kalpitau rāśī 'pañcaṣaṭkavihṛtāv ekadvikāgrau' yā 5 rū 1/ yā 6 rū 2/ anayor antaraṃ trihṛtaṃ dvyagram iti labdhaṃ kālakas tadguṇaharam agrayutam antareṇānena yā 1 rū 1 samaṃ kṛtvā labdhaṃ yāvattāvanmānam kā 3 rū 1/ anenotthāpitau jātau rāśī kā 15 rū 6/ kā 18 rū 8/ punar anayor yutir navahṛtā pañcāgreti labdhaṃ nīlakas tadguṇaṃ haram agrayutaṃ yogasyāsya kā 33 rū 14 samaṃ kṛtvā kālakamānaṃ bhinnam

nī	9	rū	9
	kā	33	

kuṭṭakenābhinnaṃ jātam pī 3 rū 0/ anenotthāpitau jātau rāśī pī 45 rū 6/ pī 54 rū 8/ punar anayor ghāte vargatvān mahatī kriyā bhavatīti pītakam ekenotthāpya prathamo rāśir vyakta eva kṛtaḥ 51/ punar anayoḥ saptataṣṭayor ghātaḥ saptataṣṭaḥ pī 3 rū 2/ etasya samaṃ kṛtvā prāgvat kuṭṭakenāptaṃ pītakamānam ha 7 rū 6/ anenotthāpito jāto rāśiḥ ha 378 rū 332/ pūrvarāśeḥ kṣepaḥ pī 45 āsīt/ sa haritakenānena ha 7 guṇitas tasya kṣepaḥ syād iti jātaḥ prathamaḥ kṣepaḥ ha 315 rū 51/ athavā prathamam evaikaṃ vyaktaṃ prakalpya dvitīyaḥ sādhyaḥ/ jātau rāśī

[314]samuddhṛtaḥ GP] samuddhutaḥ A, samuddhataḥ MT.

[315]yā 1 (2nd) AM] ∅ G; bhinnaṃ (2nd) G] ∅ AM; vidhaḥ G] vidhāḥ AM.

[316]saṃghaṭṭa AMGP] saṃga T.

rū 51/ śve 126 rū 80//E83p//[317]
udāharaṇam/E84p0/

navabhiḥ saptabhiḥ kṣuṇṇaḥ
ko rāśis triṃśatā hṛtaḥ/ E84
yadagraikyaṃ phalaikyāḍhyaṃ
bhavet ṣaḍviṃśater mitam//E84//[318]

atraikaharatvāc cheṣayoḥ phalayor yutidarśanāc ca guṇayogo guṇakaḥ kalpitaḥ rū 16/ rāśiḥ yā 1/ labdhaikyapramāṇaṃ kālakas tadguṇitaṃ haraṃ guṇaguṇitād rāśer apāsya jātaṃ śeṣam yā 16 kā $\dot{3}0$/ etat phalena kālakena yutaṃ yā 16 kā $\dot{2}9$ ṣaḍviṃśatisamaṃ kṛtvā kuṭṭakena prāgvaj jātaṃ yāvattāvanmānam nī 29 rū 27/ atra labdhyagrayogasyaikatānirdeśāt kṣepo na deyaḥ//E84p//[319]
udāharaṇam/E85p0/[320]

kas trisaptanavakṣuṇṇo rāśis triṃśadvibhājitaḥ/ E85
yadagraikyam api triṃśaddhṛtam ekādaśāgrakam//E85//

atrāpi guṇayogo guṇaḥ prāgvat rū 19/ rāśiḥ yā 1/ labdhaṃ kālakaḥ kā 1/ etadguṇaṃ haraṃ guṇaguṇitād rāśer apāsya śeṣam yā 19 kā $\dot{3}0$/ etad agraikyaṃ triṃśattaṣṭam eva/ tataḥ prathamālāpe dvitīyālāpasyāntarbhūtatvād idam evaikādaśasamaṃ kṛtvā prāgvaj jāto rāśiḥ nī 30 rū 29//E85p//[321]
udāharaṇam/E86p0/

kas trayoviṃśatikṣuṇṇaḥ ṣaṣṭyāśītyā hṛtaḥ pṛthak/ E86
yadagraikyaṃ śataṃ dṛṣṭaṃ kuṭṭakajña vadāśu tam//E86//

atra sūtraṃ vṛttam/69p0/

atraikādhikavarṇasya bhājyasthasyepsitā mitiḥ/ 69

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[317] nī 9 rū $\dot{9}$ / kā 33 G] kā = $\frac{\text{nī } 9 \text{ rū } \dot{9}}{33}$ AM; etasya AM] ∅ G; ha 7 rū 6/ anenotthāpito jāto rāśiḥ G] ∅ AM; prathamam evaikaṃ G] prathamamekaṃ AM; sādhyaḥ/] sādhyo vā AM, sādhyaḥ/ vā G; śve 126 AM] ha 126 G.

[318] agraikyaṃ MGTP] agraṃkyaṃ A; phalaikyāḍhyaṃ AMGP] phalaikādyaṃ T; ṣaḍviṃśater MGTP] ṣaḍviṃśate A.

[319] yutidarśanāc AM] yutirdarśanāc G.

[320] udāharaṇam G] ∅ AM.

[321] kā 1] ∅ AM, 1 G.

bhāgalabdhasya no kalpyā kriyā vyabhicaret tathā//69//[322]

ato 'nyathā yatitavyam/ atra svasvabhāgahārān nyūne śeṣe yathā bhavato yathā cākhilaṃ syāt tathā śeṣayogaṃ vibhajya kriyā kāryā/ tathā kalpite śeṣe 40/ 60/ rāśiḥ yā 1/ eṣa trayoviṃśatiguṇaḥ ṣaṣṭihṛtaḥ phalaṃ kālakas tadguṇaṃ haraṃ śeṣayutam asya yā 23 samaṃ kṛtvā labdhaṃ yāvattāvanmānam

kā	60	rū	40
	yā	23	

evam anyat

nī	80	rū	60
	yā	23	

anayoḥ samīkaraṇe kuṭṭakena labdhe kālakanīlakamāne

pī	4	rū	3	kā
pī	3	rū	2	nī

ābhyām utthāpane yāvattāvanmānaṃ bhinnaṃ syād iti kuṭṭakenābhinnaṃ jātam lo 240 rū 20/ athavā śeṣe 30/ 70/ ābhyāṃ rāśiḥ lo 240 rū 90//E86p//[323]

udāharaṇam/E87p0/

kaḥ pañcaguṇito rāśis trayodaśavibhājitaḥ/ E87
yal labdhaṃ rāśinā yuktaṃ triṃśaj jātaṃ vadāśu tam//E87//[324]

atra rāśiḥ yā 1/ eṣa pañcaguṇas trayodaśahṛtaḥ phalaṃ kālakaḥ 1/ etat phalaṃ rāśiyutaṃ yā 1 kā 1 triṃśatsamaṃ kriyata ity uktam/ yata iyaṃ kriyā nirādhārā nātra guṇo na ca hara upalabhyate/ tathā coktam/

'nirādhārā kriyā yatrāniyatādhārikāpi vā/ Q10
na tatra yojayet tāṃ tu kathaṃ vā sā pravartate'//Q10//[325]

ato 'trānyathā yatitavyam/ atra kila haratulye rāśau kalpite 13/ rāśiphalayogenānena 18 yadīdaṃ 5 phalaṃ tadā triṃśatā kim iti labdhaṃ phalam $\frac{25}{3}$/ etat triṃśato 'pāsya śeṣaṃ jāto rāśiḥ $\frac{65}{3}$ //E87p//

atrādyodāharaṇam/E88p0/

ṣaḍaṣṭaśatakāḥ krītvā samārghena phalāni ye/ E88

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[322] atraikādhikavarṇasya G] yatraikādhikavarṇasya A(barṇa)M, atrādhikasya varṇasya TP; bhājyasthasyepsitā AMGP] bhājyasyepsitā T.

[323] svasvabhāgahārān nyūne M] svasvabhāgahārāngyūne A, svasvabhāgahārānyūne G; cākhilaṃ AM] ca khilaṃ na G; | kā 60 rū 40 / yā 23 | G] yā = $\frac{\text{kā } 60 \text{ rū } 40}{23}$ AM; | nī 80 rū 60 / yā 23 | G] yā

vikrīya ca punaḥ śeṣam ekaikaṃ pañcabhiḥ paṇaiḥ/
jātāḥ samapaṇās teṣāṃ kaḥ krayo vikrayaś ca kaḥ//E88//[326]

[327]atra krayaḥ yā 1/ vikraya iṣṭaṃ daśādhikaśatam 110/ krayaḥ ṣaḍguṇito vikrayeṇa hṛto labdhiḥ kālakaḥ 1/ labdhiguṇaṃ haraṃ ṣaḍguṇitād rāśer apāsya jātam yā 6 kā $\dot{1}10$/ idaṃ pañcaguṇaṃ labdhiyutaṃ jātāḥ prathamasya paṇāḥ yā 30 kā $\dot{5}49$/ evaṃ dvitīyatṛtīyayor api paṇāḥ sādhyāḥ/ tatra labdhir anupātena/ yadi ṣaṇṇāṃ kālakas tadāṣṭānāṃ śatasya ca kim iti labdhir aṣṭānāṃ kā $\frac{4}{3}$ / śatasya ca kā $\frac{50}{3}$ / labdhiguṇaṃ haraṃ bhājyād apāsya śeṣaṃ pañcaguṇaṃ labdhiyutaṃ jātā dvitīyasya paṇāḥ yā $\frac{120}{3}$ kā $\frac{\dot{2}196}{3}$ / evaṃ tṛtīyasya paṇāḥ yā $\frac{1500}{3}$ kā $\frac{\dot{2}7450}{3}$ / ete sarve samā iti samacchedīkṛtya chedagame prathamadvitīyapakṣayor dvitīya-tṛtīyayoḥ prathamatṛtīyayoś ca samīkaraṇena labdhā yāvattāvadunmitis tulyaiva

$$\left|\begin{matrix} \text{kā} & 549 \\ \text{yā} & 30 \end{matrix}\right|$$

atra kuṭṭakāl labdhaṃ yāvattāvanmānam nī 549 rū 0/ nīlakam ekenotthāpya jātaḥ krayaḥ 549/ samadhanam//E88p1//[328]

idam aniyatādhārakriyāyām ādyair udāhṛtya yathākathaṃcit samīkaraṇaṃ kṛtvānītam/ iyaṃ tathā kalpanā kṛtā yathātrāniyatādhārāyām api niyatādhāra-kriyāvat phalam āgacchati/ evaṃvidhakalpanāc ca kriyāsaṃkocād yatra vyabhi-carati tatra buddhimadbhir buddhyā saṃdheyam/ tathā coktam/[329]

$= \frac{\text{nī } 80 \text{ rū } 60}{23}$ AM; $\left|\begin{matrix} \text{pī} & 4 & \text{rū} & 3 & \text{kā} \\ \text{pī} & 3 & \text{rū} & 2 & \text{nī} \end{matrix}\right|$ G] $\begin{matrix} \text{kā} & = & \text{pī} & 4 & \text{rū} & 3 \\ \text{nī} & = & \text{pī} & 3 & \text{rū} & 2 \end{matrix}$ AM.

[324]jātaṃ AMTP] jātā G.

[325]Source unidentified. yatrāniyatādhārikāpi G] yatra niyatādhārikāpi AM; vā sā G] sā vā AM.

[326]śatakāḥ AMGTP] daśakāḥ, a variant mentioned by Kṛṣṇa, who gives a solution to this version also; samārghena AMGP] samārdhena T; phalāni AMGTP] dalāni, a variant mentioned by Kṛṣṇa.

[327]E88p1–p3 are missing in A.

[328]daśādhikaśatam M] daśādhikaṃ śatam GP(K), daśādhikaṃ ca śataṃ T(K); kālakaḥ 1 MG] kālakaḥ kā 1 T(K)P(K); apāsya jātam MG] apanīya śeṣaṃ T(K)P(K); śatasya ca kim MGP(K)] śatasya kim T(K); śeṣaṃ pañcaguṇaṃ labdhiyutaṃ MG] prāgvaj T(K), tataḥ prāgvaj P(K); yā $\frac{120}{3}$ kā $\frac{\dot{2}196}{3}$ GT(K)] yā $\frac{120}{3}$ kā $\frac{2194}{3}$ M, yā 120 kā $\frac{\dot{2}196}{3}$ P(K); evaṃ tṛtīyasya paṇāḥ T(K)P(K)] evaṃ tṛtīyasya MG; yā $\frac{1500}{3}$ kā $\frac{\dot{2}7450}{3}$ M(with horizontal bars)] yā $\frac{1500}{3}$ kā $\frac{\dot{2}745}{3}$ G, $\frac{1500}{30}$ kā $\frac{\dot{2}7450}{3}$ T(K), yā 1500 kā $\frac{\dot{2}7450}{3}$ P(K); prathamatṛtīyayoś ca samī-karaṇena T(K)P(K)] samīkaraṇena ca MG; $\left|\begin{matrix} \text{kā} & 549 \\ \text{yā} & 30 \end{matrix}\right|$ GT(K)P(K)] yā $= \frac{\text{kā } 549}{30}$ M; kuṭṭakāl labdhaṃ MG] kuṭṭakalabdhaṃ T(K)P(K); nī 549 rū 0 MGT(K)] $\frac{\text{nī } 549 \text{ rū } 0}{22}$ P(K); krayaḥ 549 MGP(K)] krayāḥ 549 T(K).

[329]kriyāsaṃkocād M] kriyā saṃkocād G; tathā coktam G] ∅ M.

‘ālāpo matir amalāvyaktānāṃ kalpanā samīkaraṇam/ Q11
trairāśikam iti bīje sarvatra bhavet kriyāhetuḥ’//Q11//[330]

//E88p2//
iti bhāskarīye bījagaṇite ’nekavarṇasamīkaraṇaṃ samāptam//E88p3//[331]

II.10 Anekavarṇa-madhyamāharaṇa

athānekavarṇamadhyamāharaṇabhedāḥ//70p1//[332]
tatra ślokottarārdhād ārabhya sūtraṃ sārdhavṛttatrayam/70p0/

vargādyaṃ cet tulyaśuddhau kṛtāyāṃ 70
pakṣasyaikasyoktavad vargamūlam//70//[333]
vargaprakṛtyāparapakṣamūlaṃ 71
tayoḥ samīkāravidhiḥ punaś ca/
vargaprakṛtyā viṣayo na cet syāt
tadānyavarṇasya kṛteḥ samaṃ tam//71//[334]
kṛtvāparaṃ pakṣam athānyamānaṃ 72
kṛtiprakṛtyādyamitis tathā ca/
vargaprakṛtyā viṣayo yathā syāt
tathā sudhībhir bahudhā vicintyam//72//[335]
bījaṃ matir vividhavarṇasahāyanī hi 73
mandāvabodhavidhaye vibudhair nijādyaiḥ/
vistāritā gaṇakatāmarasāṃśumadbhir
yā saiva bījagaṇitāhvayatām upetā//73//[336]

yatra pakṣayoḥ samaśodhane kṛte saty avyaktavargādikam avaśeṣaṃ bhavati tatra pūrvavat ‘pakṣau tadeṣṭena nihatya’ (BG 59b) ityādinaikasya pakṣasya mūlaṃ grāhyam/ anyapakṣe yady avyaktavargaḥ sarūpo vartate tadā tasya pakṣasya vargaprakṛtyā mūle sādhye/ tatra varṇavarge yo ’ṅkaḥ sā prakṛtiḥ/ rūpāṇi kṣepaḥ prakalpyaḥ/ evaṃ yat kaniṣṭhapadaṃ tat prakṛtivarṇamānam/ yaj jyeṣṭhaṃ tad asya vargasya mūlam/ atas tat pūrvapakṣamūlena samaṃ kṛtvā pūrvavarṇamānaṃ

[330]Source unidentified.

[331]bhāskarīye] śrībhāskarīye MG; samāptam M] ∅ G.

[332]athānekavarṇamadhyamāharaṇabhedāḥ AMG] atha madhyamāharaṇabhedāḥ T, anekavarṇasamīkaraṇāntargataṃ madhyamāharaṇam P.

[333]The latter half of a Śālinī verse. The former half is verse 68.

[334]samīkāra AMGP] samīkara T.

[335]bahudhā AMGP] bahudā T.

[336]sahāyanī hi AMTP] sahāyanīha G; upetā AMGP] upaiti T.

sādhyam//73p1//[337]

atha yady anyapakṣe 'vyaktavargaḥ sāvyakto 'vyaktam eva sarūpam arūpaṃ vā vartate tadā vargaprakṛter na viṣayaḥ/ kathaṃ tatra mūlam ity ata āha/ 'vargaprakṛtyā' (BG 71c) iti/ tadānyavarṇavargasamaṃ kṛtvā prāgvad ekasya pakṣasya mūlaṃ grāhyam/ tadanyapakṣasya vargaprakṛtyā mūle sādhye/ tatrāpi kaniṣṭhaṃ prakṛtivarṇamānaṃ jyeṣṭhaṃ tatpakṣasya padam iti padānāṃ yathocitaṃ samīkaraṇaṃ kṛtvā varṇamānāni sādhyāni//73p2//[338]

atha yadi dvitīyapakṣe tathābhūte 'pi na viṣayas tadā yathā yathā vargaprakṛtyā viṣayo bhavati tathā tathā buddhimadbhir buddhyā vidhāyāvyaktamānāni jñātavyāni/ yadi buddhyaiva jñātavyāni tarhi bījena kim ity āśaṅkyāha/ 'bījaṃ matir' (BG 73a) iti/ hi yasmāt kāraṇāt/ buddhir eva pāramārthikaṃ bījam/ varṇās tu tatsahāyāḥ/ gaṇakakamalatigmaraśmibhir ādyair ācāryair mandāvabodhārtham ātmīyā yā matir vividhavarṇān sahāyān kṛtvā vistāraṃ nītā saiveha saṃprati bījagaṇitasaṃjñāṃ gatā/ idaṃ kila siddhānte mūlasūtraṃ saṃkṣiptam uktaṃ bālāvabodhārthaṃ kiṃcid vistāryocyate//73p3//[339]

sūtraṃ vṛttadvayam/74p0/[340]

ekasya pakṣasya pade gṛhīte
dvitīyapakṣe yadi rūpayuktaḥ/ 74
avyaktavargo 'tra kṛtiprakṛtyā
sādhye tadā jyeṣṭhakaniṣṭhamūle//74//[341]
jyeṣṭhaṃ tayoḥ prathamapakṣapadena tulyaṃ 75
kṛtvoktavat prathamavarṇamitiḥ prasādhyā/
hrasvaṃ bhavet prakṛtivarṇamitiḥ sudhībhir
evaṃ kṛtiprakṛtir atra niyojanīyā//75//[342]

asyārtho vyākhyāta eva//75p//[343]

udāharaṇam/E89p0/

ko rāśir dviguṇo rāśivargaiḥ ṣaḍbhiḥ samanvitaḥ/ E89

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[337]samaśodhane G] śodhane AM; tad asya G] tasya AM.

[338]anyapakṣe 'vyaktavargaḥ] anyapakṣe vyaktavargaḥ AMG; varṇamānāni MG] varṇamanāni A.

[339]tathābhūte 'pi] tathābhūto 'pi AM, tathābhūtamapi G; saiveha AM] saiva G; siddhānte MG] siddhante A; vistāryocyate G] vistīryocyate AM. G includes the last sentence (idaṃ ... vistāryocyate) in 74p0. 'mūlasūtra' seems to refer to GA praśna 5 cited in E43p2 above (Q2).

[340]vṛttadvayam AM] ∅ G.

[341]tadā TP] tathā AMG.

[342]mitiḥ prasādhyā TP] mitistu sādhyā AMG.

[343]asyārtho vyākhyāta eva G] ∅ AM.

mūlado jāyate bījagaṇitajña vadāśu tam//E89//[344]

atra yāvattāvadrāśir dviguṇo vargaiḥ ṣaḍbhiḥ samanvitaḥ yāva 6 yā 2/ eṣa varga iti kālakavargeṇa samīkaraṇārthaṃ nyāsaḥ/

yāva	6	yā	2	kāva	0
yāva	0	yā	0	kāva	1

atra samaśodhane jātau pakṣau

yāva	6	yā	2
kāva	1		

athaitau ṣaḍbhiḥ saṃguṇya rūpaṃ prakṣipya prāgvat prathamapakṣamūlam yā 6 rū 1/ atha dvitīyapakṣasyāsya kāva 6 rū 1 vargaprakṛtyā mūle ka 2 jye 5 vā ka 20 jye 49/ jyeṣṭhaṃ prathamapakṣapadenānena yā 6 rū 1 samaṃ kṛtvā labdhaṃ yāvattāvanmānam $\frac{2}{3}$ vā 8/ hrasvaṃ prakṛtivarṇasya kālakasya mānam 2 vā 20/ evaṃ kaniṣṭhajyeṣṭhavaśād bahudhā//E89p//[345]

ādyodāharaṇam/E90p0/

rāśiyogakṛtir miśrā rāśyor yogaghanena cet/ E90
dvighnasya ghanayogasya sā tulyā gaṇakocyatām//E90//[346]

atra kriyā yathā na vistāram eti tathā buddhimatā rāśī kalpyau/ tathā kalpitau yā 1 kā $\dot{1}$/ yā 1 kā 1/ anayor yogaḥ yā 2/ asya kṛtir asyaiva ghanena miśrā yāgha 8 yāva 4/ atha rāśyoḥ pṛthag ghanau/ prathamasya yāgha 1 yāvakābhā $\dot{3}$ kāvayābhā 3 kāgha $\dot{1}$/ dvitīyasya yāgha 1 yāvakābhā 3 kāvayābhā 3 kāgha 1/ anayor yogaḥ yāgha 2 kāvayābhā 6/ dvighnaḥ yāgha 4 kāvayābhā 12/ samaśodhanārthaṃ nyāsaḥ/

yāgha	8	yāva	4	kāvayābhā	0
yāgha	4	yāva	0	kāvayābhā	12

samaśodhane kṛte pakṣau yāvattāvatāpavartya rūpaṃ prakṣipya prathamapakṣamūlam yā 2 rū 1/ parapakṣasyāsya kāva 12 rū 1 vargaprakṛtyā mūle ka 2 jye 7 vā ka 28 jye 97/ kaniṣṭhaṃ kālakamānam/ jyeṣṭham asya yā 2 rū 1 samaṃ kṛtvā labdhaṃ yāvattāvanmānam 3 vā 48/ svasvamānenotthāpane kṛte jātau rāśī 1/ 5/ vā 20/ 76/ ityādi//E90p//[347]

athānyat sūtraṃ sārdhavṛttam/76p0/

dvitīyapakṣaṃ sati saṃbhave tu 76

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[344] jāyate AGTP] jāyaye M.

[345] iti G] iti iti AM; yāva 6 yā 2 / kāva 1 G] yāva 6 yā 2, kāva 1/ AM.

[346] ghanena AMGT(cor)] dhanena TP; cet AMG] ca TP.

[347] atra MG] atha A; yā 1 kā $\dot{1}$/ yā 1 kā 1/ G] (yā 1 kā $\dot{1}$), (yā 1 kā 1)/ AM; yāvakābhā (twice) G] yāva.kābhā AM; kāvayābhā (five times) G] kāva.yābhā AM; kāvayābhā (twice in the table) AM] yāvakābhā G; jye 97 AM] 97 G; 1/ 5/ AM] 5/ 1 G.

kṛtyāpavartyātra pade prasādhye/
jyeṣṭhaṃ kaniṣṭhena tadā nihanyāc
ced vargavargeṇa kṛto 'pavartaḥ//76//[348]
kaniṣṭhavargeṇa tadā nihanyāj 77ab
jyeṣṭhaṃ tataḥ pūrvavad eva śeṣam/77ab/

spaṣṭārtham//77abp//
udāharaṇam/E91p0/

yasya vargakṛtiḥ pañcaguṇā vargaśatonitā/ E91
mūladā jāyate rāśiṃ gaṇitajña vadāśu tam//E91//

atra rāśiḥ yā 1/ asya 'vargakṛtiḥ pañcaguṇā' vargaśatenonā yāvava 5 yāva $\dot{1}\dot{0}\dot{0}$/ ayaṃ varga iti kālakavargasamaṃ kṛtvā gṛhītaṃ kālakavargasya mūlam kā 1/ dvitīyapakṣasyāsya yāvava 5 yāva $\dot{1}\dot{0}\dot{0}$ yāvattāvadvargeṇāpavartya vargaprakṛtyā mūle ka 10 jye 20/ vā ka 170 jye 380/ kṛtyāpavarte kṛte 'jyeṣṭhaṃ kaniṣṭhena tadā nihanyāt' (BG 76c) iti jātam jye 200/ vā jye 64600/ idaṃ kālakamānam/ kaniṣṭhaṃ prakṛtivarṇamānaṃ sa eva rāśiḥ 10 vā 170//E91p//[349]
udāharaṇam/E92p0/

kayoḥ syād antare vargo vargayogo yayor ghanaḥ/ E92
tau rāśī kathayābhinnau bahudhā bījavittama//E92//

atra rāśī yā 1 kā 1/ anayor antaraṃ yā $\dot{1}$ kā 1 nīlakavargasamaṃ kṛtvā labdhaṃ yāvattāvanmānam kā 1 nīva $\dot{1}$/ anena yāvattāvad utthāpya jātau rāśī kā 1 nīva $\dot{1}$/ kā 1/ anayor vargayogaḥ kāva 2 nīvakābhā $\dot{2}$ nīvava 1/ eṣa ghana iti nīlakavargaghanasamaṃ kṛtvā śodhane kṛte jātaṃ prathamapakṣe nīvagha 1 nīvava $\dot{1}$/ dvitīyapakṣe kāva 2 nīvakābhā $\dot{2}$/ pakṣau dvābhyāṃ saṃguṇya nīlakavargavargaṃ prakṣipya dvitīyapakṣasya mūlam kā 2 nīva $\dot{1}$/ prathamapakṣaṃ nīvagha 2 nīvava $\dot{1}$ nīlakavargavargeṇāpavartya jātam nīva 2 rū $\dot{1}$/ atra vargaprakṛtyā mūle ka 5 jye 7/ vā ka 29 jye 41/ 'ced vargavargeṇa kṛto 'pavartaḥ kaniṣṭhavargeṇa tadā nihanyāj jyeṣṭham' (BG 76d–77b) iti jātaṃ jye 175 vā jye 34481/ kaniṣṭhaṃ nīlakamānam/ tenotthāpitaṃ prāṅmūlaṃ jātam kā 2 rū $\dot{2}\dot{5}$ vā kā 2 rū $8\dot{4}1$/ idaṃ jyeṣṭhamūlasamaṃ kṛtvā labdhaṃ kālakamānam 100 vā 17661/ svasvamānenotthāpya jātau

[348] dvitīyapakṣaṃ G] dvitīyapakṣe AMG(Ms)TP(Kṛṣṇa recommends the former); tadā AMGT] tathā P.

[349] śatenonā AM] śatonā G; yāvava 5 (1st) AM] yāvava 1 G.

rāśī 75/ 100/ vā 16820/ 17661 ityādi//E92p//[350]

anyat sūtraṃ sārdhavṛttam/77cdp0/

sāvyaktarūpo yadi varṇavargas 77cd
tadānyavarṇasya kṛteḥ samaṃ tam//77cd//[351]
kṛtvā padaṃ tasya tadanyapakṣe 78
vargaprakṛtyoktavad eva mūle/
kaniṣṭham ādyena padena tulyaṃ
jyeṣṭhaṃ dvitīyena samaṃ vidadhyāt//78//

atra prathamapakṣamūle gṛhīte saty anyapakṣe sāvyaktāvyaktakṛtiḥ sarūpārūpā vā bhavati tatrādyapakṣasyānyavarṇavargasamīkaraṇaṃ kṛtvā mūlaṃ grāhyam/ tadanyapakṣasya vargaprakṛtyā mūle/ tayoḥ kaniṣṭham ādyasya padena jyeṣṭhaṃ dvitīyapakṣapadena ca samaṃ kṛtvā varṇamāne sādhye //78p//[352]

udāharaṇam/E93p0/

trikādidvyuttaraśreḍhyāṃ gacche kvāpi ca yat phalam/ E93
tad eva triguṇaṃ kasminn anyagacche bhaved vada//E93//[353]

atra śreḍhyor nyāsaḥ/ ādiḥ 3/ cayaḥ 2/ gacchaḥ yā 1/ ādiḥ 3/ cayaḥ 2/ gacchaḥ kā 1/ anayoḥ phale yāva 1 yā 2/ kāva 1 kā 2/ anayor ādyaṃ triguṇaṃ parasamaṃ kṛtvā śodhanārthaṃ nyāsaḥ/

yāva	3	yā	6
kāva	1	kā	2

śodhane kṛte pakṣau triguṇīkṛtya nava prakṣipya prathamapakṣasya mūlam yā 3 rū 3/ dvitīyapakṣasyāsya kāva 3 kā 6 rū 9 nīlakavargeṇa sāmyaṃ kṛtvā tathaiva pakṣau triguṇīkṛtyarṇam aṣṭādaśa prakṣipya mūlam kā 3 rū 3/ tadanyapakṣasyāsya nīva 3 rū $\dot{1}\dot{8}$ vargaprakṛtyā mūle ka 9/ jye 15/ vā ka 33/ jye 57/ kaniṣṭham ādyenānena yā 3 rū 3 samaṃ kṛtvā labdhe yāvattāvatkālakamāne 2/ 4/ vā 10/ 18/ evaṃ sarvatra//E93p//[354]

athānyat sūtraṃ vṛttadvayam/79p0/

sarūpake varṇakṛtī tu yatra 79

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[350]atra (1st) G] atha AM; nīvakābhā (twice) G] nīva.kābhā AM; pakṣau G] pakṣāṃ AM; jātam nīva AM] nīva G; jye 175 G] jeṣṭham 175 AM.

[351]sāvyaktarūpo AMTP] sāvyaktavargo G; tadānyavarṇasya AMGP] tadānyavargasya T.

[352]sarūpārūpā vā AM] sarūpā vā G; kṛtvā mūlaṃ grāhyam/ tadanyapakṣasya vargaprakṛtyā mūle G] kṛtvā mūle AM.

[353]trikādidvyuttara MGTP] trikādyuttara A.

[354]anayor ādyaṃ MG] ranayorādyaṃ A; yā 3 rū 3 (1st) AM] yā 3 rū 2 G; rū $\dot{1}\dot{8}$ G] rū $\ddot{1}\ddot{8}$ AM.

tatrecchayaikāṃ prakṛtiṃ prakalpya/
śeṣaṃ tataḥ kṣepakam uktavac ca
mūle vidadhyād asakṛt samatve//79//
sabhāvite varṇakṛtī tu yatra
tanmūlam ādāya ca śeṣakasya/ 80
iṣṭoddhṛtasyeṣṭavivarjitasya
dalena tulyaṃ hi tad eva kāryam//80//[355]

yatra prathamapakṣamūle gṛhīte dvitīyapakṣe varṇayoḥ kṛtī sarūpe arūpe vā bhavatas tatraikāṃ varṇakṛtiṃ prakṛtiṃ prakalpya śeṣaṃ kṣepaḥ/ tata 'iṣṭaṃ hrasvaṃ tasya vargaḥ prakṛtyā kṣuṇṇaḥ' (BG 40ab) ityādikaraṇena kṣepajātīyaṃ varṇam ekādihataṃ hṛtaṃ vā svabuddhyā kaniṣṭhapadaṃ prakalpya jyeṣṭhaṃ sādhyam/ atha vargagatā cet prakṛtis tadā 'iṣṭabhakto dvidhā kṣepaḥ' (BG 54a) ityādinā mūle sādhye//80p1//[356]

yatra bhāvitaṃ ca vartate tatra 'sabhāvite varṇakṛtī tu' (BG 80a) ityādinā tadantarvartino yāvato mūlam asti tāvato mūlaṃ grāhyam/ śeṣasyeṣṭoddhṛtasyeṣṭavivarjitasya dalena samaṃ tad eva mūlaṃ kāryam//80p2//[357]

yatra tu dvitryādayo varṇavargādyā bhavanti tatra dvāv iṣṭau varṇau muktvānyeṣām iṣṭāni mānāni kṛtvā mūle sādhye//80p3//

evaṃ tadaiva yadāsakṛt samīkaraṇam/ yadā tu sakṛd eva samīkaraṇaṃ tadaikaṃ varṇaṃ muktvānyeṣām iṣṭāni mānāni kṛtvā prāgvan mūle//80p4//[358]

udāharaṇam/E94p0/

tau rāśī vada yatkṛtyoḥ saptāṣṭaguṇayor yutiḥ/ E94
mūladā syād viyogas tu mūlado rūpasaṃyutaḥ//E94//[359]

atra rāśī yā 1/ kā 1/ anayor vargayoḥ saptāṣṭaguṇayor yutiḥ yāva 7 kāva 8/ ayaṃ varga iti nīlakavargeṇa samīkaraṇārthaṃ nyāsaḥ/

yāva	7	kāva	8	nīva	0
yāva	0	kāva	0	nīva	1

samaśodhane kṛte

yāva	7	kāva	0	nīva	0
yāva	0	kāva	8	nīva	1

[355]Kṛṣṇa in TP places BG 80 between E95 and E96. ca AMG] tu TP; iṣṭoddhṛtasyeṣṭa AMTP] iṣṭoddhatasyeṣṭa G.

[356]kṣepaḥ (1st) G] kṣepam AM; ekādihataṃ hṛtaṃ vā] ekādihṛtaṃ yutaṃ vā AM, ekādihataṃ yutaṃ vā G; prakṛtis tadā] prakṛtir iti tadā AM, prakṛtiḥ G.

[357]ca AM] ∅ G; tu AM] ∅ G; śeṣasyeṣṭoddhṛta AM] śeṣasyeṣṭoddhata G.

[358]tadaikaṃ MG] tadakaṃ A.

[359]saptāṣṭa MGTP] saptaṣṭa A.

kālakavargāṣṭakaṃ prakṣipya

yāva	7	kāva	8	nīva	0
yāva	0	kāva	0	nīva	1

gṛhītaṃ nīlakapakṣasya mūlam nī 1/ parapakṣasyāsya yāva 7 kāva 8 vargaprakṛtyā mūle/ tatra yāvattāvadvarge yo 'ṅkaḥ sā prakṛtiḥ 7/ śeṣaṃ kṣepaḥ kāva 8/ 'iṣṭaṃ hrasvam' (BG 40a) ityādinā kālakadvayam iṣṭaṃ prakalpya jāte mūle kaniṣṭham kā 2/ jyeṣṭham kā 6/ jyeṣṭhaṃ nīlakamānaṃ kaniṣṭhaṃ yāvattāvanmānam/ tena yāvattāvad utthāpya jātau rāśī kā 2/ kā 1/ punar etadvargayoḥ saptāṣṭaguṇayor antaraṃ saikaṃ jātam kāva 20 rū 1/ etad varga iti prāgval labdhaṃ kaniṣṭhamūlam 2 vā 36/ etatkālakamānenotthāpitau jātau rāśī 4/ 2/ vā 72/ 36//E94p//[360]

udāharaṇam/E95p0/

ghanavargayutir vargo yayo rāśyoḥ prajāyate/ E95
samāso 'pi yayor vargas tau rāśī śīghram ānaya//E95//[361]

atra rāśī yā 1/ kā 1/ anayor vargaghanayor yogaḥ yāva 1 kāgha 1/ ayaṃ varga iti nīlakavargasamaṃ kṛtvā pakṣayoḥ kālakaghanaṃ prakṣipya nīlakapakṣasya mūlam nī 1/ parapakṣasyāsya yāva 1 kāgha 1 vargaprakṛtyā mūle/ tatra yāvattāvadvarge yo 'ṅkaḥ sā prakṛtiḥ śeṣaṃ kṣepaḥ prakalpyaḥ/ prakṛtiḥ 1/ kṣepaḥ kāgha 1/ 'iṣṭabhakto dvidhā kṣepaḥ' (BG 54a) ityādinā kālakeneṣṭena jāte mūle ka $\overset{\text{kāva } \frac{1}{2} \text{ kā } \dot{1}}{}$ jye $\overset{\text{kāva } \frac{1}{2} \text{ kā } 1}{}$ / kaniṣṭhaṃ yāvattāvanmānaṃ tenotthāpya jātau rāśī $\overset{\text{kāva } \frac{1}{2} \text{ kā } \dot{1}}{}$ / kā 1/ anayoḥ samāsaḥ $\overset{\text{kāva } \frac{1}{2} \text{ kā } 1}{}$ / ayaṃ varga iti pītakavargeṇa samīkaraṇaṃ kṛtvā pakṣaśeṣaṃ caturbhiḥ saṃguṇya rūpaṃ prakṣipya prathamapakṣamūlam kā 2 rū 1/ parapakṣasyāsya pīva 8 rū 1 vargaprakṛtyā mūle ka 6/ jye 17/ vā ka 35/ jye 99/ jyeṣṭhaṃ pūrvamūlenānena kā 2 rū 1 samaṃ kṛtvā labdhaṃ kālakamānam 8 vā 49/ anenotthāpya jātau rāśī 28/ 8/ vā 1176/ 49//E95p1//[362]

athavā rāśī yāva 2/ yāva 7/ anayor yogaḥ yāva 9/ ayaṃ varga eva/ athānayor ghanavargayogaḥ yāvagha 8 yāvava 49/ eṣa varga iti kālakavargeṇa samīkṛtya prāgvad yāvattāvadvargavargeṇāpavartya labdhaṃ yāvattāvanmānam 2/ 3/ vā 7/

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[360] | yāva | 7 | kāva | $\dot{0}$ | nīva | 0 | / | yāva | 0 | kāva | $\dot{8}$ | nīva | 1 |] ∅ AMG; yāva 7 kāva 8 nīva 0 / yāva 0 kāva 0 nīva 1 (2nd)] ∅ AMG; nī 1 AG] nā M; kāva 8 (1st) AM] kāva $\dot{8}$ G; prakṛtiḥ 7 G] prakṛtiḥ AM; kaniṣṭham kā 2 AM] ka kā 2 G; jyeṣṭham kā 6 AM] jye kā 6 G; etadvargayoḥ AM] etayorvargayoḥ G; kālakamānenotthāpitau G] kālamānenotthāpitau AM.

[361] yayo rāśyoḥ AMGP] yayoḥ rāśyoḥ T; samāso AMGP] samāse T.

[362] prakṛtiḥ 1] prakṛtiḥ yāva 1 AMG; saṃguṇya AG] saṃgaṇya M. Here and hereafter, the step of samaśodhana is often to be understood in the procedure of samīkaraṇa; the existence of that step can be inferred from the phrase, 'pakṣayoḥ kālakaghanaṃ prakṣipya.' Cf. E94p.

anenotthāpitau rāśī 8/ 28/ vā 18/ 63/ vā 98/ 343//E95p2//[363]

'sabhāvite varṇakṛtī tu yatra' (BG 80a) ityetadviṣayībhūtam udāharaṇam/ E96p0/[364]

yayor vargayutir ghātayutā mūlapradā bhavet/ E96
tanmūlaguṇito yogaḥ sarūpaś cāśu tau vada//E96//[365]

atra rāśī yā 1/ kā 1/ anayor 'vargayutir ghātayutā' yāva 1 yākābhā 1 kāva 1/ asyā mūlaṃ nāstīti nīlakavargeṇa samām etāṃ kṛtvā pakṣayoḥ kālakavargaṃ prakṣipya pakṣau ṣaṭtriṃśatā saṃguṇya labdhaṃ nīlakapakṣamūlam nī 6/ parapakṣasyāsya yāva 36 yākābhā 36 kāva 36 yāvato mūlam asti tāvataḥ 'sabhāvite varṇakṛtī tu' (BG 80a) ityādinā mūlaṃ gṛhītam yā 6 kā 3/ śeṣasyāsya kāva 27 iṣṭena kālakena 1 hṛtasyeṣṭakālakavarjitasya ca dalena kā 13 tanmūlasamaṃ kṛtvā labdhaṃ yāvattāvanmānam kā $\overset{5}{3}$ / anena yāvattāvad utthāpya jātau rāśī kā $\overset{5}{3}$ / kā 1/ anayor vargayuteḥ kāva $\overset{34}{9}$ ghātayutāyāḥ $\overset{49}{9}$ mūlam kā $\overset{7}{3}$ / anena rāśiyogo kā $\overset{8}{3}$ guṇitaḥ kāva $\overset{56}{9}$ sarūpo jātaḥ $\overset{\text{kāva } 56 \text{ rū } 9}{9}$ / amuṃ pītakavargasamaṃ kṛtvā samacchedīkṛtya pakṣayor nava rūpāṇi prakṣipya labdhaṃ kaniṣṭhamūlam 6 vā 180/ etat kālakamānam ity anenotthāpitau jātau rāśī 10/ 6/ vā 300/ 180/ evam anekadhā//E96p//[366]

atha kasyāpy udāharaṇam/E97p0/

yat syāt sālpavadhārdhato ghanapadaṃ yad vargayogāt padaṃ E97
yad yogāntarayor dvikābhyadhikayor vargāntarāt sāṣṭakāt/
yac caitatpadapañcakaṃ ca militaṃ syād vargamūlapradaṃ
tau rāśī kathayāśu niścalamate ṣaṭkāṣṭakābhyāṃ vinā//E97//[367]

sālpavadhasyārdhād ghanapadaṃ grāhyam/ atrālāpānāṃ bahutve 'sakṛtkriyā

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[363]ayaṃ varga eva AM] svayaṃ varga eva G; ghanavargayogaḥ AM] ghanavargayoryogaḥ G; yāvattāvadvargavargeṇāpavartya] yāvattāvadvargeṇāpavarttya AMG; 2/ 3/ vā 7/ AM] 2/ vā 7 G; 8/ 28/ vā 18/ 63/ vā 98/ 343] 8/ 28/ 18/ 63/ vā 98/ 343 AM, 28/ 8/ vā 98/ 343/ vā 18/ 63/ vā 128/ 448 G.

[364]yatra ityetad AM] yatra etad G.

[365]vargayutir AMGP] vargayuti T.

[366]nīlakavargeṇa samām etāṃ kṛtvā AM] nīlakavargasamaṃ kṛtvā G; pakṣayoḥ (1st) AM] ∅ G; yākābhā AM] yā.kābhā G; tu AM] ∅ G; yā 6 kā 3 AM] yā 6 kā 6 G; tanmūlasamaṃ G] tanmūlaṃ samaṃ AM; $\overset{34}{9}$ G] $\frac{34}{3}$ AM; kā $\overset{7}{3}$ AM] ka $\overset{7}{3}$ G; $\overset{\text{kāva } 56 \text{ rū } 9}{9}$] $\frac{\text{kā } 56 \text{ rū } 9}{9}$ AM, kāva $\frac{56}{9}$ rū 9 G; jātau (2nd) MG] ∅ A.

[367]sālpa AMTP] sālya G; yad yogāntarayor AMG] ye yogāntarayor TP; yac caitat AMTP] taccaitat G; pañcakaṃ ca TP] pañcakaṃ tu AMG.

kāryā/ sā na nirvahati/ ato buddhimatā tathā rāśī kalpyau yathaikenaiva varṇena sarve 'py ālāpā ghaṭante//E97p1//[368]

tathā kalpitau rāśī yāva 1 rū $\dot{1}$/ yā 2/ anayoḥ sālpavadhārdhato ghanapadaṃ yā 1/ vargayogāt padam yāva 1 rū 1/ dvyadhikayogapadam yā 1 rū 1/ dvyadhikāntarapadam yā 1 rū $\dot{1}$/ sāṣṭavargāntarapadam yāva 1 rū $\dot{3}$/ eṣāṃ yogaḥ yāva 2 yā 3 rū $\dot{2}$/ ayaṃ varga iti kālakavargasamaṃ kṛtvā pakṣāv aṣṭabhiḥ saṃguṇya pañcaviṃśatirūpāṇi prakṣipya prathamapakṣasya mūlam yā 4 rū 3/ parapakṣasyāsya kāva 8 rū 25 vargaprakṛtyā mūle ka 5 jye 15/ vā ka 30 jye 85/ vā ka 175 jye 495/ jyeṣṭhaṃ pūrvapadena samaṃ kṛtvā labdhaṃ yāvattāvanmānam 3 vā $\frac{41}{2}$ vā 123/ anenotthāpitau rāśī 8/ 6/ vā $\frac{1677}{4}$ / 41/ vā 15128/ 246/ evam anekadhā//E97p2//[369]

athavā yāvattāvadvargo yāvattāvaddvayena yuta eko rāśiḥ yāva 1 yā 2/ yāvattāvaddvayaṃ rūpadvayayutam anyarāśhiḥ yā 2 rū 2/ athavā yāvattāvadvargo yāvattāvaddvayona eko rāśiḥ yāva 1 yā $\dot{2}$/ yāvattāvaddvayaṃ rūpadvayonam anyarāśiḥ yā 2 rū $\dot{2}$/ athavā yāvattāvadvargo yāvattāvaccatuṣṭayaṃ rūpatrayayutaṃ caiko rāśiḥ yāva 1 yā 4 rū 3/ yāvattāvaddvayaṃ rūpacatuṣṭayaṃ cānyaḥ yā 2 rū 4//E97p3//[370]

evaṃ sahasradhā gūḍhā mūḍhānāṃ kalpanā yataḥ/ 81
kṛpayā kalpanopāyas tadartham atra kathyate//81//[371]

atha sūtraṃ vṛttadvayam/82p0/[372]

sarūpam avyaktam arūpakaṃ vā 82
viyogamūlaṃ prathamaṃ prakalpyam/
yogāntarakṣepakabhajitād yad
vargāntarakṣepakataḥ padaṃ syāt//82//[373]
tenādhikaṃ tat tu viyogamūlaṃ 83
syād yogamūlaṃ tu tayos tu vargau/

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[368]sālpa AM] sālya G.

[369]sālpa AM] sālya G; vargāntarapadam MG] vargāgtarapadam A; aṣṭabhiḥ AM] aṣṭābhiḥ G; 8/ 6 AM] 6/ 8 G.

[370]yāva 1 yā 2/ yāvattāvaddvayaṃ rūpadvayayutam anyarāśhiḥ yā 2 rū 2 A] yāva 1 yā $\dot{2}$/ yāvattāvaddvayaṃ rūpadvayayutamanyarāśhiḥ yā 2 rū 2 M, yāvattāvaddvayaṃ (ṛṇa)rūpadvayayutamanyarāśhiḥ yāva 1 yā 2/ yā 2 rū 2 G; athavā yāvattāvadvargo yāvattāvaddvayona ... yā 2 rū $\dot{2}$/ AM] ∅ G; yāvattāvaccatuṣṭayaṃ MG] yāvattavaccatuṣṭayaṃ A; yāva 1 yā 4 rū 3/ yāvattāvaddvayaṃ ... yā 2 rū 4 AM] yāvattāvaddvayaṃ rūpacatuṣṭayaṃ cānyaḥ yāva 1 yā 4 rū 3/ yā 2 rū 4 G.

[371]kṛpayā AM] kriyayā GTP; tadartham atra T] tadarthamatha GP, teṣāmeva ca AM.

[372]atha sūtraṃ vṛttadvayam AM] sūtram G.

[373]prakalpyam TP] prakalpya AMG.

svakṣepakonau hi viyogayogau
syātāṃ tataḥ saṃkramaṇena rāśī//83//

udāharaṇam/E98p0/

rāśyor yogaviyogakau trisahitau vargau bhavetāṃ tayor E98
vargaikyaṃ caturūnitaṃ raviyutaṃ vargāntaraṃ syāt kṛtiḥ/
sālpaṃ ghātadalaṃ ghanaḥ padayutis teṣāṃ dviyuktā kṛtis
tau rāśī vada komalāmalamate ṣaṭ sapta hitvā parau//E98//[374]

atra rūponam avyaktaṃ viyogamūlaṃ prakalpya yā 1 rū $\dot{1}$/ atrāpy anayaiva yuktyā kalpitau rāśī yāva 1 rū $\dot{2}$/ yā 2/ vā kalpitau rāśī yāva 1 yā 2 rū $\dot{1}$/ yā 2 rū 2/ rāśyor yogas trisahitaḥ yāva 1 yā 2 rū 1/ rāśyor antaraṃ trisahitam yāva 1 yā $\dot{2}$ rū 1/ prathamarāśivargaḥ yāvava 1 yāva $\dot{4}$ rū 4/ dvitīyarāśivargaḥ yāva 4/ anayor aikyaṃ caturūnaṃ yāvava 1/ tayor evāntaraṃ raviyutam yāvava 1 yāva $\dot{8}$ rū 16/ rāśighātaḥ yāgha 2 yā $\dot{4}$/ dalam yāgha 1 yā $\dot{2}$/ sālpam yāgha 1/ ebhyo mūlāni/ tatra triyutayogamūlam yā 1 rū 1/ triyutaviyogamūlam yā 1 rū $\dot{1}$/ caturūnitavargaikyamūlam yāva 1/ raviyutavargāntaramūlam yāva 1 rū $\dot{4}$/ tathā ghanamūlam yā 1/ padapañcakayogo dviyuto jātaḥ yāva 2 yā 3 rū $\dot{2}$/ eṣa varga iti kālakavargeṇa samīkaraṇāya nyāsaḥ

yāva	2	yā	3	kāva	0	rū	$\dot{2}$
yāva	0	yā	0	kāva	1	rū	0

samīkaraṇāt pakṣaśeṣau

yāva	2	yā	3
kāva	1	rū	2

atraitāv aṣṭabhiḥ saṃguṇya nava rūpāṇi prakṣipyādyapakṣasya mūlam yā 4 rū 3/ parapakṣasyāsya kāva 8 rū 25 vargaprakṛtyā mūle ka 5 jye 15/ vā ka 175 jye 495/ jyeṣṭhaṃ prathamapakṣamūlasamaṃ kṛtvāptaṃ yāvattāvanmānam 3/ vā 123/ vargeṇādyaṃ kevalenāntyam utthāpya jātau rāśī 7/ 6/ vā 15127/ 246//E98p1//[375]

athavā kalpitadvitīyarāśyor yogas triyutaḥ yāva 1 yā 4 rū 4/ viyogas triyutaḥ yāva 1/ atrādyavargaḥ yāvava 1 yāgha 4 yāva 2 yā $\dot{4}$ rū 1/ dvitīyarāśivargaḥ yāva 4 yā 8 rū 4/ anayor aikyaṃ caturūnam yāvava 1 yāgha 4 yāva 6 yā 4 rū 1/ vargāntaraṃ raviyutam yāvava 1 yāgha 4 yāva $\dot{2}$ yā $\dot{1}\dot{2}$ rū 9/ rāśighātaḥ yāgha 2 yāva 6 yā 2 rū $\dot{2}$/

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[374]yoga AMGP] yauga T; sālpaṃ AMTP] sālyaṃ G; hitvā parau GTP] hitvāparau AM.

[375]anayaiva G] ananayaiva AM; kalpitau (1st) MG] kaspitau A; sālpam AM] sālyam G; triyutaviyogamūlam yā 1 rū $\dot{1}$/ caturūnitavargaikyamūlam yāva 1/ AM] ∅ G; samīkaraṇāya AG] samākaraṇāya M; | yāva 2 yā 3 | kāva 1 rū 2 | G] yāva 2 yā 3, kāva 1 rū 2 AM; kāva 8 rū 25 vargaprakṛtyā AM] kāva 4 rū 25 vargakṛtyā G.

dalam yāgha 1 yāva 3 yā 1 rū $\dot{1}$/ sālpam yāgha 1 yāva 3 yā 3 rū 1/ ebhyo mūlāni/ tatra triyutayogamūlam yā 1 rū 2/ triyutaviyogamūlam yā 1/ caturūnitavargaikyamūlam yāva 1 yā 2 rū 1/ raviyutavargāntaramūlam yāva 1 yā 2 rū $\dot{3}$/ ghanamūlam yā 1 rū 1/ padapañcakayogo dviyuktaḥ yāva 2 yā 7 rū 3/ eṣa varga iti kālakavargeṇa samīkaraṇāya nyāsaḥ

yāva	2	yā	7	kāva	0	rū	3
yāva	0	yā	0	kāva	1	rū	0

samaśodhanāt pakṣaśeṣau

yāva	2	yā	7
kāva	1	rū	$\dot{3}$

atra pakṣāv aṣṭabhiḥ saṃguṇyaikonapañcāśad rūpāṇi prakṣipyādyapakṣamūlam yā 4 rū 7/ parapakṣasyāsya kāva 8 rū 25 vargaprakṛtyā mūle ka 5 jye 15/ vā ka 175 jye 495/ jyeṣṭhaṃ prathamapakṣapadena samaṃ vidhāya labdhaṃ yāvattāvanmānam 2/ vā 122/ atra vargeṇāvyaktavargarāśiṃ kevalenāvyaktam utthāpya jātau rāśī 7/ 6/ vā 15127/ 246//E98p2//[376]

tad yathā/ yā 2/ asya vargaḥ 4/ anena yāva 1 guṇitaḥ 4/ kevalena 2 yā 2 guṇitaḥ 4/ ubhayor vyaktatvād yogaḥ 8/ ṛṇage rūpe $\dot{1}$ viyojite jāta ekaḥ 7/ tathā yā 2 kevalena yā 2 guṇitaḥ 4/ rūpa 2 yuto jātaḥ paraḥ 6/ evaṃ dvitīyaḥ yā 122/ vargaḥ 14884/ anena yāva 1 guṇitaḥ 14884/ kevalena yā 122 yā 2 guṇitaḥ 244/ ubhayor vyaktayor yogād ṛṇaṃ rūpaṃ viśodhya jāta ekaḥ 15127/ tathā yā 2 kevalena 122 guṇito vyaktarūpa 2 yuto 'paraḥ 246/ evaṃ bahudhā//E98p3//[377]

ādyodāharaṇam/E99p0/

rāśyor yayoḥ kṛtiyutiviyutī caikena saṃyute vargau/ E99
rahite vā tau rāśī gaṇayitvā kathaya yadi vetsi//E99//[378]

atra prathamodāharaṇe kalpitau rāśivargau yāva 4/ yāva 5 rū $\dot{1}$/ anayor yogaviyogau rūpayutau mūladau bhavataḥ/ kathitaprathamavargasya mūlam eko rāśiḥ yā 2/ dvitīyasyāsya yāva 5 rū $\dot{1}$ vargaprakṛtyā mūle ka 1 jye 2/ vā ka 17 jye 38/

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[376]dvitīyarāśivargaḥ MG] dvitīyārāśivargaḥ A; yāva 4 yā 8 rū 4 G] yāva 4 yā 8 rū $\dot{4}$ AM; sālpam AM] sālyam G; eṣa varga MG] varga A; | yāva 2 yā 7 kāva 0 rū 3 / yāva 0 yā 0 kāva 1 rū 0 | AM] yā 2 yā 7 kāva 0 rū 3 / yā 0 yā 0 kāva 1 rū 0 G; | yāva 2 yā 7 / kāva 1 rū $\dot{3}$ |] yāva 2 yā 7, kāva 1 rū $\dot{3}$ AM, ya 2 yā 7 / kāva 1 rū $\dot{3}$ G.

[377]anena yāva 1 (1st) AM] anena yā 1 G; kevalena yā 122 MG] kevalena 122 A; viśodhya MG] viśodhyaṃ A; rūpa 2 yuto AG] rūpa 3 yuto M.

[378]kṛtiyutiviyutī AMGT] kṛtiviyutī P; saṃyute AMGT] saṃyutau P; rahite AMGT] rahitau P.

anayor jyeṣṭhapadaṃ dvitīyarāśiḥ/ hrasvaṃ yāvattāvanmānam/ anenotthāpyādyarāśiḥ/ evaṃ jātau rāśī 2/ 2/ vā 34/ 38//E99p1//[379]

atha dvitīyodāharaṇe tathaiva kalpitaḥ prathamarāśiḥ yā 2/ dvitīyasyāsya yāva 5 rū 1 vargaprakṛtyā mūle ka 4 jye 9/ vā ka 72 jye 161/ kaniṣṭhena prathama utthāpito jyeṣṭhaṃ dvitīya iti jātau rāśī 8/ 9/ vā 144/ 161//E99p2//[380]

atrālparāśivargeṇa yo rāśir ūnito yutaś ca mūladaḥ syāt sa tāvad vyakta eva dvitīyo jñeyaḥ/ tasyānayane 'py upāyas tad yathā/ kalpitarāśivargaḥ 4/ anena dvitīyarāśir ūnito yutaś ca mūladaḥ syād ity ayaṃ dviguṇaḥ 8/ vargāntaram idaṃ kayor api ca yogāntaraghātasamam/ ato 'ntaram iṣṭaṃ 2 kalpitam/ 'vargāntaraṃ rāśiviyogabhaktam' (L 58) iti jāte vargāntarayogamūle 1/ 3/ ādyasya varge 1 kalpitarāśivargaṃ 4 prakṣipya dvitīyasya vargāt 9 vā viśodhya jāto dvitīyaḥ 5/ atra cālparāśivargas tathā kalpyate yathā dvitīyarāśir abhinnaḥ syāt//E99p3//

tathānyaḥ kalpitaḥ 36/ dviguṇaḥ 72/ idaṃ vargāntaram/ rāśyantaraṣaṭke kalpite jātau 3/ 9/ anyavargāt 81 kalpitaṃ 36 viśodhya jāto dvitīyaḥ 45/ catuṣkeṇa vā 85/ dvikena vā 325//E99p4//[381]

athānyathā kalpane yuktiḥ/ rāśyor ghātena dviguṇena vargayogo yutonito 'vaśyaṃ mūladaḥ syāt/ rāśivadho dviguṇo yathā vargaḥ syāt tathaiko vargo 'nyo vargārdham iti kalpyau/ yato vargayor vadho vargo bhavatīti tathā kalpitau/ eko vargaḥ 1/ anyo vargārdham 2/ anayor ghāto 2 dviguṇaḥ 4/ ayaṃ prathamaḥ/ ayam alparāśivargaḥ/ tayor eva vargayogaḥ 5/ ayaṃ dvitīyo rāśiḥ/ athavaiko vargaḥ 9/ anyo vargārdham 2/ anayor ghāto 18 dviguṇaḥ 36/ ayam alparāśivargaḥ/ atha tayor eva vargayogaḥ 85/ ayaṃ dvitīyo rāśiḥ/ etau vyaktau yāvattāvadvargaguṇau kalpitau/ prathamodāharaṇe dvitīyo rāśī rūpeṇono dvitīyodāharaṇe rūpayutaḥ kāryaḥ/ evaṃ kṛtvā tau tathā rāśivargau kalpyau yathālāpadvayaṃ ghaṭate kiṃtu prathamasya mūlaṃ gṛhītvā dvitīyasya vargaprakṛtyā mūlam ityādi pūrvoktam eva/ evam anekadhā//E99p5//[382]

sūtram/84p0/[383]

yatrāvyaktaṃ sarūpaṃ hi tatra tanmānam ānayet/ 84
sarūpasyānyavarṇasya kṛtvā kṛtyādinā samam//84//
rāśiṃ tena samutthāpya kuryād bhūyo 'parāṃ kriyām/ 85
sarūpeṇānyavarṇena kṛtvā pūrvapadaṃ samam//85//

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[379]atra prathamodāharaṇe] atha prathamodāharaṇe AM, atra G; yāva 5 rū $\dot{1}$ G] yāva 5 rū 1 AM; mānam/ anenotthāpyādya] mānenotthāpyādya MG, mānenotthāpyadya A.

[380]kaniṣṭhena MG] kāniṣṭhena A.

[381]36 (2nd) G] ∅ AM.

[382]vargaguṇau AM] vargaguṇitau G; prathamodāharaṇe dvitīyo rāśī rūpeṇono dvitīyodāharaṇe rūpayutaḥ kāryaḥ G] prathamodāharaṇe rūpayutaḥ dvitīyo rāśī rūpeṇono dvitīyodāharaṇe kāryaḥ AM; tau tathā AM] tathā tau G; kalpyau (last) G] kalpitau AM.

[383]sūtram G] ∅ AM.

yatrādyapakṣamūle gṛhīte parapakṣe 'vyaktaṃ sarūpam arūpaṃ vā syāt tatrānyavarṇasya sarūpasya vargeṇa sāmyaṃ kṛtvā tasyāvyaktasya mānam ānīya tena rāśim utthāpya punar anyāṃ kriyāṃ kuryāt/ tathā tenānyavarṇena sarūpeṇādyapakṣapadasāmyāc ca/ yadi punaḥ kriyā na bhavet tadā tu vyaktenaiva vargādinā samakriyā//85p//[384]

udāharaṇam/E100p0/

yas tripañcaguṇo rāśiḥ pṛthak saikaḥ kṛtir bhavet/ E100
vada taṃ bījamadhye 'si madhyamāharaṇe paṭuḥ//E100//[385]

atra rāśiḥ yā 1/ eṣa triguṇaḥ saikaḥ yā 3 rū 1/ ayaṃ varga iti kālakavargasamaṃ kṛtvā pakṣayo rūpaṃ prakṣipya labdhaṃ kālakapakṣasya mūlam kā 1/ anyapakṣasyāsya yā 3 rū 1 sarūpanīlakatrayasya vargeṇa nīva 9 nī 6 rū 1 sāmyaṃ kṛtvā labdhayāvattāvanmānenotthāpito jāto rāśiḥ nīva 3 nī 2/ punar ayaṃ pañcaguṇaḥ saiko varga iti nīva 15 nī 10 rū 1 pītakavargasamaṃ kṛtvā samaśodhane kṛte pakṣau

nīva	15	nī	10
pīva	1	rū	$\dot{1}$

imau pañcadaśabhiḥ saṃguṇya pañcaviṃśatirūpāṇi prakṣipyādyapakṣasya mūlam nī 15 rū 5/ parapakṣasyāsya pīva 15 rū 10 vargaprakṛtyā mūle ka 9 jye 35/ vā ka 71 jye 275/ kaniṣṭhaṃ pītakamānam/ jyeṣṭham ādyapakṣasya mūlenānena nī 15 rū 5 samaṃ kṛtvāptaṃ nīlakamānam 2 vā 18/ svasvamānenotthāpya jāto rāśiḥ 16 vā 1008//E100p1//[386]

athavaikālāpaḥ svata eva saṃbhavati tathā kalpito rāśiḥ yāva $\frac{1}{3}$ rū $\frac{\dot{1}}{3}$ / eṣa pañcaguṇo rūpayutaḥ yāva $\frac{5}{3}$ rū $\frac{\dot{2}}{3}$ mūlada iti kālakavargasamaṃ kṛtvā pakṣayor ṛṇatryaṃśadvayaṃ prakṣipyoktavad gṛhītaṃ kālakapakṣasya mūlam kā 1/ dvitīyapakṣasyāsya yāva $\frac{5}{3}$ rū $\frac{\dot{2}}{3}$ vargaprakṛtyā mūle ka 7 jye 9/ vā ka 55 jye 71/ atra kaniṣṭhaṃ prakṛtivarṇamānam/ tena kalpitarāśim utthāpya jāto rāśiḥ sa eva 16/ vā 1008//E100p2//[387]

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[384] padasāmyāc ca AM] padasāmyaṃ ca G.

[385] vada taṃ GTP] vadeti AM.

[386] pakṣayo rūpaṃ G] pakṣayoḥ rūpaṃ 1 AM; labdhaṃ kālakapakṣasya mūlam kā 1 G] mūlam kā 1 AM; | nīva 15 nī 10 / pīva 1 rū $\dot{1}$ | M] nīva 15 nī 10/ pīva 1 rū $\dot{1}$ AG; saṃguṇya G] saṃguṇyaḥ A, saṃgaṇya M; prakṣipyādyapakṣasya AM] prakṣipyādyasya pakṣasya G.

[387] tathā kalpito AM] tadā kalpito G; yāva $\frac{1}{3}$ rū $\frac{\dot{1}}{3}$ AM] yāva $\frac{1}{3}$ rū $\frac{\dot{2}}{3}$ G; yāva $\frac{5}{3}$ rū $\frac{\dot{2}}{3}$ (1st) AM] yāva $\frac{5}{3}$ rū $\frac{\dot{1}}{3}$ G; pakṣayor ṛṇa G] pakṣayo ṛṇa AM; yāva $\frac{5}{3}$ rū $\frac{\dot{2}}{3}$ (2nd)] yāva $\frac{5}{3}$ rū $\frac{2}{3}$ AM, $\underline{\text{yāva } \frac{5}{3} \quad \text{rū } \frac{\dot{2}}{3}}$ G.

athādyodāharaṇam/E101p0/

ko rāśis tribhir abhyastaḥ sarūpo jāyate ghanaḥ/ E101
ghanamūlaṃ kṛtībhūtaṃ tryabhyastaṃ kṛtir ekayuk//E101//[388]

atra rāśiḥ yā 1/ ayaṃ tryabhyasto rūpayutaḥ yā 3 rū 1/ eṣa ghana iti kālaka-ghanasamaṃ kṛtvā prāgvaj jāto rāśiḥ kāgha $\begin{smallmatrix}1\\3\end{smallmatrix}$ rū $\begin{smallmatrix}\bullet\\1\\3\end{smallmatrix}$ / asya triguṇasya sarūpasya ghanamūlaṃ vargitaṃ trihataṃ rūpayutaṃ kāva 3 rū 1/ etat kṛtir iti nīlaka-vargasamaṃ kṛtvā pakṣayo rūpaṃ prakṣipya prathamapakṣamūlam nī 1/ dvitīya-pakṣasyāsya kāva 3 rū 1 vargaprakṛtyā mūle ka 1 jye 2/ vā ka 4 jye 7/ vā ka 15 jye 26/ kaniṣṭhaṃ kālakamānam 4/ asya ghanena 64 utthāpito rāśiḥ 21 vā $\begin{smallmatrix}3374\\3\end{smallmatrix}$ //E101p//[389]

udāharaṇam/E102p0/

vargāntaraṃ kayo rāśyoḥ pṛthag dvitriguṇaṃ triyuk/ E102
vargau syātāṃ vada kṣipraṃ ṣaṭkapañcakayor iva//E102//[390]

kvacid ādeḥ kvacin madhyāt kvacid antyāt kriyā budhaiḥ/ 86
ārabhyate yathā laghvī nirvahec ca yathā tathā//86//[391]

ato 'tra vargāntaram yā 1/ etad dvighnaṃ triyutaṃ yā 2 rū 3 varga iti kālaka-vargasamaṃ kṛtvāptayāvattāvanmānenotthāpito jāto rāśiḥ kāva $\begin{smallmatrix}1\\2\end{smallmatrix}$ rū $\begin{smallmatrix}\bullet\\3\\2\end{smallmatrix}$ / punar idaṃ trighnaṃ triyutam kāva $\begin{smallmatrix}3\\2\end{smallmatrix}$ rū $\begin{smallmatrix}\bullet\\3\\2\end{smallmatrix}$ varga iti nīlakavargasamaṃ kṛtvā sama-śodhane kṛte jātau pakṣau

nīva 2 rū 3
kāva 3

etau tribhiḥ saṃguṇya kālakapakṣamūlam kā 3/ parapakṣasyāsya nīva 6 rū 9 varga-prakṛtyā mūle ka 6 jye 15/ vā ka 60 jye 147/ jyeṣṭhaṃ prathamapakṣapadena kā 3 samaṃ kṛtvā labdhaṃ kālakamānam 5 vā 49/ prāgvad āptakālakamānenotthāpitaṃ jātaṃ vargāntaraṃ rāśyoḥ 11 vā 1199/ idam antarahṛtaṃ dvidhāntareṇonayutam ardhitaṃ rāśī bhavata iti prāg uktam (BG E99p4)/[392] ato 'ntaram iṣṭaṃ rūpaṃ prakalpya jātau rāśī 6/ 5/ vā 600/ 599/ athavāntaram ekādaśa prakalpya jātau rāśī

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[388]sarūpo AMGP] sarūpe T.

[389]rū $\begin{smallmatrix}\bullet\\1\\3\end{smallmatrix}$ AM] rū $\frac{1}{3}$ G.

[390]kayo rāśyoḥ GTP] kayoḥ rāśyo A, kayoḥ rāśyoḥ M.

[391]laghvī AMGP] lubdhī T.

[392]Cf. L 56 & 58.

60/ 49//E102p//[393]

anyat karaṇasūtraṃ sārdhavṛttam/87p0/[394]

vargāder yo haras tena guṇitaṃ yadi jāyate/ 87
avyaktaṃ tatra tanmānam abhinnaṃ syād yathā tathā/
kalpyo 'nyavarṇavargādis tulyaḥ śeṣaṃ yathoktavat//87//[395]

yatra vargādau kuṭṭakādau vaikapakṣamūle gṛhīte 'nyapakṣe 'vyaktavargādikasya yo haras tena guṇitam avyaktaṃ yadi syāt tadā tasya mitir abhinnā yathā syāt tathānyavarṇavargādiḥ sarūpo rūpono vā tulyaḥ kalpyaḥ/ śeṣaṃ pūrvasūtroktam (BG 84–85)//87p//[396]

udāharaṇam/E103p0/

ko vargaś caturūnaḥ san saptabhakto viśudhyati/ E103
triṃśadūno 'thavā kaḥ syād yadi vetsi vada drutam//E103//[397]

atra rāśiḥ yā 1/ asya vargaś caturūnaḥ saptabhakto viśudhyatīti labdhipramāṇaṃ kālakaḥ/ tadguṇitahareṇāsya yāva 1 rū $\dot{4}$ sāmyaṃ kṛtvā prathamapakṣamūlam yā 1/ parapakṣasyāsya kā 7 rū 4 mūlābhāvād 'vargāder yo haras tena guṇitaṃ yadi jāyate' (BG 87ab) ityādinā karaṇena nīlakasaptakasya rūpadvayādhikasya vargeṇa tulyaṃ kṛtvā labdhaṃ kālakamānam abhinnaṃ jātam nīva 7 nī 4/ yat tu kalpitaṃ tasya dvitīyapakṣasya mūlam nī 7 rū 2/ idaṃ prākpakṣamūlasyāsya yā 1 samaṃ kṛtvāptaṃ yāvattāvanmānam nī 7 rū 2/ sakṣepam 9/ asya vargo rāśiḥ syāt 81//E103p//[398]

athavānyavarṇakalpanāyāṃ mandāvabodhāya pūrvair upāyaḥ paṭhitaḥ/ tatra sūtrāṇi/88p0/[399]

harabhaktā yasya kṛtiḥ śudhyati so 'pi dvirūpapadaguṇitaḥ/ 88
tenāhato 'nyavarṇo rūpapadenānvitaḥ kalpyaḥ//88//
na yadi padaṃ rūpāṇāṃ kṣiped dharaṃ teṣu hārataṣṭeṣu/ 89
tāvad yāvad vargo bhavati na ced evam api khilaṃ tarhi//89//[400]

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[393]mūlam kā 3 AM] mūlam kā 3 kṛtvā G; labdhaṃ kālakamānam AM] labdhakālakamānam G; 600 AM] 60 G; ekādaśa MG] ekādaśaṃ A.

[394]anyat AM] athānyat G.

[395]tulyaḥ AMGT] tulyaṃ P.

[396]sūtroktam AM] sūtravat G.

[397]kaḥ syād AMG] kastaṃ TP.

[398]kā 7 rū 4 AG] kā 7 rū $\dot{4}$ M.

[399]tatra sūtrāṇi AM] sūtram G

[400]yadi AMGP] yadiha T.

hatvā kṣiptvā ca padaṃ yatrādyasyeha bhavati tatrāpi/ 90
ālāpita eva haro rūpāṇi tu śodhanādisiddhāni//90//[401]

harabhakteti/ yasyāṅkasya kṛtir harabhaktā satī śudhyatīti niḥśeṣā bhavati/ api ca so 'py aṅko dvābhyāṃ rūpapadena ca guṇito harabhaktaḥ san śudhyati tadā tenāṅkena hato 'nyavarṇas tena rūpeṇānvitaḥ kalpyaḥ/ yadi tu rūpāṇāṃ padaṃ na tadā teṣu haratasṭeṣu rūpeṣu tāvad dharaṃ kṣiped yāvad vargo bhavet/ tanmūlaṃ rūpapadaṃ bhavet/ evam api kṛte ced vargaḥ kadācin na bhavet tadā tadudāharaṇaṃ khilaṃ syāt/ yatra tv ādyapakṣasya mūlaṃ 'hatvā kṣiptvā' (BG 90a) ityādinā labhyate tadā hara ālāpita eva grāhyo na tu guṇito vibhakto vā/ rūpāṇi tu samaśodhane kṛte śodhanādisiddhāni yāni tāny eva grāhyāni//90p1//[402]

evaṃ ghane 'pi yojyam/ tad yathā/ yasyāṅkasya ghano harabhaktaḥ śudhyati tathā ca so 'py aṅkas tribhī rūpāṇāṃ ghanamūlena ca guṇito harabhaktaḥ śudhyati tadā tenāṅkena hato 'nyavarṇo rūpāṇāṃ ghanamūlena cānvitaḥ kalpyaḥ/ yadi rūpāṇāṃ ghanamūlaṃ na labhyate tadā teṣu rūpeṣu haratasṭeṣu tāvad dharaṃ kṣiped yāvad ghano bhavet/ tac ca ghanamūlaṃ rūpapadaṃ syāt/ evam api kṛte ca ghanaḥ kadācin na bhavet tadudāharaṇaṃ khilaṃ syād ity agre 'pi yojyam iti śeṣaḥ//90p2//

atha dvitīyodāharaṇe (BG E103) rāśiḥ yā 1/ asya yathoktaṃ kṛtvādyapakṣasya mūlam yā 1/ parapakṣasyāsya kā 7 rū 30 'na yadi padaṃ rūpāṇām' (BG 89a) ityādikaraṇena hārataṣṭarūpeṣu dviguṇaṃ haraṃ prakṣipya mūlam 4/ etadadhikanīlakasaptakavargasamīkaraṇādinā prāgvaj jāto rāśiḥ nī 7 rū 4/ atha yady ṛṇarūpair anvitaṃ nīlakasaptakaṃ nī 7 rū $\dot{4}$ parikalpyānīyate tadānyo 'pi rāśiḥ 3 syāt//90p3//[403]

udāharaṇam/E104p0/[404]

ṣaḍbhir ūno ghanaḥ kasya pañcabhakto viśudhyati/ E104
taṃ vadāśu tavālaṃ ced abhyāso ghanakuṭṭake//E104//[405]

atra rāśiḥ yā 1/ asya yathoktaṃ kṛtvādyapakṣasya ghanamūlam yā 1/ parapakṣasyāsya kā 5 rū 6 'harabhakto yasya ghanaḥ śudhyati so 'pi trirūpapadaguṇitaḥ' (≈ BG 88ab)[406] ityādiyuktyā nīlakapañcakasya rūpaṣaṭkādhikasya ghanena sāmyaṃ kṛtvā prāgvaj jāto rāśiḥ sakṣepaḥ nī 5 rū 6/ utthāpane kṛte jāto rāśiḥ 6 vā

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[401] hatvā TP] hitvā AMG.

[402] śudhyatīti (1st) AM] śudhyati G; ca (2nd) AM] ∅ G; hatvā] hitvā AMG.

[403] nī 7 rū $\dot{4}$ AG] nī 7 rū 4 M.

[404] udāharaṇam MG] ∅ A.

[405] vadāśu AMG] vadāsti TP.

[406] BG 88, which is meant for square, is here slightly modified for cube.

11//E104p//[407]
udāharaṇam/E105p0/

yadvargaḥ pañcabhiḥ kṣuṇṇas triyuktaḥ ṣoḍaśoddhṛtaḥ/ E105
śuddhim eti tam ācakṣva dakṣo 'si gaṇite yadi//E105//[408]

atra rāśiḥ yā 1/ asya yathoktaṃ kṛtvādyapakṣamūlam yā 5/ parapakṣasyāsya kā 80 rū 15 'hatvā kṣiptvā ca padaṃ yatra' (BG 90ab) ityādināpy atra 'ālāpita eva haraḥ' (BG 90c) sthāpyaḥ/ 'rūpāṇi tu śodhanādisiddhāni' (BG 90d) iti tathā kṛte jātam kā 16 rū 15/ amuṃ nīlakāṣṭakasya saikasya vargeṇa samaṃ kṛtvāptaṃ kālakamānam abhinnam nīva 4 nī 1 rū 1/ kalpitapadam nī 8 rū 1/ idam ādyasyāsya yā 5 samaṃ kṛtvā kuṭṭakāl labdhaṃ yāvattāvanmānam pī 8 rū 5/ utthāpite jāto rāśiḥ 13//E105p1//[409]

athavarṇarūpeṇādhike nīlakāṣṭake kalpite sati labdhaṃ yāvattāvanmānam pī 8 rū 3//E105p2//[410]

evaṃ 'vargaprakṛtyā viṣayo yathā syāt tathā sudhībhir bahudhā vicintyam' (BG 72cd) ity asya prapañco bahudhā darśitaḥ/ tathā vargakuṭṭake 'pi kiṃcid darśitam/ evaṃ buddhimadbhir anyad api yathāsaṃbhavaṃ yojyam//E105p3//

iti bhāskarīye bījagaṇite 'nekavarṇasaṃbandhimadhyamāharaṇabhedāḥ//E105p4//[411]

II.11 Bhāvita

atha bhāvitam//91p1//[412]
tatra sūtraṃ vṛttam/91p0/

muktveṣṭavarṇaṃ sudhiyā pareṣāṃ 91
kalpyāni mānāni tathepsitāni/
yathā bhaved bhāvitabhaṅga evaṃ
syād ādyabījakriyayeṣṭasiddhiḥ//91//[413]

yatrodāharaṇe varṇayor varṇānāṃ vā vadhād bhāvitam utpadyate tatreṣṭaṃ varṇam apahāya śeṣayoḥ śeṣāṇāṃ vā varṇānām iṣṭāni vyaktāni mānāni kṛtvā tais tān

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[407]kā 5 AM] kāgha 5 G; sakṣepaḥ MG] saṃkṣepaḥ A.

[408]ṣoḍaśoddhṛtaḥ AMGP] ṣoḍaśoddhataḥ T; tam ācakṣva AMG] samācakṣva TP.

[409]hatvā] hitvā AMG; kṣiptvā G] kṣiptā AM.

[410]nīlakāṣṭake AM] nīlāṣṭake G.

[411]bhāskarīye] śrīsiddhāntaśiromaṇau bhāskarācāryaviracite AM, śrībhāskarīye G.

[412]atha bhāvitam TG] atha bhāvitamucyate AM, bhāvitam P.

[413]tathepsitāni/ yathā G] yathepsitāni/ tathā AMTP.

varṇān pakṣayor utthāpya rūpeṣu prakṣipyaivaṃ bhāvitabhaṅgaṃ kṛtvā prathamabījakriyayā varṇamānam ānayet//91p//[414]

udāharaṇam/E106p0/

catustriguṇayo rāśyoḥ saṃyutir dviyutā tayoḥ/ E106
rāśighātena tulyā syāt tau rāśī vetsi ced vada//E106//[415]

atra rāśī yā 1 kā 1/ anayor yathokte kṛte jātau pakṣau

yā 4 kā 3 rū 2
yākābhā 1

evaṃ bhāvite jāte 'muktveṣṭavarṇam' (BG 91a) ityādisūtreṇa kālakasya kileṣṭaṃ rūpapañcakaṃ mānaṃ kalpitam/ tena prathamapakṣe kālakam utthāpya rūpeṣu prakṣipya jātam yā 4 rū 17/ dvitīyapakṣe yā 5/ anayoḥ samaśodhane kṛte prāgval labdhaṃ yāvattāvanmānam 17/ evam etau jātau rāśī 17/ 5/ athavā ṣaṭkena kālakam utthāpya jātau rāśī 10/ 6/ evam iṣṭavaśād ānantyam//E106p//[416]

udāharaṇam/E107p0/

catvāro rāśayaḥ ke te yadyogo nakhasaṃguṇaḥ/ E107
sarvarāśihates tulyo bhāvitajña nigadyatām//E107//[417]

atra rāśiḥ yā 1 śeṣā dṛṣṭāḥ 5/ 4/ 2/ ataḥ prathamabījena labdhaṃ yāvattāvanmānam 11/ evaṃ jātā rāśayaḥ 11/ 5/ 4/ 2/ vā 28/ 10/ 3/ 1/ vā 55/ 6/ 4/ 1/ vā 60/ 8/ 3/ 1/ evaṃ bahudhā//E107p//

udāharaṇam/E108p0/

yau rāśī kila yā ca rāśinihatir yau rāśivargau tathā E108
teṣām aikyapadaṃ sarāśiyugalaṃ jātā trayoviṃśatiḥ/
pañcāśat triyutāthavā vada kiyat tad rāśiyugmaṃ pṛthak
tac cābhinnam avehi vatsa gaṇakaḥ kas tvatsamo 'sti kṣitau//
E108//[418]

atra rāśī yā 1/ rū 2/ anayor ghātayutivargāṇāṃ yogaḥ yāva 1 yā 3 rū 6/ imaṃ rāśiyogonatrayoviṃśateḥ yā $\dot{1}$ rū 21 vargasyāsya yāva 1 yā $\dot{4}\dot{2}$ rū 441 samaṃ kṛtvā

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[414]utpadyate AM] ucyate G; bhāvitabhaṅgaṃ MG] bhāvitamaṅgaṃ A.

[415]guṇayo AMGP] guṇyo T; saṃyutir AGTP] saṃyuti M.

[416]yathokte MG] yathokta A; | yā 4 kā 3 rū 2 / yākābhā 1 | G] yā 4 kā 3 rū 2 = yā.kā.bhā 1 AM; prakṣipya MG] prakṣiṣya A; 17/ 5 AM] 15/ 5 G; 10/ 6 AG] 10, 7 M.

[417]catvāro AGTP] catvārā M.

[418]nihatir yau GTP] nihatiryauṃ A, nihātaryau M; vargau MGTP] vargauṃ A; jātā AM] jātaṃ GTP; tac cābhinnam G] kṛtvābhinnam AMTP; avehi AMGP] avaihi T; vatsa GTP] vetsi AM.

labdhaṃ yāvattāvanmānam $\begin{smallmatrix}29\\3\end{smallmatrix}$ / evam etau rāśī $\begin{smallmatrix}29\\3\end{smallmatrix}$ / 2/ athavā rāśī yā 1/ rū 3/ ataḥ prāgvaj jātau rāśī $\begin{smallmatrix}97\\11\end{smallmatrix}$ / 3/ evaṃ pañcakam iṣṭaṃ prakalpya jātāv abhinnau 7/ 5//E108p1//[419]

atha dvitīyodāharaṇe rāśī yā 1/ rū 2/ anayor ghātayutivargāṇāṃ yogaḥ yāva 1 yā 3 rū 6/ amuṃ rāśidvayonatripañcāśadvargasyāsya yāva 1 yā $\dot{1}0\dot{2}$ rū 2601 samaṃ kṛtvā prāgvaj jātau rāśī $\begin{smallmatrix}173\\7\end{smallmatrix}$ / 2/ vā 11/ 17/ evam ekasmin vyakte rāśau kalpite sati bahunāyāsenābhinnau rāśī jñāyete//E108p2//[420]

atha tau yathālpāyāsena bhavatas tathocyate/ tatra sūtraṃ sārdhavṛttadvayam/92p0/

bhāvitaṃ pakṣato 'bhīṣṭāt tyaktvā varṇau sarūpakau/ 92
anyato bhāvitāṅkena tataḥ pakṣau vibhajya ca/
varṇāṅkāhatirūpaikyaṃ bhaktveṣṭeneṣṭatatphale//92//[421]
etābhyāṃ saṃyutāv ūnau kartavyau svecchayā ca tau/ 93
varṇāṅkau varṇayor māne jñātavye te viparyayāt//93//[422]

samayoḥ pakṣayor ekasmād bhāvitam apāsyānyato varṇau rūpāṇi ca/ tato bhāvitāṅkena pakṣāv apavartya dvitīyapakṣe varṇāṅkayor ghātaṃ rūpayutaṃ kenacid iṣṭena vibhajya tadiṣṭaṃ tatphalaṃ ca dve api varṇāṅkābhyāṃ svecchayā yukte satī varṇayor māne viparyayeṇa jñātavye/ yatra kālakāṅko yojitas tad yāvattāvanmānam/ yatra yāvattāvadaṅkas tat kālakamānam ity arthaḥ/ yatra tv iyattāvaśād evaṃ kṛte saty ālāpo na ghaṭate tatreṣṭaphalābhyāṃ varṇāṅkāv ūnitau vyatyayān māne bhavataḥ//93p1//[423]

atha prathamodāharaṇam/Q12p0/

'catustriguṇayo rāśyoḥ saṃyutir dviyutā tayoḥ/ Q12
rāśighātena tulyā ⟨syāt ...⟩'//Q12//[424]

iti/ tatra yathokte kṛte pakṣau

yā 4	kā 3	rū 2
yākābhā 1		

'varṇāṅkāhatirūpaikyam' (BG 92e) 14/ etad ekeneṣṭena hṛtaṃ jāte iṣṭaphale 1/ 14/ ete varṇāṅkābhyāṃ 4/ 3 svecchayā yute jāte yāvattāvatkālakamāne 4/ 18 vā 17/ 5/

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[419] evaṃ pañcakam iṣṭaṃ prakalpya jātāv abhinnau 7/ 5 AM] ∅ G.

[420] yāva 1 yā 3 rū 6 G] yāva 1 yā 3 rū $\dot{6}$ A, yāva $\dot{1}$ yā 3 rū $\dot{6}$ M; $\begin{smallmatrix}173\\7\end{smallmatrix}$ AG] $\frac{172}{7}$ M.

[421] 'bhīṣṭāt AMGP] 'bhīṣṭā T; bhaktveṣṭeneṣṭa AMP] bhakteṣṭeneṣṭa GT.

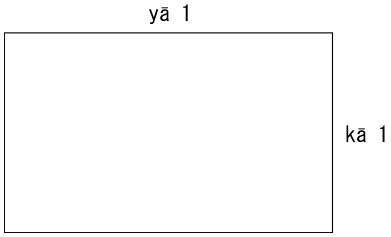
[422] varṇāṅkau AMTP] varṇāṅka G; jñātavye AMGP] ∅ T.

[423] varṇau MG] varṇauṃ A; rūpayutaṃ AM] rūpayutena G; tv] tu AMG; ālāpo MG] ālopo A.

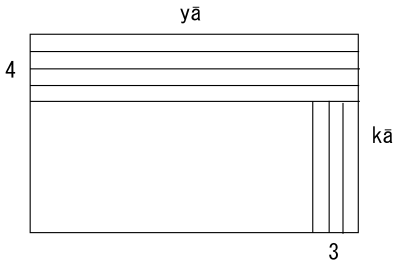
[424] Cited from BG E106.

dvikena jāte 5/ 11 vā 10/ 6//93p2//[425]

asyopapattiḥ/ sā ca dvidhā sarvatra syāt/ ekā kṣetragatānyā rāśigateti/ tatra kṣetragatocyate/ dvitīyapakṣaḥ kila bhāvitasamo vartate/ bhāvitaṃ tv āyatacaturasrakṣetraphalam/ tatra varṇau bhujakoṭī/ nyāsaḥ/



atra kṣetrāntar yāvaccatuṣṭayaṃ vartate kālakatrayaṃ dve ca rūpe/ ataḥ kṣetrād yāvattāvaccatuṣṭaye rūpacatuṣṭayonakālake svāṅkaguṇe cāpanīte jātam/ nyāsaḥ/



dvitīyapakṣe ca tathā kṛte jātam 14/ etad bhāvitakṣetrāntarvartino 'vaśiṣṭakṣetrasyādhastanasya phalam/ tad bhujakoṭivadhāj jātam/ te cātra jñātavye/ ata iṣṭo bhujaḥ kalpitas tena phale 'smin 14 bhakte koṭir labhyate/ anayor bhujakoṭyor ekatarā yāvattāvadaṅkatulyai rūpair 4 adhikatarā satī bhāvitakṣetrasya koṭir bhavati yato bhāvitakṣetrād yāvattāvaccatuṣṭaye 'panīte tatkoṭiś caturūnā jātā/ evaṃ kālakāṅkatulyai rūpair 3 adhikataro bhujo bhavati/ te eva yāvattāvatkālakamāne//93p3//[426]

atha rāśigatopapattir ucyate/ sāpi kṣetramūlāntarbhūtā/ tatra yāvattāvatkālaka-

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[425]prathamo MG] pramo A; guṇayo MG] guṇayī A; yākābhā 1 G] yā.kā.bhā 1 AM.

[426]dve ca rūpe AM] dve rūpe G; rūpacatuṣṭayonakālake AM] rūpacatuṣṭayone kālake G; kṣetrasyādhastanasya G] kṣetrasthādhastanasya AM; bhāvitakṣetrād AM] bhāvitakṣetrasya G; kālakāṅkatulyai] kālakatulyai AMG; te eva M] ta eva AG. In AMG, the second figure is rotated anticlockwise by 90 degrees.

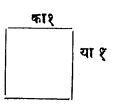
Fig. BG93p-1a: 

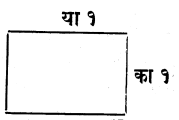
Fig. BG93p-1g: 

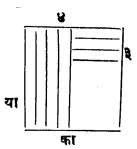
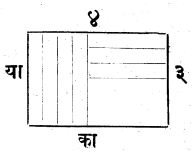
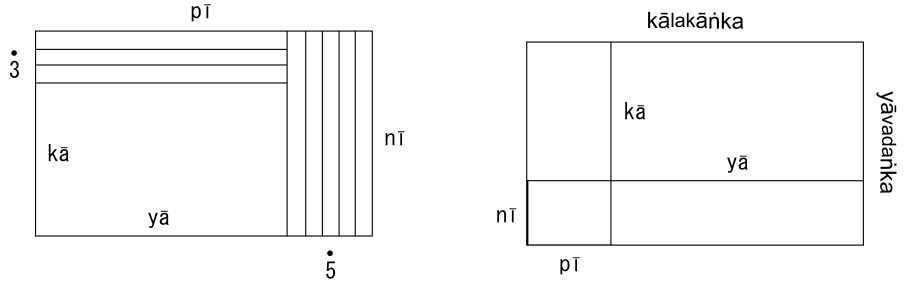
Fig. BG93p-2a: 

Fig. BG93p-2g: 

bhujakoṭimānātmakakṣetrāntargatasya laghukṣetrasya bhujakoṭimāne 'nyavarṇau kalpitau nī 1/ pī 1/ ata etayor ekataro yāvattāvadaṅkatulyai rūpair adhiko bahiḥkṣetrakoṭeḥ kālakasya mānam/ anyaḥ kālakāṅkatulyai rūpair adhiko bhujasya yāvattāvato mānaṃ kalpitam/ nī 1 rū 4/ pī 1 rū 3/ ābhyāṃ pakṣayor yāvattāvatkālakavarṇāv utthāpyoparitanapakṣe nī 3 pī 4 rū 26/ bhāvitakṣetre ca nīpībhā 1 nī 3 pī 4 rū 12/ etayoḥ samaśodhane kṛte jātam adhaḥ nīpībhā 1 ūrdhvapakṣe rū 14/ idam eva tadantaḥkṣetraphalam/ etad varṇāṅkayor ghātasya rūpayutasya samaṃ syād/ ato varṇamāne bhavatas tat prāg uktam eva (BG 93p3)/ iyam eva kriyā pūrvācāryaiḥ saṃkṣiptapāṭhena nibaddhā/[427] ye kṣetragatām upapattiṃ na budhyanti teṣām iyaṃ rāśigatā darśanīyā//93p4//[428]

upapattiyutaṃ bījagaṇitaṃ gaṇakā jaguḥ/ 94
na ced evaṃ viśeṣo 'sti na pāṭībījayor yataḥ//94//[429]

ata iyaṃ bhāvitopapattir dvividhā darśitā/ yat tūktaṃ varṇāṅkayor ghāto rūpair yuto bhāvitakṣetrāntarvartino 'nyakṣetrasya koṇasthasya phalam iti tat kvacid anyathā syāt/ yathā/ yadā varṇāṅkāv ṛṇagatau bhavatas tadā tasyaivāntar bhāvitakṣetraṃ koṇe dṛśyate/ yadā tu bhāvitakṣetre bhujakoṭibhyāṃ varṇāṅkāv adhikau dhanagatau bhavatas tadā bhāvitakṣetrād bahiḥkoṇasthaṃ kṣetraṃ syāt/ tad yathā/ nyāsaḥ/



yadīdṛśaṃ tadeṣṭaphalābhyām ūnitau varṇāṅkau yāvattāvatkālakayor māne bhavataḥ//93p5//[430]

udāharaṇam/E109p0/

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[427]Cf. BSS 18.60, SSe 14.20–21ab.

[428]kālakāṅkatulyai] kālakatulyaiḥ AM, kālakatulyai G; nī 1 rū 4/ pī 1 rū 3 G] kā = nī 1 rū 4, yā = pī 1 rū 3 AM; nīpībhā 1 (twice) G] nī.pī.bhā 1 AM.

[429]TP do not have this verse. upapatti AG] upapātta M.

[430]yuto MG] yutī A; 'nyakṣetrasya AM] 'nyasya laghukṣetrasya G; yathā/ yadā G (without daṇḍa)] yathā AM; koṇe dṛśyate M] kauṇe dṛśyate A, koṇasthaṃ syāt G; māne bhavataḥ MG] mā bhavataḥ A. In AMG, the first figure is turned over and rotated by 90 degrees, and the second is rotated clockwise by 90 degrees, both with 'nī' and 'pī' exchanged; $\dot{3}$ M] 3 AG; $\dot{5}$ M] 5 AG; yāvadaṅka] ∅ AMG; kālakāṅka] ∅ AMG. For the numerals, $\dot{3}$ and $\dot{5}$, in the first figure see E110.

dviguṇena kayo rāśyor ghātena sadṛśaṃ bhavet/ E109
daśendrāhatarāśyaikyaṃ dvyūnaṣaṣṭivivarjitam//E109//[431]

atra rāśī yā 1/ kā 1/ anayor yathokte kṛte bhāvitāṅkena bhakte jātam yā 5 kā 7 rū 29/ atra 'varṇāṅkāhatirūpaikyam' (BG 92e) 6 dvihṛtam iṣṭaphale 2/ 3/ ābhyāṃ varṇāṅkau yutau rāśī 10/ 7/ vā 9/ 8/ ūnitau jātau 4/ 3/ vā 5/ 2//E109p//

udāharaṇam/E110p0/

tripañcaguṇarāśibhyāṃ yuto rāśyor vadhaḥ kayoḥ/ E110
dviṣaṣṭipramito jātas tau rāśī vetsi ced vada//E110//[432]

atra yathokte kṛte jātau pakṣau

yā 3	kā 5	rū 62
yākābhā 1		

'varṇāṅkāhatirūpaikyam' (BG 92e) 77/ iṣṭatatphale 7/ 11/ ābhyāṃ varṇāṅkau yutāv eva/ iṣṭatatphalābhyām ābhyāṃ 7/ 11 ūnitau ced vidhīyete tadarṇagatau bhavataḥ/ ata ābhyāṃ 7/ 11 yutau jātau rāśī 6/ 4/ vā 2/ 8/ ūnitau 12/ 14/ vā 16/ 10//E110p1//[433]

atha pūrvatṛtīyodāharaṇam/Q13p0/[434]

'yau rāśī kila yā ca rāśinihatir yau rāśivargau tathā Q13
teṣām aikyapadaṃ sarāśiyugalaṃ ⟨jātā trayoviṃśatiḥ⟩'//
Q13//[435]

iti/ atra rāśī yā 1/ kā 1/ anayor ghātayutivargāṇāṃ yogaḥ yāva 1 kāva 1 yākābhā 1 yā 1 kā 1/ asya mūlābhāvād rāśidvayonāyās trayoviṃśateḥ yā 1 kā 1 rū 23 vargeṇānena yāva 1 kāva 1 yākābhā 2 yā 46 kā 46 rū 529 sāmyam/ tatra samayoga-

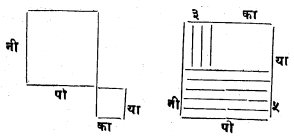

Fig. BG93p-3a:

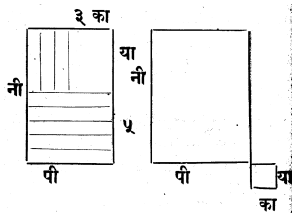

Fig. BG93p-3g:

[431]kayo GTP] kayoḥ AM; dvyūna MGTP] dvayūna A.

[432]yuto AMGT] yukto P; tau rāśī G] rāśiṃ tvaṃ AM, rāśī tvaṃ TP.

[433]yākābhā 1 G] yā.kā.bhā 1 A, yā.kā.bhā M; yutāv eva G] yutāveva kāryau AM; vā (2nd) AM] ∅ G.

[434]tṛtīyodāharaṇam] caturthodāharaṇam AMG.

[435]Cited from BG E108ab.

viyogādau samataiveti samavargagame śodhane ca kṛte bhāvitāṅkena hṛte jātam yā 47 kā 47 rū 529/ atra varṇāṅkāhatī rūpayutā 1680/ iyaṃ catvāriṃśateṣṭena hṛtā phalam 42/ iṣṭam 40/ atreṣṭaphalābhyām ābhyāṃ varṇāṅkāv ūnāv eva kāryau/ tena jātau rāśī 7/ 5/ yutau cet kriyete tarhi 'jātā trayoviṃśatiḥ' (BG E108b) iti pūrvālāpo na ghaṭate//E110p2//[436]

caturthodāharaṇam/Q14p0/[437]

'pañcāśat triyutāthavā'//Q14//[438] Q14

iti/ atrodāharaṇe yathokte kṛte bhāvitāṅkena vibhakte jātam yā 107 kā 107 rū 2809/ atra 'varṇāṅkāhatirūpaikyam' (BG 92e) 8640/ iṣṭatatphale 90/ 96/ ābhyāṃ varṇāṅkāv ūnitau rāśī 11/ 17/ evam anyatrāpi//E110p3//[439]

kvacid bahuṣu sāmyeṣu bhāvitonmitīr ānīya tābhyaḥ samīkṛtacchedagamābhyaḥ sāmye pūrvabījakriyayaiva rāśī jñāyete/ atra rāśī iti dvivacanopādānād anyeṣām tṛtīyādivarṇānām iṣṭāni mānāni kalpyānīty arthāt siddham//E110p4//[440]

iti bhāskarīye bījagaṇite bhāvitaṃ samāptam//E110p5//[441]

II.12 Grantha-samāpti

āsīn maheśvara iti prathitaḥ pṛthivyām 95
ācāryavaryapadavīṃ viduṣāṃ prapannaḥ/
labdhvāvabodhakalikāṃ tata eva cakre
tajjena bījagaṇitaṃ laghu bhāskareṇa//95//[442]
brahmāhvayaśrīdharapadmanābha- 96
bījāni yasmād ativistṛtāni/
ādāya tatsāram akāri nūnaṃ
sadyuktiyuktaṃ laghu śiṣyatuṣṭyai//96//[443]
atrānuṣṭupsahasraṃ hi sasūtroddeśake mitiḥ/ 97

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[436]yugalam AM] yutaṃ G; dvayonāyās AM] dvayona G; yākābhā 1 G] yā.kābhā 1 AM; trayoviṃśateḥ G] trayorviśateḥ AM; yākābhā 2 G] yā.kā.bhā 2 AM; catvāriṃśateṣṭena AG] catvāriṃśateṣṭaina M; tena jātau MG] te jātau A; jātā AM] jātaṃ G.

[437]caturthodāharaṇam G] pūrvodāharaṇam AM.

[438]Cited from BG E108c.

[439]yathokte kṛte] yathoktakṛta AMG; 2809 AM] 2809 G.

[440]dvivacanopādānād G] dvivacanād AM; tṛtīyādi] tryādi AM, ādi G.

[441]bhāskarīye] śrībhāskarācāryaviracite AM, śrībhāskarīye G; samāptam AM] ∅ G.

[442]prapannaḥ AM] prayātaḥ GTP.

[443]brahmāhvaya TP] brāhmāhvaya AMG.

kvacit sūtrārthaviṣayaṃ vyāptiṃ darśayituṃ kvacit//97//[444]
kvacic ca kalpanābhedaṃ kvacid yuktim udāhṛtam/ 98
na hy udāharaṇānto 'sti stokam uktam idaṃ yataḥ//98//
dustaraḥ stokabuddhīnāṃ śāstravistāravāridhiḥ/ 99
athavā śāstravistṛtyā kiṃ kāryaṃ sudhiyām api//99//[445]
upadeśalavaṃ śāstraṃ kurute dhīmato yataḥ/ 100
tat tu prāpyaiva vistāraṃ svayam evopagacchati//100//[446]
'jale tailaṃ khale guhyaṃ pātre dānaṃ manāg api/ 101
prājñe śāstraṃ svayaṃ yāti vistāraṃ vastuśaktitaḥ'//101//[447]

[tathā gole mayoktam/ ullasadamalamatīnāṃ trairāśikamātram eva pāṭī buddhir eva bījam/ tathā golādhyāye mayoktam/Q15p0/

'asti trairāśikaṃ pāṭī bījaṃ ca vimalā matiḥ/ Q15
kim ajñātaṃ subuddhīnām ato mandārtham ucyate'//Q15//[448]

//101p//][449]

gaṇaka bhaṇitiramyaṃ bālalīlāvagamyaṃ 102
sakalagaṇitasāraṃ sopapattiprakāram/
iti bahuguṇayuktaṃ sarvadoṣair vimuktaṃ
paṭha paṭha mativṛddhyai laghv idaṃ prauḍhasiddhyai//
102//[450]

iti bhāskarīye siddhāntaśiromaṇau bījagaṇitādhyāyaḥ samāptaḥ//102p//[451]

---

[444]After 97ab, TP have an Anuṣṭubh hemistich, 'kvacit sūtrārthaviṣayaṃ darśayitum udāhṛtam', which AMG do not. It has the same meaning as 97c. atrānuṣṭup GTP] atrānup AM.

[445]vistāra AMTP] vistara G.

[446]gacchati AMGP] gacchatti T.

[447]Cited from CV 14.5. An introductory phrase for 101, 'yathoktaṃ yantrādhyāye', occurs in AM but not in GTP (the editor of G remarks that the phrase is found in most mūla-pustakas). dānaṃ AGT] pānaṃ M, dāna P.

[448]Cited from GA, praśna 3.

[449]BG 101p (the inside of the square brackets) occurs in AM but not in GTP (the editor of G remarks that this passage is seen in most mūla-pustakas but that it has not been accepted by commentators).

[450]bhaṇiti AMG] bhaṇati TP; prauḍha MGTP] proḍha A.

[451]TP omit this colophon. bhāskarīye] śrībhāskarācāryaviracite AM, śrībhāskarīye G.

III Appendices

III.1 Rules and Examples of the *Bījagaṇita*

Here I briefly describe the mathematical rules and examples given in the verses of the BG and the solutions of the examples given in the prose parts. I express them in modern algebraic notation for easy reference and apprehension.

III.1.1 Chapter 1: Six kinds of operations on positive and negative numbers

1: Salutation.

Bhāskara salutes to (1) avyakta (the invisible), which is the sole primary seed of all the visible material world conceived by the Sāṃkhya philosophy, (2) īśa (the Lord), who is the unique supreme seed of all that is visible, and (3) avyakta-gaṇita (the invisible mathematics or the mathematics with unknown numbers), which is the seed of the vyakta-gaṇita (the visible mathematics or the mathematics with known numbers).

2: Introduction.

'Since the visible ⟨mathematics⟩ (i.e., mathematics with known numbers) told before ⟨by me in the *Līlāvatī*⟩ has the invisible ⟨mathematics⟩ as its seed, and since, without the reasoning of the invisible ⟨mathematics⟩, problems can hardly be understood (i.e., solved) ⟨even by intelligent persons and⟩ not at all by less-intelligent persons, I speak about the operations with seeds.'

Cf. Q2, 73, 94, and Q15

3ab: Addition.

Let a and b be positive numbers. Then

$$a+b=a+b,\quad \dot{a}+\dot{b}=\dot{\overbrace{a+b}},$$

$$a+\dot{b}=\begin{cases} a-b & (b<a) \\ \dot{\overbrace{b-a}} & (a<b) \end{cases},\quad \dot{a}+b=\begin{cases} \dot{\overbrace{a-b}} & (b<a) \\ b-a & (a<b). \end{cases}$$

E1:

1. $\dot{3}+\dot{4}=\dot{7}$. 2. $3+4=7$. 3. $3+\dot{4}=\dot{1}$. 4. $\dot{3}+4=1$.

3cd: Subtraction.

Let a and b be positive numbers. Then

$$a-b=a+\dot{b},\quad \dot{a}-\dot{b}=\dot{a}+b,\quad a-\dot{b}=a+b,\quad \dot{a}-b=\dot{a}+\dot{b}.$$

To these the rule for the sum (3ab) is applied.

E2ab:
1. $3 - 2 = 1$. 2. $\overset{\bullet}{3} - \overset{\bullet}{2} = \overset{\bullet}{1}$. 3. $3 - \overset{\bullet}{2} = 5$. 4. $\overset{\bullet}{3} - 2 = \overset{\bullet}{5}$.

4a: Multiplication.
Let a and b be positive numbers. Then

$$a \times b = ab, \quad \overset{\bullet}{a} \times \overset{\bullet}{b} = ab, \quad a \times \overset{\bullet}{b} = \overset{\bullet}{\widehat{ab}}, \quad \overset{\bullet}{a} \times b = \overset{\bullet}{\widehat{ab}}.$$

E2cd:
1. $2 \times 3 = 6$. 2. $\overset{\bullet}{2} \times \overset{\bullet}{3} = 6$. 3. $2 \times \overset{\bullet}{3} = \overset{\bullet}{6}$. 4. $\overset{\bullet}{2} \times 3 = \overset{\bullet}{6}$.

4b: Division.
Let a and b be positive numbers. Then

$$a \div b = a/b, \quad \overset{\bullet}{a} \div \overset{\bullet}{b} = a/b, \quad a \div \overset{\bullet}{b} = \overset{\bullet}{\widehat{a/b}}, \quad \overset{\bullet}{a} \div b = \overset{\bullet}{\widehat{a/b}}.$$

E3:
1. $8 \div 4 = 2$. 2. $\overset{\bullet}{8} \div \overset{\bullet}{4} = 2$. 3. $\overset{\bullet}{8} \div 4 = \overset{\bullet}{2}$. 4. $8 \div \overset{\bullet}{4} = \overset{\bullet}{2}$.

4cd: Square and square-root.
Let a be a positive number. Then

$$a^2 = a^2, \qquad (\overset{\bullet}{a})^2 = a^2,$$

$$\text{square-roots of } a = \sqrt{a} \text{ and } \overset{\bullet}{\sqrt{a}},$$

$$\overset{\bullet}{a} \text{ does not have a square-root.}$$

E4ab: Square.
1. $3^2 = 9$. 2. $\left(\overset{\bullet}{3}\right)^2 = 9$.

E4cd: Square-root.
1. Square-roots of $9 = 3$ and $\overset{\bullet}{3}$. 2. $\overset{\bullet}{9}$ does not have a square-root.

III.1.2 Chapter 2: Six kinds of operations on zero

5ab: Addition and subtraction.
Let a be a positive number. Then

$$a + 0 = 0 + a = a, \quad \overset{\bullet}{a} + 0 = 0 + \overset{\bullet}{a} = \overset{\bullet}{a}, \quad a - 0 = a, \quad \overset{\bullet}{a} - 0 = \overset{\bullet}{a},$$

$$0 - a = \overset{\bullet}{a}, \quad 0 - \overset{\bullet}{a} = a.$$

E5ab:
1. $3+0=0+3=3$. 2. $\overset{\bullet}{3}+0=0+\overset{\bullet}{3}=\overset{\bullet}{3}$. 3. $0+0=0$. 4. $0-3=\overset{\bullet}{3}$. 5. $0-\overset{\bullet}{3}=3$. 6. $0-0=0$.

5cd: Multiplication, division, square, square-root.

Let a be a positive or a negative number. Then

$$0\times a=a\times 0=0,$$
$$0\div a=0,\quad a\div 0=\frac{a}{0}\ \text{(zero-divisor)},$$
$$0^2=0,\quad \sqrt{0}=0.$$

E5cd:
1. $0\times 2=0$. 2. $0\div 3=0$. 3. $3\div 0=\frac{3}{0}$ (zero-divisor). 4. $0^2=0$. 5. $\sqrt{0}=0$.

6: Zero-divisor and God: a simile.

Bhāskara compares the zero-divisor to God (Viṣṇu) for its infinite (ananta) and permanent (acyuta) nature: $\frac{a}{0}\pm b=\frac{a}{0}$. For the story on which this simile is based, see *Mahābhārata*, Poona ed., 6.30.17–19 and 6.31.7–8.

III.1.3 Chapter 3: Six kinds of operations on unknown numbers

Section 3.1: Six kinds of operations on an unknown number

7: Names of the values of unknown numbers.

The relative adverb yāvattāvat and the color names kālaka, nīlaka, pīta, lohita, etc. are employed for designating unknown numbers.

In BG 68p1, Bhāskara refers to additional color names and the consonants, ka etc., to be used for the same purpose. In BG E44p, he says that intelligent persons (matimat) may use the initial letters of the names of the things whose quantities are to be known.

In this appendix, I use x, y, z, etc. for the original unknown numbers of a particular problem and s_1, s_2, s_3, etc. for yāvattāvat, kālaka, nīlaka, etc. If the problem involves only one unknown number, then I use x for the original unknown number and s for yāvattāvat.

8ab: Addition and subtraction.

Of two names (letters) of the same kind (samāna-jāti), the sum or the difference is taken. Two names of different kinds (vibhinna-jāti) stand separately.

For the sake of convenience, I hereafter write '$-a$' in place of $\overset{\bullet}{a}$: for example, '$(x+1)+(2x-8)=3s-7$' in place of '$(x+1)+(2x+\overset{\bullet}{8})=3s+\overset{\bullet}{7}$' (E6.1), and '$2x-(-6x+8)=8s-8$' in place of '$2x-(\overset{\bullet}{6}x+8)=8s+\overset{\bullet}{8}$' (E7cd).

E6: Addition.

1. $(x+1)+(2x-8)=3s-7$. 2. $(-x-1)+(2x-8)=s-9$. 3. $(x+1)+(-2x+8)=-s+9$. 4. $(-x-1)+(-2x+8)=-3s+7$.

E7ab: Addition.

$(3x^2+3)+(-2x)=3s^2-2s+3$.

E7cd: Subtraction.

$2x-(-6x+8)=8s-8$.

8cd–9: Multiplication, division, square, square-root.

A color × rūpas = the color; product of the same color = power (square, cube, etc.) of the color; product of different colors = bhāvita ('what is produced'); apply the rules given in the L to the rest (division, square, square-root).

10: Multiplication by parts (khaṇḍa-guṇanā).

The same algorithm that is given in L 14cd. This algorithm can be used also for the square of unknown numbers and for the multiplication and the square of karaṇīs.

E8: Multiplication.

1. $(5s-1)\times(3s+2)=15s^2+7s-2$. 2. $(-5s+1)\times(3s+2)=-15s^2-7s+2$. 3. $(5s-1)\times(-3s-2)=-15s^2-7s+2$. 4. $(-5s+1)\times(-3s-2)=15s^2+7s-2$.

11: Division.

The same algorithm that is given in L 18ab but worded for the division involving colors (unknown numbers).

Examples in 11p1 (the reverse of E8): 1. $(15s^2+7s-2)\div(3s+2)=(5s-1)$. 2. $(-15s^2-7s+2)\div(3s+2)=(-5s+1)$. 3. $(-15s^2-7s+2)\div(-3s-2)=(5s-1)$. 4. $(15s^2+7s-2)\div(-3s-2)=(-5s+1)$.

E8ef: Square.

$(4s-6)^2=16s^2-48s+36$.

12: Square-root.

Take the square-roots of the squares of colors contained in the given quantity and subtract twice the product of every twos of those roots from the rest. If the given quantity contains a rūpa, take its square-root first.

Example in 12p1 (the reverse of E8ef): the square-root of $(16s^2-48s+36)=4s-6$.

Kṛṣṇa refers to the other root, yā $\dot{4}$ rū 6 or $(-4s+6)$, and Colebrooke includes it in his translation but AMG do not mention it. Of course, Bhāskara knew the existence of two roots of a positive number (cf. BG 4c, 21 and E14cd) but his intention here is to obtain the very root from which the square is obtained in the previous problem (E8ef). See the first sentence of 12p1. For a similar case see E10p5. He attaches

much importance to the intention of the questioner (praṣṭṛ): when there is more than one solution (or more than one expression of solution), he chooses one that has been intended by the questioner. Cf. 'tathā yathā praṣṭur abhīpsitāḥ syuḥ' (BG 17d). Cf. also 18p3 and 20p4.

Section 3.2: Six kinds of operations on more than one color

E9: Addition and subtraction.

1. $(3s_1+5s_2+7s_3)+(-2s_1-3s_2-s_3)=s_1+2s_2+6s_3$. 2. $(3s_1+5s_2+7s_3)-(-2s_1-3s_2-s_3)=5s_1+8s_2+8s_3$.

E10: Multiplication, division, square, square-root.

1. $(-3s_1-2s_2+1s_3+1)\times(-6s_1-4s_2+2s_3+2)=18s_1^2+8s_2^2+2s_3^2+24s_1s_2-12s_1s_3-8s_2s_3-12s_1-8s_2+4s_3+2$. 2. (the reverse of 1) $(18s_1^2+8s_2^2+2s_3^2+24s_1s_2-12s_1s_3-8s_2s_3-12s_1-8s_2+4s_3+2)\div(-3s_1-2s_2+1s_3+1)=-6s_1-4s_2+2s_3+2$. 3. $(-3s_1-2s_2+1s_3+1)^2=9s_1^2+4s_2^2+1s_3^2+12s_1s_2-6s_1s_3-4s_2s_3-6s_1-4s_2+2s_3+1$. 4. (the reverse of 3) the square-root of $(9s_1^2+4s_2^2+s_3^2+12s_1s_2-6s_1s_3-4s_2s_3-6s_1-4s_2+2s_3+1)=-3s_1-2s_2+1s_3+1$. For the choice of this root see the notes under BG 12 above.

III.1.4 Chapter 4: Six kinds of operations on karaṇīs

13–14: Addition and subtraction.

Let ka $c=$ ka $a\pm$ ka b $(a>b)$. Let also ab be a square number and

$$L=a+b,\qquad S=2\sqrt{ab}.$$

Then

$$c=L\pm S.$$

Or, otherwise,

$$c=\left(\sqrt{\frac{a}{b}}\pm 1\right)^2\times b.$$

Multiplication and division. 'One should multiply a square by a square and divide a square by a square.' Since a of 'ka a' is a number in the square power,

$c=ab$	when	ka $c=$ ka $a\times$ ka b
$c=ab^2$	when	ka $c=$ ka $a\times$ rū b
$c=a^2b$	when	ka $c=$ rū $a\times$ ka b
$c=a\div b$	when	ka $c=$ ka $a\div$ ka b
$c=a\div b^2$	when	ka $c=$ ka $a\div$ rū b
$c=a^2\div b$	when	ka $c=$ rū $a\div$ ka b

E11: Addition and subtraction.

1a. ka 2 + ka 8 = ka 18. 1b. ka 8 − ka 2 = ka 2. 2a. ka 3 + ka 27 = ka 48. 2b. ka 27 − ka 3 = ka 12. 3a. ka 3 + ka 7 = ka 3 + ka 7 (set down separately). 3b. ka 7 − ka 3 = ka $\overset{\bullet}{3}$ + ka 7 (set down separately).

E12: Multiplication and division.

1. (ka 3 + rū 5) × (ka 2 + ka 3 + ka 8) = rū 3 + ka 450 + ka 75 + ka 54. 2. (ka 3 + rū 5) × (ka 3 + ka 12 − rū 5), which is solved after the following rule.

15: Special rule for the sign in the conversion of a rūpa to a karaṇī and vice versa:

rū $\overset{\bullet}{a}$ = ka $\overset{\bullet}{(\widehat{a^2})}$, which means, in modern notation, $-a = -\sqrt{a^2}$. I shall write it as '− rū a = − ka a^2.'

Solution of E12.2: (ka 3 + rū 5) × (ka 3 + ka 12 − rū 5) = ka 300 − rū 16. (E12p2)

Ex. 1 for division (the reverse of E12.1) in E12p4. (rū 3 + ka 450 + ka 75 + ka 54) ÷ (ka 2 + ka 3 + ka 8) = rū 5 + ka 3. Ex. 2 for division (the reverse of E12.2) in E12p5. (ka 300 − rū 16) ÷ (ka 3 + ka 12 − rū 5) = ka 3 + rū 5.

In E12p4–p5, the divisions are made by means of the same algorithm that is given in L 18ab. Cf. BG 11 above. Another algorithm for division is given in the next two verses.

16–17: Division by rationalization of the divisor.

'Having made the sign of any optionally chosen karaṇī in the divisor reversed, one should multiply the dividend and the (original) divisor by such an (altered) divisor repeatedly until a single karaṇī is left in the divisor. By that (karaṇī) the karaṇīs in the dividend should be divided. If there are some (karaṇīs) produced by addition (in the answer), they should be decomposed by means of the decomposition rule so that they become the ones desired by the questioner.'

The decomposition rule is given in the next verse.

18: Decomposition rule.

If $c = a^2 b$ and $a = a_1 + a_2$, then ka c = ka $a_1^2 b$ + ka $a_2^2 b$.

Ex. 1 for division in 18p1 (the same divisor and dividend as in E12p4). Ex. 2 for division in 18p2 (the same divisor and dividend as in E12p5). Ex. 3 for division in 18p3 (the reverse of E12.1). (rū 3 + ka 450 + ka 75 + ka 54) ÷ (rū 5 + ka 3) = ka 18 + ka 3 = ka 2 + ka 3 + ka 8, where ka 18 is made into ka 2 and ka 8 by means of the decomposition rule.

E13–14ab: Square and square-root.

1. (ka 2 + ka 3 + ka 5)^2 = rū 10 + ka 24 + ka 40 + ka 60. 2. (ka 3 + ka 2)^2 = rū 5 + ka 24. 3. (ka 6 + ka 5 + ka 3 + ka 2)^2 = rū 16 + ka 120 + ka 72 + ka 60 + ka 48 + ka 40 + ka 24. 4. (ka 18 + ka 8 + ka 2)^2 = (ka 72)^2 = ka 5184. 5 (the reverse of 4). Square-root of ka 5184 = rū 72.

For the square, Bhāskara refers to a slightly modified algorithm of L 19 and to the algorithm of BG 10.

19–20: Square-root.

Suppose that the square-root of rū r_0 + ka k_1 + ka k_2 + ⋯ + ka k_n is required. 1) Find a_1 such that $r_0^2 - \sum_j k_j = a_1^2$ for some k_j's and obtain $r_1 = \frac{r_0+a_1}{2}$ and $\ell_1 = \frac{r_0-a_1}{2}$. 2) If there remain k_i's, find a_2 from r_1 (which is assumed to be a rūpa) and the remaining k_i's in the same way and obtain $r_2 = \frac{r_1+a_2}{2}$ and $\ell_2 = \frac{r_1-a_2}{2}$. 3) If there still remain k_i's, repeat the same until all the original k_i's are exhausted. Let r_m and ℓ_m be the last pair obtained. Then, ka ℓ_1 + ka ℓ_2 + ⋯ + ka ℓ_m + ka r_m is the square-root of the given quantity.

Ex. 1 in 20p1 (the reverse of E13–14ab.1). Square-root of rū 10 + ka 24 + ka 40 + ka 60 = ka 2 + ka 3 + ka 5. Ex. 2 in 20p2 (the reverse of E13–14ab.2). Square-root of rū 5 + ka 24 = ka 3 + ka 2. Ex. 3 in 20p3 (the reverse of E13–14ab.3). Square-root of rū 16 + ka 120 + ka 72 + ka 60 + ka 48 + ka 40 + ka 24 = ka 6 + ka 5 + ka 3 + ka 2. Ex. 4 in 20p4 (the reverse of E13–14ab.4). Square-root of rū 72 = ka 2 + ka 8 + ka 18.

21: Rule for the square-root of a number containing negative karaṇīs.

If the given number contains negative karaṇīs, then assume them to be positive, apply the above rule (BG 19–20), and at each step make either r_i or ℓ_i, as the case might be, negative.

E14cd: Square and square-root.

1. (−ka 3 + ka 7)^2 = rū 10 − ka 84. 2. (ka 3 − ka 7)^2 = rū 10 − ka 84. 3 (the reverse of 1 and 2). Square-root of rū 10 − ka 84 = −ka 3 + ka 7 or ka 3 − ka 7.

E15: Square and square-root.

1. (ka 2 + ka 3 − ka 5)^2 = rū 10 + ka 24 − ka 40 − ka 60. 2. (−ka 2 − ka 3 + ka 5)^2 = rū 10 + ka 24 − ka 40 − ka 60. 3 (the reverse of 1 and 2). Square-root of rū 10 + ka 24 − ka 40 − ka 60 = ka 2 + ka 3 − ka 5 or −ka 2 − ka 3 + ka 5.

22–25: The number of karaṇīs in a square number and the properties of the pairs obtained at each step of the square-root procedure (BG 19–20).

1. In the following table, A is the number of karaṇīs in a certain composite karaṇī, B the number of karaṇīs in its square, and C the number of karaṇīs to be subtracted from the square of the rūpa at each step of the square-root procedure.

A	2	3	4	5	6	...	n	...
B	1	3	6	10	15	...	$\frac{n(n-1)}{2}$	...
C	⟨1⟩	2	3	4	5	...	$(n-1)$	...

B is the number of possible combinations when two things (karaṇīs) are taken at a time from n things (karaṇīs in the root), a number which is equal to the sum of natural series (called saṃkalita) up to $(n-1)$. If B and C do not match, then the

root obtained is not correct (na sat).

2. All the karaṇīs (k_j's) that are subtracted from the square of the rūpa at the i-th step of the square-root procedure are divisible by $4\ell_i$, and every ka $k_j/4\ell_i$ is part of the root. If not, the root obtained is incorrect (asat).

For Bhāskara's rules for the number of combinations and for the sum of natural series, see L 112–114 and 117ab, respectively.

E16: Non existence of square-root.

There is no square-root in karaṇīs (karaṇī-gata-mūla-abhāva) of rū 10 + ka 32 + ka 24 + ka 8.

E17: Non existence of square-root.

There is no square-root in karaṇīs of rū 10 + ka 60 + ka 52 + ka 12.

E18: Non existence of square-root.

There is no square-root in karaṇīs of rū 10 + ka 8 + ka 56 + ka 60.

E19: Non existence of square-root.

There is no square-root in karaṇīs of rū 13 + ka 48 + ka 60 + ka 20 + ka 44 + ka 32 + ka 24.

In E19p Bhāskara remarks that in these problems one should obtain an approximate square-root (āsanna-mūla) of each karaṇī, add them to the rūpa, and tell an (approximate) square-root.

E20: Slight alteration of the square-root procedure (BG 19–20).

Square-root of rū 17 + ka 40 + ka 80 + ka 200 = ka 10 + ka 5 + ka 2. In this problem one should assume ℓ_1 (instead of r_1) to be the rūpa of the next step.

III.1.5 Chapter 5: Kuṭṭaka

In this chapter, linear indeterminate equations of the type $y = \frac{ax+c}{b}$ are solved. I express these equations by KU $(a, b, c)\,[y, x]$. KU $(a, b, c)\,[d, e]$ means $(y, x) = (d, e)$ are solutions of KU $(a, b, c)\,[y, x]$.

26–27=L 242–243: Preliminaries.

1. The dividend a, the divisor b, and the additive c should be reduced by the reducer (apavartana) or the greatest common factor, if possible. 2. If c cannot be divided by a common factor of a and b, the problem is wrong. 3. How to find the reducer of a and b: when they are mutually divided, the last remainder is the reducer (the so-called Euclidean algorithm). 4. The dividend a and the divisor b reduced by that reducer are called 'firm' (dṛḍha), that is to say, mutually prime.

28–29=L 244–245: Main rule.

1. Divide the 'firm' a and b mutually. That is, put b below a, divide a by b, and put the remainder r_1 below b and the quotient q_1 to the left of it. Then, divide b by r_1, and put the remainder r_2 below r_1 and the quotient q_2 to the left of it. The dividend at each step may have been deleted after the division. Continue this until unity is obtained as a remainder. The following is the case where $r_4 = 1$.

$$\begin{array}{ll} a & \\ b & \\ q_1\ r_1 & \Leftarrow :\ a = bq_1 + r_1 \\ q_2\ r_2 & \Leftarrow :\ b = r_1q_2 + r_2 \\ q_3\ r_3 & \Leftarrow :\ r_1 = r_2q_3 + r_3 \\ q_4\ \ 1 & \Leftarrow :\ r_2 = r_3q_4 + 1 \end{array}$$

I express the mutual divisions (paraspara-bhajana) with the quotients and the remainders by $\mathrm{PB}\begin{bmatrix} a\ b\ r_1\ r_2\ r_3\ 1 \\ \quad q_1\ q_2\ q_3\ q_4 \end{bmatrix}$.

2. Delete the right column and put the additive c below the last quotient and a zero below it. The column obtained is called vallī or a creeper.

$$\begin{array}{c} q_1 \\ q_2 \\ q_3 \\ q_4 \\ c \\ 0 \end{array}$$

I express the vallī by $\mathrm{Vall}(q_1, q_2, \ldots, c, 0)$.

3. To this vallī apply the following procedure repeatedly until the number of its terms becomes two. 'Multiply the third term from the bottom by the penultimate, add the last to the product, and delete the last.'

$$\begin{array}{c} \beta \\ \alpha \end{array}$$

I express this procedure by '>>' as $\mathrm{Vall}(q_1, q_2, \ldots, c, 0) >> \mathrm{Vall}(\beta, \alpha)$.

4. 'Pare' or reduce, if possible, β and α by means of the modulo operations mod a and mod b, respectively. Then, $(y, x) = (\beta, \alpha)$ are the least positive solutions of $\mathrm{KU}\,(a, b, c)\,[y, x]$. This is the case where the number of the quotients of the mutual divisions $(q_1, q_2, \ldots)$ is even as in the above. For the other case see the next verse.

30=L 246: Additional rule 1. When the number of quotients is odd.

When the number of the quotients is odd, $\mathrm{KU}\,(a, b, c)\,[a - \beta, b - \alpha]$.

31=L 248: Additional rule 2. When a and c or b and c are reduced.

1. When $a = a'p$ and $c = c'p$, if $\mathrm{KU}\,(a', b, c')\,[\beta, \alpha]$, then $\mathrm{KU}\,(a, b, c)\,[p\beta, \alpha]$.
2. When $b = b'p$ and $c = c'p$, if $\mathrm{KU}\,(a, b', c')\,[\beta, \alpha]$, then $\mathrm{KU}\,(a, b, c)\,[\beta, p\alpha]$.

32≈L 250: Additional rule 3. When the sign of a or c is reversed. Quotients of modulo operations.

1. If KU (a, b, c) $[\beta, \alpha]$, then KU $(a, b, -c)$ $[a - \beta, b - \alpha]$.
2. If KU (a, b, c) $[\beta, \alpha]$, then KU $(-a, b, c)$ $[-(a - \beta), b - \alpha]$.
3. At step 4 of the main rule (BG 28–29), the quotients of the two modulo operations must be the same.

The L does not have a parallel to 32cd (2nd item of additional rule 3).

33=L 252: Additional rule 4. When c is pared down by b.

When $c = bp + c'$, if KU $(a, b, \pm c')$ $[\beta, \alpha]$, then KU $(a, b, \pm c)$ $[\beta \pm p, \alpha]$.

34: Additional rule 5. When both a and c are pared down by b.

When $a = bp_1 + a'$ and $c = bp_2 + c'$, if KU (a', b, c') $[\beta, \alpha]$, then KU (a, b, c) $[(a\alpha + c)/b, \alpha]$.

The L does not have this verse (additional rule 5).

35=L 254: Additional rule 6. When c is divisible by b.

When $c = 0$ or $c = bp$, KU (a, b, c) $[p, 0]$ (if $c = 0$, then $p = 0$).

36ab=L 256: Additional rule 7. General solution.

If KU (a, b, c) $[\beta, \alpha]$, then KU (a, b, c) $[\beta + ak, \alpha + bk]$.

Hereafter, I use abbreviation AR for 'additional rule.'

E21=L 247: KU $(221, 195, 65)$ $[y, x]$.

PB$\left[\begin{smallmatrix} 221 & 195 & 26 & 13 & 0 \\ & & 1 & 7 & 2 \end{smallmatrix}\right]$. Hence follows the 'reducer' (the greatest common factor) 13. The equation reduced by 13: KU $(17, 15, 5)$ $[y, x]$. PB$\left[\begin{smallmatrix} 17 & 15 & 2 & 1 \\ & & 1 & 7 \end{smallmatrix}\right]$. Vall(1, 7, 5, 0) >> Vall(40, 35). By paring, the least positive solution is obtained: KU $(17, 15, 5)$ $[6, 5]$. By AR 7, other solutions, KU $(17, 15, 5)$ $[23, 20]$, KU $(17, 15, 5)$ $[40, 35]$, etc. are obtained.

E22=L 249: KU $(100, 63, \pm 90)$ $[y, x]$.

1. KU $(100, 63, 90)$ $[y, x]$.

Solution 1. PB$\left[\begin{smallmatrix} 100 & 63 & 37 & 26 & 11 & 4 & 3 & 1 \\ & & 1 & 1 & 1 & 2 & 2 & 1 \end{smallmatrix}\right]$. Vall(1, 1, 1, 2, 2, 1, 90, 0) >> Vall(2430, 1530). By paring, KU $(100, 63, 90)$ $[30, 18]$. (E22p1)

Solution 2. Reduce the dividend and the additive by 10, KU $(10, 63, 9)$ $[y, x]$. PB$\left[\begin{smallmatrix} 10 & 63 & 10 & 3 & 1 \\ & & 0 & 6 & 3 \end{smallmatrix}\right]$. Vall(0, 6, 3, 9, 0) >> Vall(27, 171). By paring, $(7, 45)$. By AR 1, $(y, x) = (10, 63) - (7, 45) = (3, 18)$, or KU $(10, 63, 9)$ $[3, 18]$. The multiplier 18 is accepted also for the original equation and $y = (100 \cdot 18 + 90)/63 = 30$. That is, KU $(100, 63, 90)$ $[30, 18]$. Or, otherwise, by AR 2.1, KU $(100, 63, 90)$ $[30, 18]$. (E22p2)

Solution 3. Reduce the divisor and the additive by 9, KU $(100, 7, 10)$ $[y, x]$. PB$\left[\begin{smallmatrix} 100 & 7 & 2 & 1 \\ & & 14 & 3 \end{smallmatrix}\right]$. Vall(14, 3, 10, 0) >> Vall(430, 30). By paring, $(30, 2)$. Therefore, by AR 2.2, KU $(100, 63, 90)$ $[30, 18]$. (E22p3)

Solution 4. Reduce the divisor and the additive by 9 and then the dividend and the additive by 10, KU $(10, 7, 1)\,[y, x]$. PB$\left[\begin{smallmatrix}10&7&3&1\\&&1&2\end{smallmatrix}\right]$. Vall(1, 2, 1, 0) >> Vall(3, 2). By AR 2.1 and 2.2, KU $(100, 63, 90)\,[30, 18]$. By AR 7, $(y, x) = (130, 81)$, (230,144), etc. are also solutions. (E22p4)

2. KU $(100, 63, -90)\,[y, x]$. From KU $(100, 63, 90)\,[30, 18]$ obtained above, by AR 3.1, KU $(100, 63, -90)\,[70, 45]$. By AR 7, $(y, x) = (170, 108)$, (270, 171), etc. are also solutions. (E22p5)

E23≈L 251: KU $(-60, 13, \pm 3)\,[y, x]$.

1. Solution of KU $(-60, 13, 3)\,[y, x]$. PB$\left[\begin{smallmatrix}60&13&8&5&3&2&1\\&&4&1&1&1&1\end{smallmatrix}\right]$. Vall(4, 1, 1, 1, 1, 3, 0) >> Vall(69, 15). By paring, (9, 2). By AR 1, $(60, 13) - (9, 2) = (51, 11)$. That is, KU $(60, 13, 3)\,[51, 11]$. By AR 3.2, KU $(-60, 13, 3)\,[-9, 2]$.

2. Solution of KU $(-60, 13, -3)\,[y, x]$. From KU $(-60, 13, 3)\,[-9, 2]$ obtained above, by AR 3.1, KU $(-60, 13, -3)\,[-51, 11]$.

The corresponding verse in the L (251) gives a slightly different problem with the positive dividend 60: KU $(60, 13, \pm 16)\,[y, x]$.

In E23p2, Bhāskara cites two verses for supplementary rules. One (Q1) is of his own (BG 32cd) but the other (Q0) has not been identified.

Q0: Supplementary rule 1. When the signs of both a and c are reversed, or that of b or of c is reversed.

1. If KU $(a, b, c)\,[\beta, \alpha]$, then KU $(-a, b, -c)\,[-\beta, \alpha]$. (in Q0ab)

2. If KU $(a, b, c)\,[\beta, \alpha]$, then KU $(a, b, -c)\,[a - \beta, b - \alpha]$. This is the same as AR 3.1 (BG 32ab). (in Q0c)

3. If KU $(a, b, c)\,[\beta, \alpha]$, then KU $(a, -b, c)\,[-\beta, \alpha]$. (in Q0d)

Q1 = 32cd: When the sign of a is reversed.

If KU $(a, b, c)\,[\beta, \alpha]$, then KU $(-a, b, c)\,[-(a - \beta), b - \alpha]$.

Note that there are eight possible combinations of the signs of a, b, and c, and that the corresponding solutions other than KU $(a, b, c)\,[\beta, \alpha]$ can be obtained from it. Those seven cases are covered by BG 32 (except ef) and Q0 with overlap as follows (SR = supplementary rule).

KU $(-a, b, c)\,[-(a - \beta), b - \alpha]$	AR 3.2 (32cd = Q1)
KU $(a, -b, c)\,[-\beta, \alpha]$	SR 1.3 (Q0d)
KU $(a, b, -c)\,[a - \beta, b - \alpha]$	AR 3.1 (32ab), SR 1.2 (Q0c)
KU $(-a, -b, c)\,[a - \beta, b - \alpha]$	SR 1.3 (Q0d) from $(-a, b, c)$
KU $(-a, b, -c)\,[-\beta, \alpha]$	SR 1.1 (Q0ab)
KU $(a, -b, -c)\,[-(a - \beta), b - \alpha]$	SR 1.3 (Q0d) from $(a, b, -c)$
KU $(-a, -b, -c)\,[\beta, \alpha]$	SR 1.3 (Q0d) from $(-a, b, -c)$

E24: KU $(18, -11, \pm 10)\,[y, x]$.

1. Solution of KU $(18, -11, 10)$ $[y, x]$. PB$\left[\begin{smallmatrix} 18 & 11 & 7 & 4 & 3 & 1 \\ & & 1 & 1 & 1 & 1 \end{smallmatrix}\right]$. Vall(1, 1, 1, 1, 10, 0) >> Vall(50, 30). By paring, $(y, x) = (14, 8)$. That is, KU $(18, 11, 10)$ $[14, 8]$. Therefore, KU $(18, -11, 10)$ $[-14, 8]$.

2. Solution of KU $(18, -11, -10)$ $[y, x]$. From KU $(18, 11, 10)$ $[14, 8]$ obtained above, by AR 3.1 (or SR 1.2), KU $(18, 11, -10)$ $[4, 3]$. By SR 1.3, KU $(18, -11, -10)$ $[-4, 3]$.

The L does not have this verse (E24).

E25=L 253: KU $(5, 3, \pm 23)$ $[y, x]$.

Solution 1. PB$\left[\begin{smallmatrix} 5 & 3 & 2 & 1 \\ & & 1 & 1 \end{smallmatrix}\right]$. Vall(1, 1, 23, 0) >> Vall(46, 23). By paring with the quotient 7 for both, $(11, 2)$. That is, KU $(5, 3, 23)$ $[11, 2]$. By AR 3.1, KU $(5, 3, -23)$ $[-6, 1]$. For positive solutions, apply AR 7: $(-6, 1) + (5k, 3k) = (-6 + 5k, 1 + 3k)$. When $k = 2$, KU $(5, 3, -23)$ $[4, 7]$. (E25p1)

Solution 2. The additive (23) is pared by the divisor (3), KU $(5, 3, \pm 2)$ $[y', x]$ $(y = y' \pm 7)$. The mutual division is exactly the same as that of solution 1. Vall(1, 1, 2, 0) >> Vall(4, 2). That is, KU $(5, 3, 2)$ $[4, 2]$. By AR 3.1, KU $(5, 3, -2)$ $[1, 1]$. By AR 4, KU $(5, 3, 23)$ $[11, 2]$ and KU $(5, 3, -23)$ $[-6, 1]$. By adding $(5, 3)$ twice to the latter, KU $(5, 3, -23)$ $[4, 7]$. (E25p2)

Solution 3. Both the dividend (5) and the additive (23) are pared by the divisor (3), KU $(2, 3, \pm 2)$ $[y', x]$ $(y = y' + x \pm 7)$. PB$\left[\begin{smallmatrix} 2 & 3 & 2 & 1 \\ & & 0 & 1 \end{smallmatrix}\right]$. Vall(0, 1, 2, 0) >> Vall(2, 2). That is, KU $(2, 3, 2)$ $[2, 2]$. By AR 5, KU $(5, 3, 23)$ $[11, 2]$. ⟨By AR 3.1, KU $(5, 3, -23)$ $[-6, 1]$. By adding $(5, 3)$ twice, KU $(5, 3, -23)$ $[4, 7]$.⟩ (E25p3)

E26=L 255: 1. KU $(5, 13, 0)$ $[y, x]$. 2. KU $(5, 13, 65)$ $[y, x]$.

1. Solution. By AR 6, KU $(5, 13, 0)$ $[0, 0]$.

2. Solution. By AR 6, KU $(5, 13, 65)$ $[5, 0]$. By AR 7, KU $(5, 13, 65)$ $[10, 13]$ etc.

36cd–37ab=L 257: Constant kuṭṭaka.

If KU $(a, b, \pm 1)$ $[\beta, \alpha]$, then KU $(a, b, \pm c)$ $[c\beta, c\alpha]$. If $c\beta > a$ and $c\alpha > b$, then they are pared by a and b, respectively. The word 'constant' (sthira) refers to the fact that the dividend a and the divisor b are kept constant while the additive c varies in this calculation.

In 37abp, Bhāskara illustrates this rule by solving E21: KU $(221, 195, 65)$ $[y, x]$. As before, the equation is reduced by 13: KU $(17, 15, 5)$ $[y, x]$. First solve KU $(17, 15, 1)$ $[y, x]$ as before: KU $(17, 15, 1)$ $[8, 7]$. Then, by the rule of constant kuṭṭaka, KU $(221, 195, 65)$ $[6, 5]$.

From KU $(17, 15, 1)$ $[8, 7]$, by AR 3.1, KU $(17, 15, -1)$ $[9, 8]$. By the above rule, KU $(17, 15, -5)$ $[11, 10]$. (37abp ends here.)

37cd–38=L 258: Constant kuṭṭaka in planetary calculation (graha-gaṇita).

1. Revolutions of a planet and accumulated civil days. Let D be the number of

civil days in a Kalpa (an integer), R the number of revolutions of a planet in a Kalpa (an integer), d the number of accumulated civil days from the beginning of the Kalpa (an integer), and r the number of revolutions of the planet when d civil days have passed. Since $D : R = d : r$, we have $r = \frac{Rd}{D}$. Let the integer part of r be q_1 and the remainder r_1 (which is called the 'residue of revolution'): $\frac{Rd}{D} = q_1 + \frac{r_1}{D}$. Now, the sub-units of the revolution are defined as follows: 1 revolution = 12 zodiacal signs, 1 sign = 30 degrees, 1 degree = 60 minutes, and 1 minute = 60 seconds. The 'residue of revolution' divided by D can be expressed in these sub-units (see the calculations in the left column in the next paragraph): q_2 signs, q_3 degrees, q_4 minutes, q_5 seconds, and the residue of second r_5. That is to say, when d civil days have passed since the beginning of the Kalpa, the planet made q_1 complete revolutions and is located at q_3 degrees, q_4 minutes, q_5 seconds, and the residue of second r_5 in the $(q_2 + 1)$-th sign.

If the 'residue of second' r_5 is given, we can obtain, in order, q_5, q_4, q_3, q_2, q_1, and d by solving the five indeterminate equations in the right column from the bottom upward. As the quotient and multiplier (y, x) of an equation having the subtractive r_i are (q_i, r_{i-1}), the multiplier obtained of that equation shall be the subtractive of the next step.

$$\frac{R}{D} \times d = q_1 + \frac{r_1}{D} \qquad y = \frac{Rx - r_1}{D}$$

$$\frac{r_1}{D} \times 12 = q_2 + \frac{r_2}{D} \qquad y = \frac{12x - r_2}{D}$$

$$\frac{r_2}{D} \times 30 = q_3 + \frac{r_3}{D} \qquad y = \frac{30x - r_3}{D}$$

$$\frac{r_3}{D} \times 60 = q_4 + \frac{r_4}{D} \qquad y = \frac{60x - r_4}{D}$$

$$\frac{r_4}{D} \times 60 = q_5 + \frac{r_5}{D} \qquad y = \frac{60x - r_5}{D}$$

In these kuṭṭaka calculations, the dividends (R, 12, 30, and 60) and the divisor (D) are constant while the remainders (r_i's) vary. Therefore, if one solves in advance $\mathrm{KU}\,(R, D, -1)\,[y, x]$, $\mathrm{KU}\,(12, D, -1)\,[y, x]$, $\mathrm{KU}\,(30, D, -1)\,[y, x]$, and $\mathrm{KU}\,(60, D, -1)\,[y, x]$, then one can easily solve $\mathrm{KU}\,(R, D, -r_1)\,[y, x]$ etc. by the rule of the constant kuṭṭaka (BG 36cd–37ab).

2. Intercalary months and solar days. Let D_s be the number of solar days in a Kalpa (an integer), A the number of intercalary months in a Kalpa (an integer), d_s the number of elapsed solar days (an integer), and a the number of elapsed intercalary months when d_s solar days have gone. Since $D_s : A = d_s : a$, we have $a = \frac{Ad_s}{D_s}$. Let the integer part of a be q_1 and the remainder r_1: $\frac{Ad_s}{D_s} = q_1 + \frac{r_1}{D_s}$. If the 'residue of intercalary month' r_1 is given, the solutions (y, x) of the equation,

$y = \frac{Ax-r_1}{D_s}$, are the number of the completed intercalary months and that of the past solar days (q_1, d_s).

3. Omitted lunar days and lunar days. Let D_m be the number of lunar days in a Kalpa (an integer), U the number of omitted lunar days in a Kalpa (an integer), d_m the number of the past lunar days (an integer), and $u =$ the number of the past omitted lunar days when d_m lunar days have gone. Since $D_m : U = d_m : u$, we have $u = \frac{Ud_m}{D_m}$. Let the integer part of u be q_1 and the remainder r_1: $\frac{Ud_m}{D_m} = q_1 + \frac{r_1}{D_m}$. If the 'residue of omitted lunar day r_1 is given, the solutions (y, x) of the equation, $y = \frac{Ux-r_1}{D_m}$, are the number of the completed omitted lunar days and that of the past lunar days (q_1, d_m).

39=L 259: Contiguous kuṭṭaka.

This is applied to a system of simultaneous indeterminate equations of the type:

$$a_i x = bq_i + r_i \quad (0 \le r_i < b; \;\; i = 1, 2, \ldots, n).$$

Rule. Let $a = a_1 + a_2 + \cdots + a_n$ and $c = r_1 + r_2 + \cdots + r_n$ and apply the kuṭṭaka procedure to KU $(a, b, -c)\,[y, x]$.

Note that a_i is called guṇa (multiplier) in the statements of problmes but bhājya (dividend) in the kuṭṭaka procedure. Cf. GA, praśna 13–14 for 'sphuṭa-kuṭṭaka.'

E27=L 260: $5x = 63q_1 + 7$, $10x = 63q_2 + 14$.

Solution. The two equations are combined: $15x = 63(q_1 + q_2) + 21$, which is equivalent to: $q_1 + q_2 = (15x - 21)/63$. The kuṭṭaka procedure is applied to KU $(15, 63, -21)\,[y, x]$. PB$\begin{bmatrix} 15 & 63 & 15 & 3 & 0 \\ & & 0 & 4 & 5 \end{bmatrix}$. Hence follows the reducer 3. The equation reduced by 3: KU $(5, 21, -7)\,[y, x]$. PB$\begin{bmatrix} 5 & 21 & 5 & 1 \\ & & 0 & 4 \end{bmatrix}$. Vall(0, 4, 7, 0) >> Vall(7, 28). By paring, (2, 7). That is, KU $(5, 21, 7)\,[2, 7]$. By AR 3.1, KU $(5, 21, -7)\,[3, 14]$. Therefore, $x = 14$ is a solution.

III.1.6 Chapter 6: Varga-prakṛti

Section 6.1: Varga-prakṛti

This chapter treats the indeterminate equation, $px^2 + t = y^2$. The coefficient p is called prakṛti (natural form) and the procedure for solution varga-prakṛti (naural form of square). I express the equation by VP $(p)\,[x, y, t]$; VP $(p)\,[\alpha, \beta, \gamma]$ means that $(x, y, t) = (\alpha, \beta, \gamma)$ is a set of solutions of VP $(p)\,[x, y, t]$.

40: Rule 1. Trial method.

Given p, find out a set of solution VP $(p)\,[\alpha, \beta, \gamma]$ by trial and error.

41–43: Rule 2. Generative method (bhāvanā).

Given two sets of solutions, VP $(p)\,[\alpha_1, \beta_1, \gamma_1]$ and VP $(p)\,[\alpha_2, \beta_2, \gamma_2]$,

$$\alpha_3 = \mid \alpha_1\beta_2 \pm \alpha_2\beta_1 \mid, \quad \beta_3 = \mid p\alpha_1\alpha_2 \pm \beta_1\beta_2 \mid, \quad \gamma_3 = \gamma_1\gamma_2$$

is another set of solutions of $\mathrm{VP}\,(p)\,[x, y, t]$. This procedure is called bhāvanā or generative method. The bhāvanā with the plus sign is called the generative method by sum (samāsa-bhāvanā) and that with the negative sign the generative method by difference (antara-bhāvanā). When $\alpha_1 = \alpha_2$, $\beta_1 = \beta_2$, and $\gamma_1 = \gamma_2$, it is called the generative method ⟨by sum⟩ with equals (tulya-bhāvanā). I express the procedure of the generative method by

$$\mathrm{BH}^{\pm}(p) \begin{bmatrix} \alpha_1 & \beta_1 & \gamma_1 \\ \alpha_2 & \beta_2 & \gamma_2 \end{bmatrix} = \mathrm{VP}\,(p)\,[\alpha_3, \beta_3, \gamma_3]\,.$$

44: Rule 3. Reduction and multiplication.

Given $\mathrm{VP}\,(p)\,[\alpha, \beta, \gamma]$, then $\mathrm{VP}\,(p)\,[\alpha/a, \beta/a, \gamma/a^2]$ and $\mathrm{VP}\,(p)\,[a\alpha, a\beta, a^2\gamma]$ for any optional a.

45–**46ab:** Rule 4. Rational solutions of $\mathrm{VP}\,(p)\,[x, y, 1]$.

$\mathrm{VP}\,(p)\left[\frac{2a}{|p-a^2|}, \beta, 1\right]$ for any optional a. 'Infinite ⟨sets of solutions can be obtained⟩ by means of the generative method (rule 2) and by optionally chosen numbers.'

As for β, the verses simply say that 'the greater ⟨root should be calculated⟩ from it.' It may be expressed as: $\beta = \frac{p+a^2}{|p-a^2|}$.

E28: 1. $\mathrm{VP}\,(8)\,[x, y, 1]$. 2. $\mathrm{VP}\,(11)\,[x, y, 1]$.

1. Solution of $\mathrm{VP}\,(8)\,[x, y, 1]$. By rule 1 (trial and error), $\mathrm{VP}\,(8)\,[1, 3, 1]$. By rule 2 (generative method with equals), $\mathrm{BH}^{+}(8) \left[\begin{smallmatrix} 1 & 3 & 1 \\ 1 & 3 & 1 \end{smallmatrix}\right] = \mathrm{VP}\,(8)\,[6, 17, 1]$. By rule 2 (generative method by sum), $\mathrm{BH}^{+}(8) \left[\begin{smallmatrix} 1 & 3 & 1 \\ 6 & 17 & 1 \end{smallmatrix}\right] = \mathrm{VP}\,(8)\,[35, 99, 1]$. Likewise, infinite solutions of $\mathrm{VP}\,(8)\,[x, y, 1]$ can be obtained. (E28p1)

2. Solution of $\mathrm{VP}\,(11)\,[x, y, 1]$. By rule 1, $\mathrm{VP}\,(11)\,[1, 3, -2]$. By rule 2, $\mathrm{BH}^{+}(11) \left[\begin{smallmatrix} 1 & 3 & -2 \\ 1 & 3 & -2 \end{smallmatrix}\right] = \mathrm{VP}\,(11)\,[6, 20, 4]$. By rule 3, $\mathrm{VP}\,(11)\,[3, 10, 1]$. By rule 2, $\mathrm{BH}^{+}(11) \left[\begin{smallmatrix} 3 & 10 & 1 \\ 3 & 10 & 1 \end{smallmatrix}\right] = \mathrm{VP}\,(11)\,[60, 199, 1]$. Likewise, infinite solutions of $\mathrm{VP}\,(11)\,[x, y, 1]$ can be obtained. (E28p2)

3. Another solution of $\mathrm{VP}\,(11)\,[x, y, 1]$. By rule 1, $\mathrm{VP}\,(11)\,[1, 4, 5]$. By rule 2, $\mathrm{BH}^{+}(11) \left[\begin{smallmatrix} 1 & 4 & 5 \\ 1 & 4 & 5 \end{smallmatrix}\right] = \mathrm{VP}\,(11)\,[8, 27, 25]$. By rule 3, $\mathrm{VP}\,(11)\left[\frac{8}{5}, \frac{27}{5}, 1\right]$. By rule 2, $\mathrm{BH}^{+}(11) \left[\begin{smallmatrix} 8/5 & 27/5 & 1 \\ 3 & 10 & 1 \end{smallmatrix}\right] = \mathrm{VP}\,(11)\left[\frac{161}{5}, \frac{534}{5}, 1\right]$; or, by difference, $\mathrm{BH}^{-}(11) \left[\begin{smallmatrix} 8/5 & 27/5 & 1 \\ 3 & 10 & 1 \end{smallmatrix}\right] = \mathrm{VP}\,(11)\left[\frac{1}{5}, \frac{6}{5}, 1\right]$. Likewise, may solutions of $\mathrm{VP}\,(11)\,[x, y, 1]$ can be obtained. (E28p3)

4. By means of rule 4. With $a = 3$, rule 4 brings the solutions, $\mathrm{VP}\,(8)\,[6, 17, 1]$ (cf. 1 above) and $\mathrm{VP}\,(11)\,[3, 10, 1]$ (cf. 2 above). Likewise, infinite solutions of both equations can be obtained by means of rule 4 with the optional number a or by means of the generative method (rule 2) with sum or difference from the already obtained solutions. (E28p4)

Section 6.2: Cakravāla

46cd–50ab: Rule 5. Cakravāla (cyclic) method for solving VP $(p)\,[x, y, 1]$.

Given VP $(p)\,[\alpha_0, \beta_0, \gamma_0]$, let KU $(\alpha_0, \gamma_0, \beta_0)\,[n, m]$. Then VP $(p)\,[\alpha_1, \beta_1, \gamma_1]$, where

$$\alpha_1 = n, \quad \gamma_1 = \frac{m^2 - p}{\gamma_0}, \quad \beta_1 = \sqrt{p\alpha_1^2 + \gamma_1}.$$

If one repeats this procedure, choosing at each step such m that makes $\mid m^2 - p \mid$ smallest, then one arrives at VP $(p)\,[\alpha_k, \beta_k, \gamma_k]$ with $\gamma_k = \pm 4$, ± 2, or ± 1. For the cases other than $\gamma_k = 1$, apply rule 2 and/or rule 3 to obtain solutions of VP $(p)\,[x, y, 1]$. Hereafter I use the notation, $g(m) =\mid m^2 - p \mid$.

E29: 1. VP $(67)\,[x, y, 1]$. 2. VP $(61)\,[x, y, 1]$.

1. Solution of VP $(67)\,[x, y, 1]$.

1.1. Since VP $(67)\,[1, 8, -3]$ by rule 1, KU $(1, -3, 8)\,[y, x]$ is to be solved. Reverse the sign of the divisor: KU $(1, 3, 8)\,[y', x]$. Pare the additive by the divisor: KU $(1, 3, 2)\,[y'', x]$. Then, PB$\left[\begin{smallmatrix} 1 & 3 & 1 \\ & & 0 \end{smallmatrix}\right]$ and Vall(0, 2, 0) >> Vall(0, 2). By AR 1, KU $(1, 3, 2)\,[1, 1]$. By AR 4, KU $(1, 3, 8)\,[3, 1]$. By SR 1.3, KU $(1, -3, 8)\,[-3, 1]$. By AR 7, KU $(1, -3, 8)\,[-3 + k, 1 - 3k]$. When $k = -2$, KU $(1, -3, 8)\,[-5, 7]$ and $g(7) = 18$ is the smallest. When $m = 7$, $\gamma_1 = (m^2 - p)/\gamma_0 = (7^2 - 67)/(-3) = 6$; $\alpha_1 = n = -5$, whose sign is reversed, 5; and $\beta_1 = \sqrt{p\alpha_1^2 + \gamma_1} = 41$. Hence follows VP $(67)\,[5, 41, 6]$. (E29p1)

1.2. KU $(5, 6, 41)\,[y, x]$ is to be solved. PB$\left[\begin{smallmatrix} 5 & 6 & 5 & 1 \\ & & 0 & 1 \end{smallmatrix}\right]$. Vall(0, 1, 41, 0) >> Vall(41, 41). By paring, $(11, 5)$, that is, KU $(5, 6, 41)\,[11, 5]$. By AR 7, KU $(5, 6, 41)\,[11 + 5k, 5 + 6k]$. When $k = 0$, KU $(5, 6, 41)\,[11, 5]$ and $g(5) = 42$ is the smallest. When $m = 5$, $\gamma_2 = (m^2 - p)/\gamma_1 = (5^2 - 67)/6 = -7$; $\alpha_2 = n = 11$; and $\beta_2 = \sqrt{p\alpha_2^2 + \gamma_2} = 90$. Hence follows VP $(67)\,[11, 90, -7]$. (E29p2)

1.3. KU $(11, -7, 90)\,[y, x]$ is to be solved. Reverse the sign of the divisor: KU $(11, 7, 90)\,[y', x]$. Pare the additive by the divisor: KU $(11, 7, 6)\,[y'', x]$. Then, PB$\left[\begin{smallmatrix} 11 & 7 & 4 & 3 & 1 \\ & & 1 & 1 & 1 \end{smallmatrix}\right]$ and Vall(1, 1, 1, 6, 0) >> Vall(18, 12). By paring, $(7, 5)$. By AR 1, KU $(11, 7, 6)\,[4, 2]$, KU $(11, 7, 90)\,[16, 2]$, and KU $(11, -7, 90)\,[-16, 2]$. By AR 7, KU $(11, -7, 90)\,[-16 + 11k, 2 - 7k]$. When $k = -1$, $(y, x) = (-27, 9)$ and $g(9) = 14$ is the smallest. When $m = 9$. Then, $\gamma_3 = (m^2 - p)/\gamma_2 = (9^2 - 67)/(-7) = -2$; $\alpha_3 = n = -27$, whose sign is reversed, 27; and $\beta_3 = \sqrt{p\alpha_3^2 + \gamma_3} = 221$. Hence follows VP $(67)\,[27, 221, -2]$. (E29p3)

1.4. By rule 2, BH$^+(67)\left[\begin{smallmatrix} 27 & 221 & -2 \\ 27 & 221 & -2 \end{smallmatrix}\right]$ = VP $(67)\,[11934, 97684, 4]$. By rule 3, VP $(67)\,[5967, 48842, 1]$. (E29p4)

2. Solution of VP $(61)\,[x, y, 1]$.

2.1. Since VP $(61)\,[1, 8, 3]$ by rule 1, KU $(1, 3, 8)\,[y, x]$ is to be solved. Pare the additive by the divisor: KU $(1, 3, 2)\,[y', x]$. Then, Vall(0, 2, 0) >> Vall(0, 2). By AR 1, KU $(1, 3, 2)\,[1, 1]$. By AR 4, KU $(1, 3, 8)\,[3, 1]$. By AR 7, KU $(1, 3, 8)\,[3 + k, 1 + 3k]$. When $k = 2$, KU $(1, 3, 8)\,[5, 7]$ and $g(7) = 12$ is the smallest. When $m = 7$, $\gamma_1 =$

$(m^2-p)/\gamma = (7^2-61)/3 = -4$; $\alpha_1 = n = 5$; and $\beta_1 = \sqrt{p\alpha_1^2+\gamma_1} = 39$. Hence follows VP (61) $[5, 39, -4]$. (E29p5)

2.2. By rule 3, VP (61) $[5/2, 39/2, -1]$. By rule 2,

$$\mathrm{BH}^+(61)\begin{bmatrix}5/2 & 39/2 & -1\\ 5/2 & 39/2 & -1\end{bmatrix} = \mathrm{VP}\,(61)\left[\frac{195}{2}, \frac{1523}{2}, 1\right]. \quad \text{(E29p6)}$$

2.3. By rule 2,

$$\mathrm{BH}^+(61)\begin{bmatrix}195/2 & 1523/2 & 1\\ 5/2 & 39/2 & -1\end{bmatrix} = \mathrm{VP}\,(61)\,[3805, 29718, -1].$$

By rule 2,

$$\mathrm{BH}^+(61)\begin{bmatrix}3805 & 29718 & -1\\ 3805 & 29718 & -1\end{bmatrix} = \mathrm{VP}\,(61)\,[226153980, 1766319049, 1]. \quad \text{(E29p7)}$$

50cd–52ab: Rule 6. Solubility of VP $(p)\,[x, y, -1]$.

1. If p is not the sum of two square numbers, then VP $(p)\,[x, y, -1]$ does not have a solution.

2. If p is the sum of two square numbers, say a^2 and b^2, then VP $(p)\,[1/a, \beta, -1]$ and VP $(p)\,[1/b, \beta, -1]$, where $\beta = \sqrt{p(1/a)^2-1} = b/a$ and $\beta = \sqrt{p(1/b)^2-1} = a/b$, respectively; or, otherwise VP $(p)\,[x, y, -1]$ may be solved by rule 1 (trial and error).

E30: 1. VP (13) $[x, y, -1]$. 2. VP (8) $[x, y, -1]$.

1. Solution of VP (13) $[x, y, -1]$.

1.1. As $13 = 2^2 + 3^2$, by rule 6.2, VP (13) $\left[\frac{1}{2}, \frac{3}{2}, -1\right]$ and VP (13) $\left[\frac{1}{3}, \frac{2}{3}, -1\right]$. (E30p1)

1.2. Or, otherwise, by rule 1, VP (13) $[1, 3, -4]$. By rule 3, VP (13) $\left[\frac{1}{2}, \frac{3}{2}, -1\right]$. Likewise, by rule 1, VP (13) $[1, 2, -9]$. By rule 3, VP (13) $\left[\frac{1}{3}, \frac{2}{3}, -1\right]$. (E30p2)

1.3. For integer solutions, the cyclic method is used. Since VP (13) $\left[\frac{1}{2}, \frac{3}{2}, -1\right]$ from above, KU $\left(\frac{1}{2}, -1, \frac{3}{2}\right)[y, x]$ is to be solved. By 'reducing' (apavartya) the dividend and the divisor by the common factor $\frac{1}{2}$, KU $(1, -2, 3)\,[y, x]$. Reverse the sign of the divisor: KU $(1, 2, 3)\,[y', x]$. Pare the additive by the divisor: KU $(1, 2, 1)\,[y'', x]$. Then, Vall(0, 1, 0) >> Vall(0, 1). By AR 1, KU $(1, 2, 1)\,[1, 1]$, KU $(1, 2, 3)\,[2, 1]$, and KU $(1, -2, 3)\,[-2, 1]$. By AR 7, KU $(1, -2, 3)\,[-2 + k, 1 - 2k]$. When $k = 0$, KU $(1, -2, 3)\,[-2, 1]$ and $g(1) = 12$, which is not the least. When $k = -1$, $x = 3$ and $g(3) = 4$, which is the least. When $m = 3$, $\gamma_1 = (m^2-p)/\gamma_0 = (9-13)/(-1) = 4$; $\alpha_1 = n = -3$, whose sign is reversed, 3; and $\beta_1 = \sqrt{13 \times 3^2 + 4} = 11$. Hence follows VP (13) $[3, 11, 4]$. Now, KU $(3, 4, 11)\,[y, x]$ is to be solved. Vall(0, 1, 11, 0) >> Vall(11, 11). By paring, KU $(3, 4, 11)\,[5, 3]$. By AR 7, KU $(3, 4, 11)\,[5 + 3k, 3 + 4k]$. When $k = 0$, $x = 3$ and $g(3) = 4$, which is the smallest. When $m = 3$, $\gamma_2 =$

$(m^2-p)/\gamma_1 = (9-13)/4 = -1$; $\alpha_2 = n = 5$; and $\beta_2 = \sqrt{13\times 5^2-1} = 18$. Hence follows VP (13) $[5, 18, -1]$. This is a set of integer solutions for '$t = -1$'. Infinite solutions of VP (13) $[x, y, -1]$ can be obtained from this set with a set of integer solutions for '+1', which can be obtained by rule 2:

$$\mathrm{BH}^{+}(13)\begin{bmatrix}5 & 18 & -1\\ 5 & 18 & -1\end{bmatrix} = \mathrm{VP}\,(13)\,[180, 649, 1]\,. \quad \text{(E30p3)}$$

2. Solution of VP (8) $[x, y, -1]$. As $8 = 2^2 + 2^2$, by rule 6.2, VP (8) $\left[\frac{1}{2}, 1, -1\right]$. (E30p4)

E31: 1. VP (6) $[x, y, 3]$. 2. VP (6) $[x, y, 12]$. 3. VP (6) $[x, y, 75]$. 4. VP (6) $[x, y, 300]$.

Solution. By rule 1, VP (6) $[1, 3, 3]$. From this, by rule 3 with $a = 2$, VP (6) $[2, 6, 12]$; with $a = 5$, VP (6) $[5, 15, 75]$; and with $a = 10$, VP (6) $[10, 30, 300]$.

52cd–53ab: Rule 7. Infinite solutions of VP (p) $[x, y, \gamma]$.

Once a set of solutions for $t = \gamma$, VP (p) $[\alpha, \beta, \gamma]$, and a set of solutions for $t = 1$, VP (p) $[\alpha_0, \beta_0, 1]$, are obtained somehow by one's own intelligence, then infinite sets of solutions of VP (p) $[x, y, \gamma]$ can be obtained by rule 2 (bhāvanā).

The introduction (52cdp0) says that this rule was intended to show the calculation of roots (solutions) for additive unity but it does not precisely agree with the given rule, although that case is also included as a special case ($\gamma = 1$) .

53cd: Rule 8. A set of solutions of VP (p) $[x, y, t]$ when p is divisible by a square number.

If $p/a^2 = p'$ and VP (p') $[\alpha, \beta, \gamma]$, then VP (p) $[\alpha/a, \beta, \gamma]$.

E32: VP (32) $[x, y, 1]$.

Solution 1. By rule 1, VP (32) $\left[\frac{1}{2}, 3, 1\right]$.

Solution 2. VP (8) $[1, 3, 1]$ by rule 1, and $32 = 8\times 2^2$. Hence, by rule 8, follows VP (32) $\left[\frac{1}{2}, 3, 1\right]$.

54: Rule 9. A set of solutions of VP (p) $[x, y, t]$ when p is a square number.

If $p = a^2$, then for any two numbers, m and $n\,(\neq 0)$,

$$\mathrm{VP}\,(p)\left[\left(\frac{n}{m} - m\right)\div 2\div a, \left(\frac{n}{m} + m\right)\div 2, n\right].$$

E33: 1. VP (9) $[x, y, 52]$. 2. VP (4) $[x, y, 33]$.

1. Solution of VP (9) $[x, y, 52]$. By rule 9 with $m = 2$, VP (9) $[4, 14, 52]$; with $m = 4$, VP (9) $[3/2, 17/2, 52]$.

2. Solution of VP (4) $[x, y, 33]$. By rule 9 with $m = 1$, VP (4) $[8, 17, 33]$; with $m = 3$, VP (4) $[2, 7, 33]$.

E34: 1. $\mathrm{VP}\,(13)\,[x, y, -13]$. 2. $\mathrm{VP}\,(13)\,[x, y, 13]$.

1. Solution of $\mathrm{VP}\,(13)\,[x, y, -13]$. By rule 1, $\mathrm{VP}\,(13)\,[1, 0, -13]$. By rule 4, $\mathrm{VP}\,(13)\left[\frac{3}{2}, \frac{11}{2}, 1\right]$. From this, by rule 2,

$$\mathrm{BH}^{+}(13)\begin{bmatrix} 1 & 0 & -13 \\ 3/2 & 11/2 & 1 \end{bmatrix} = \mathrm{VP}\,(13)\left[\frac{11}{2}, \frac{39}{2}, -13\right].$$

2. Solution of $\mathrm{VP}\,(13)\,[x, y, 13]$. From $\mathrm{VP}\,(13)\left[\frac{1}{2}, \frac{3}{2}, -1\right]$ (cf. E30) and from $\mathrm{VP}\,(13)\,[1, 0, -13]$ and $\mathrm{VP}\,(13)\left[\frac{11}{2}, \frac{39}{2}, -13\right]$ (cf. 1 above), by rule 2,

$$\mathrm{BH}^{\pm}(13)\begin{bmatrix} 1 & 0 & -13 \\ 1/2 & 3/2 & -1 \end{bmatrix} = \mathrm{VP}\,(13)\left[\frac{3}{2}, \frac{13}{2}, 13\right],$$

$$\mathrm{BH}^{+}(13)\begin{bmatrix} 11/2 & 39/2 & -13 \\ 1/2 & 3/2 & -1 \end{bmatrix} = \mathrm{VP}\,(13)\,[18, 65, 13],$$

$$\mathrm{BH}^{-}(13)\begin{bmatrix} 11/2 & 39/2 & -13 \\ 1/2 & 3/2 & -1 \end{bmatrix} = \mathrm{VP}\,(13)\left[\frac{3}{2}, \frac{13}{2}, 13\right].$$

E35: $\mathrm{VP}\,(-5)\,[x, y, 21]$.

Solution. By rule 1, $\mathrm{VP}\,(-5)\,[1, 4, 21]$ and $\mathrm{VP}\,(-5)\,[2, 1, 21]$. Also by rule 1, $\mathrm{VP}\,(-5)\,[1, 2, 9]$. By rule 3 with $a = \frac{1}{3}$, $\mathrm{VP}\,(-5)\left[\frac{1}{3}, \frac{2}{3}, 1\right]$. From this and the first solution, $\mathrm{VP}\,(-5)\,[1, 4, 21]$, by rule 2,

$$\mathrm{BH}^{+}(-5)\begin{bmatrix} 1 & 4 & 21 \\ 1/3 & 2/3 & 1 \end{bmatrix} = \mathrm{VP}\,(-5)\,[2, 1, 21],$$

which is nothing but the second solution. Also by rule 2 (by difference),

$$\mathrm{BH}^{-}(-5)\begin{bmatrix} 1 & 4 & 21 \\ 1/3 & 2/3 & 1 \end{bmatrix} = \mathrm{VP}\,(-5)\left[-\frac{2}{3}, -\frac{13}{3}, 21\right].$$

Reverse the sign of x and y: $\mathrm{VP}\,(-5)\left[\frac{2}{3}, \frac{13}{3}, 21\right]$. Also from $\mathrm{VP}\,(-5)\left[\frac{1}{3}, \frac{2}{3}, 1\right]$ and $\mathrm{VP}\,(-5)\,[2, 1, 21]$ by rule 2,

$$\mathrm{BH}^{+}(-5)\begin{bmatrix} 2 & 1 & 21 \\ 1/3 & 2/3 & 1 \end{bmatrix} = \mathrm{VP}\,(-5)\left[\frac{5}{3}, -\frac{8}{3}, 21\right].$$

Reverse the sign of y: $\mathrm{VP}\,(-5)\left[\frac{5}{3}, \frac{8}{3}, 21\right]$. Also by rule 2 (by difference),

$$\mathrm{BH}^{-}(-5)\begin{bmatrix} 2 & 1 & 21 \\ 1/3 & 2/3 & 1 \end{bmatrix} = \mathrm{VP}\,(-5)\,[1, -4, 21].$$

Reverse the sign of y: $\mathrm{VP}\,(-5)\,[1, 4, 21]$, which is the same as the first solution. Likewise, by rule 2 (bhāvanā) with $\mathrm{VP}\,(-5)\left[\frac{1}{3}, \frac{2}{3}, 1\right]$, a number of solutions of $\mathrm{VP}\,(-5)\,[x, y, 21]$ can be obtained.

55: Concluding remark of the first six chapters.

According to Bhāskara, what have been told in Chapters 1 to 6 are preliminaries to the main topics of the bīja-gaṇita, which he deals with in Chapters 7 to 11.

III.1.7 Chapter 7: Equations in one color

Hereafter, when I express the 'statements of problem,' I use the symbols according to the following principle: x with or without subscripts, y, and z for the unknown numbers whose values are to be obtained, a, b, c, and p for known numbers, q and r with or without subscripts for both known and unknown numbers (esp. for unknown quotients and remainders of divisions), and the rest (u, v, etc. with or without subscripts) for the unknown numbers whose values are not required in the problem.

56–58: Rule for the first seed, one-color equation.

1. Assuming the value (māna) of the unknown quantity (avyakta-rāśi) to be yāvattāvat, make two sides (pakṣas) equal to each other according to the statements of the problem (uddiṣṭa). [samī-karaṇa, 'making equal' or equation]

2. Subtract the unknown of one side from the other side (strictly speaking, from both sides) and the rūpas of that side from the first side (strictly speaking, from both sides). [sama-śodhana, 'subtracting equal things' or equal subtraction]

3. Divide the remaining rūpas by the remaining unknown, and the manifest (vyakta) value of the unknown quantity is produced.

4. If there is more than one unknown quantity in the problem, assume them, except one, to be a multiple of yāvattāvat or its fractional part, or the same increased or deceased by some quantity, or even a known quantity.

In 58p1, Bhāskara gives definitions of the 'quartet of seeds' (bīja-catuṣṭaya): 'The first seed is the equation in one color; the second seed is the equation in more than one color; (the third is) the elimination of the second term where equations of the square etc. of one, two, or more colors occur; (the fourth is) bhāvita where equations of bhāvita occur.' For bhāvita see 8cd–9 above.

E36–37: Properties of two persons in horses and money.

x = price of a horse, u_i = properties of two persons ($i = 1, 2$).

Statements of problem 1. $6x + 300 = u_1$, $10x - 100 = u_2$, and $u_1 = u_2$.

Solution. Let $x = s$ (= yā 1). Then, $6s + 300 (= u_1 = u_2) = 10s - 100$. Subtract $6s$ and -100 from both sides: $400 = 4s$. Divide the remaining rūpas 400 by the remaining unknown 4: $s = 100$. Raised by this, $x = 100$ and $u_1 = u_2 = 900$. (E37p1)

Statements of problem 2. u_i = same as above, and $u_1/2 + 2 = u_2$.

Solution. $3s + 152 = 10s - 100$, $7s = 252$, $s = 36$. Or, otherwise, since $u_1 = (u_2 - 2) \times 2$, $6s + 300 = \{(10s - 100) - 2\} \times 2 = 20s - 204$, $14s = 504$, $s = 36$. Hence follow $x = 36$, $u_1 = 516$, and $u_2 = 260$. (E37p2)

Statements of problem 3. u_i = same as above, and $u_1 = 3u_2$.

Solution. $6s + 300 = 3(10s - 100)$, $6s + 300 = 30s - 300$, $24s = 600$, $s = 25$. When raised by this, $x = 25$, $u_1 = 450$, and $u_2 = 150$. (E37p3)

E38: Properties of two persons in three kinds of gems and money.

x_i = price of a piece of the i-th kind of gems ($i = 1, 2, 3$), u_i = property of the i-th person ($i = 1, 2$).

Statement of problem. $5x_1 + 8x_2 + 7x_3 + 90 = u_1$, $7x_1 + 9x_2 + 6x_3 + 62 = u_2$, and $u_1 = u_2$.

Solution 1. Let $x_1 = 3s$ (= yā 3), $x_2 = 2s$ (= yā 2), and $x_3 = 1s$ (= yā 1). Then, $15s + 16s + 7s + 90 = 21s + 18s + 6s + 62$, $38s + 90 = 45s + 62$, $7s = 28$, $s = 4$. When raised by this, $x_1 = 12$, $x_2 = 8$, $x_3 = 4$, and $u_1 = u_2 = 242$. (E38p1)

Solution 2. Let $x_1 = s$ (= yā 1), $x_2 = 5$, and $x_3 = 3$. Then, $5s + 151 = 7s + 125$, $2s = 26$, and $s = 13$. When raised by this, $x_1 = 13$, $x_2 = 5$, $x_3 = 3$, and $u_1 = u_2 = 216$. (E38p2)

E39: Properties of two persons after mutual donation.

x_i = properties of two persons ($i = 1, 2$).

Statements of problem. $x_1 + 100 = 2(x_2 - 100)$ and $6(x_1 - 10) = x_2 + 10$.

Solution. Let $x_1 = 2s - 100$ and $x_2 = s + 100$. Then, the first statement (ālāpa) is realized (ghaṭate) automatically. From the second statement, $6\{(2s - 100) - 10\} = (s + 100) + 10$, $12s - 660 = s + 110$, $11s = 770$, $s = 70$. When raised by this, $x_1 = 40$ and $x_2 = 170$.

E40: Purchase of three kinds of gems.

x_i = price of the i-th kind of gems ($i = 1, 2, 3$).

Statements of problem. $8x_1 = u$, $10x_2 = u$, $100x_3 = u$, and $x_1 + x_2 + x_3 = 47$.

Solution. Let $u = s$ (= yā 1). Then, $x_1 = s/8$, $x_2 = s/10$, and $x_3 = s/100$. Hence follows $\frac{47}{200}s = 47$. Reduce both sides to a common denominator: $\frac{47}{200}s = \frac{9400}{200}$. Eliminate the denominators: $47s = 9400$. Then, $s = 9400 \div 47 = 200$. When raised by this, $x_1 = 25$, $x_2 = 20$, $x_3 = 2$, $u = 200$, and the total price of all the gems is $3u = 600$. (E40p1)

E40p2 gives the reason why the elimination of the denominators 200's is allowed. It is because the denominators disappear in the process of calculating $s = \frac{9400}{200} \div \frac{47}{200} = \frac{9400}{200} \times \frac{200}{47}$ even if they were not eliminated at that step.

E41=L 55: A flock of bees.

x = the number of bees.

Statement of problem. $\frac{x}{5} + \frac{x}{3} + 3\left(\frac{x}{3} - \frac{x}{5}\right) + 1 = x$.

Solution. Let $x = s$ (= yā 1). Then, $\frac{x}{5} + \frac{x}{3} + 3\left(\frac{x}{3} - \frac{x}{5}\right) = \frac{14}{15}s$. Hence follows $\frac{14}{15}s + 1 = s$, $\frac{14}{15}s + \frac{15}{15} = \frac{15}{15}s$, $14s + 15 = 15s$, $s = 15$. Raised by this, $x = 15$.

In the L, this problem is given as an example for the iṣṭa-karman or 'optional-quantity operation' (L 51).

E42: Equal amounts of interest on different capitals in equal periods.

x_i = two capitals ($i = 1, 2$), y = amounts of interest on the two capitals, z = periods of loan, $r_i\%$ = interest rates ($i = 1, 2$).

Statements of problem. $y = 5x_1z/100$ ($r_1 = 5$), $x_2 = x_1 - y^2$, and $y = 10x_2z/100$ ($r_2 = 10$).

Solution 1. Assume $z = 5$ and let $x_1 = s$ (= yā 1). Then, by the five-quantity operation (first statement), $y = s/4$. From the second statement, $x_2 = s - (s/4)^2 = (-s^2 + 16s)/16$. Again by the five-quantity operation (third statement), $y = (-s^2 + 16s)/32$. Hence follows the equation, $(-s^2 + 16s)/32 = s/4$. Reduced by s, $(-s + 16)/32 = 1/4$. Reduce both sides to a common denominator and eliminate the denominators: $-s + 16 = 8$. By the equal-subtraction, $s = 8$ or $x_1 = 8$. ⟨Raised by this, $x_2 = 4$ and $y = 2$.⟩ (E42p1)

Easy method (algorithm without 'colors'). From the first and the third statements, $x_1 = (r_2/r_1) \cdot x_2 = 1 \cdot x_2 + (r_2/r_1 - 1)x_2$. (This step of decomposition is not explicitly mentioned but hinted by the word 'ekaguṇaṃ' which is otherwise useless.) From the second statement, on the other hand, $x_1 = x_2 + y^2$. Hence follows $(r_2/r_1 - 1)x_2 = y^2$, or, $x_2 = y^2/(r_2/r_1 - 1)$. (E42p2)

Solution 2 (by means of the algorithm given in E42p2). $r_2/r_1 = 10/5 = 2$. Assume $y = 2$. Then, $x_2 = 2^2/(2 - 1) = 4$ and $x_1 = 4 + 4 = 8$. By the three-quantity operation, $z = 1 \cdot 2/(5 \cdot 8/100) = 5$ months. (E42p3)

E43: Equal amounts of interest on different capitals in equal periods.

x_i = two capitals ($i = 1, 2$), y = amounts of interest on the two capitals, z = periods of loan, $r_i\%$ = interest rates ($i = 1, 2$).

Statements of problem. $y = 1x_1z/100$ ($r_1 = 1$), $x_2 = x_1 - y^2$, and $y = 5x_2z/100$ ($r_2 = 5$).

Solution (by means of the algorithm given in E42p2). $r_2/r_1 = 5/1 = 5$. Assume $y = 4$. Then, $x_2 = y^2/(r_2/r_1 - 1) = 16/4 = 4$, $x_1 = x_2 + y^2 = 4 + 16 = 20$, and $z = 1 \cdot 4/(1 \cdot 20/100) = 20$ months. (E43p1)

Kṛṣṇa points out that this example has been designed for showing the validity of the easiness of the 'easy method' given in E42p2. Cf. 97cd–98 below.

In E43p2, Bhāskara emphasizes the importance of the intellect (buddhi), citing the next verse from his *Golādhyāya*.

Q2=GA praśna 5: Importance of intellect for bīja-gaṇita.

'Bīja⟨-gaṇita⟩ is not just composed of colors (symbols employed for indicating unknown numbers). Nor are there different bījas (seeds) ⟨even though there exists the traditional concept of bīja-catuṣṭaya (quartet of seeds)⟩. There exists only one ⟨true⟩ bīja, that is, intelligence (mati), because the function of thought (kalpanā) is vast.'

For the relationships between the three concepts, seed, intelligence and color, see BG 73. For Bhāskara's references to intellect or intelligence see mati, buddhi, and

dhī in Appendix 6 (Index to Words). For the concept of bīja-catuṣṭaya see BG 58p1.

E44=L 102: Exchanges of gems.

x_i = price of a piece of the i-th kind of gems ($i = 1, 2, 3, 4$). u_i = property of the i-th person ($i = 1, 2, 3, 4$).

Statements of problem. $(8-3)x_1+x_2+x_3+x_4 = u_1$, $x_1+(10-3)x_2+x_3+x_4 = u_2$, $x_1+x_2+(100-3)x_3+x_4 = u_3$, $x_1+x_2+x_3+(5-3)x_4 = u_4$, and $u_1 = u_2 = u_3 = u_4$.

Solution. Bhāskara uses the initial letter of the name of each kind of gems in order to indicate each price but I use x_i instead. Subtract $x_1 + x_2 + x_3 + x_4$ from every side: $4x_1 = 6x_2 = 96x_3 = x_4$. Assume every side obtained to be 96. Then, $x_1 = 96/4 = 24$, $x_2 = 96/6 = 16$, $x_3 = 96/96 = 1$, and $x_4 = 96/1 = 96$.

In the L, this problem is given as an example for L 101, which prescribes an algorithm for a more general case including the present one.

E45: Loan.

x = capital, u = interest.

Statements of problem. $u = 5 \cdot 12 \cdot x/100$ and $x + u = 2x - 16$.

Solution. Let $x = s$ (= yā 1). Then, $u = \frac{3}{5}s$. Hence follows $\frac{8}{5}s = 2s - 16$, $s = 40$. When raised by this, $x = 40$ and $u = 24$.

E46: Loan in three installments with equal totals.

x_i = capitals, u_i = interests ($i = 1, 2, 3$).

Statements of problem. $x_1+x_2+x_3 = 390$, $u_1 = (5{\cdot}7{\cdot}x_1)/100$, $u_2 = (2{\cdot}10{\cdot}x_2)/100$, $u_3 = (4 \cdot 5 \cdot x_3)/100$, and $x_i + u_i = v$ ($i = 1, 2, 3$).

Solution. Let $v = s$ (= yā 1). If $x_1 = 100$, then $u_1 = 35$ and $x_1 + u_1 = 135$. Conversely, if $x_1+u_1 = 135$, then $x_1 = 100$. Therefore, by proportion, if $x_1+u_1 = s$, then $x_1 = \frac{100}{135}s = \frac{20}{27}s$. Likewise, $x_2 = \frac{5}{3}s$ and $x_3 = \frac{5}{3}s$. Hence follows $\frac{20}{27}s+\frac{5}{3}s+\frac{5}{3}s = 390$, $\frac{65}{27}s = 390$, $s = 162$. Raised by this, $x_1 = 120$, $x_2 = x_3 = 135$, and $v = 162$. ⟨Raised by these, $u_1 = 42$ and $u_2 = u_3 = 27$.⟩

E47: Property of a traveling merchant and tolls.

x = original property of a merchant, u_i = his property at his departure from the i-th town ($i = 1, 2, 3$).

Statements of problem. $(x - 10) \times 2 - 10 - 10 = u_1$, $(u_1 - 10) \times 2 - 10 - 10 = u_2$, $(u_2 - 10) \times 2 - 10 - 10 = u_3$, and $u_3 = 3x$.

Solution. Let $x = s$ (= yā 1), then $u_1 = 2s-40$, $u_2 = 4s-120$, and $u_3 = 8s-280$. Therefore, $8s - 280 = 3s$, $5s = 280$, $s = 56$. Raised by this, $x = 56$.

E48=L 99: Purchase of two commodities in a given ratio.

x_i = quantities of rice and kidney beans purchased, y_i = prices of rice and kidney beans purchased ($i = 1, 2$).

Statements of problem. $x_1 : x_2 = 2 : 1$, $y_1 + y_2 = 13$ kākiṇīs (= $\frac{13}{64}$ dramma), $x_1/y_1 = 3\frac{1}{2}$ māna/dramma, and $x_2/y_2 = 8$ māna/dramma.

Solution. Let $x_2 = s$ (= yā 1) māna. Then, $x_1 = 2s$ māna. Since $y_1 = \frac{4}{7}s$ dramma and $y_2 = \frac{1}{8}s$ dramma, $\frac{39}{56}s = \frac{13}{64}$, $\frac{24}{448}s = \frac{7}{448}$, $24s = 7$, $s = \frac{7}{24}$. Raised by this, $x_1 = \frac{7}{12}$ māna, $x_2 = \frac{7}{24}$ māna, $y_1 = \frac{1}{6}$ dramma, and $y_2 = \frac{7}{192}$ dramma.

In L 98, Bhāskara prescribes an algorithm for solving this type of problems.

E49: Additions and subtractions of parts (purely numerical).

Statements of problem. $x_1 + \frac{x_1}{2} = x_2 + \frac{x_2}{5} = x_3 + \frac{x_3}{9}$ and $x_1 - \frac{x_2}{5} - \frac{x_3}{9} = x_2 - \frac{x_1}{2} - \frac{x_3}{9} = x_3 - \frac{x_1}{2} - \frac{x_2}{5} = 60$.

Solution. Let $x_1 + \frac{x_1}{2} = ... = s$ (= yā 1). By the rule of inverse operations (L 48–49), $x_1 = \frac{2}{3}s$, $x_2 = \frac{5}{6}s$, and $x_3 = \frac{9}{10}s$. Therefore, $x_1 - \frac{x_2}{5} - \frac{x_3}{9} = ... = \frac{2}{5}s$. Hence follows $\frac{2}{5}s = 60$, $s = 150$. Raised by this, $x_1 = 100$, $x_2 = 125$, and $x_3 = 135$.

In this problem, the number of the equations exceeds that of the unknown quantities.

E50: Base of a trilateral.

a, b = two flank sides of a trilateral, A = area, x = base. This is the terminology of E50 but Bhāskara regards the side a as the base of the trilateral, using the following terminology: u_1, u_2 = segments of the base a touching the flank sides b and x, respectively, and v = perpendicular to the base a.

Statements of problem. $\langle v^2 + u_1^2 = b^2,\ v^2 + u_2^2 = x^2,\ u_1 + u_2 = a,\ A = \frac{a}{2} \cdot v \rangle$, a = ka 13 ($= \sqrt{13}$), b = ka 5 ($= \sqrt{5}$), and $A = 4$,

Solution. By the rule of L 166, $A = \frac{a}{2} \cdot v$. Conversely, $v = A/\frac{a}{2}$. Therefore, $v^2 = A^2/(a^2/4) = 16/(13/4) = 64/13$, v = ka $64/13$. By the Pythagorean theorem, $u_1 = \sqrt{b^2 - v^2} = \sqrt{5 - 64/13} = \sqrt{1/13}$ = ka $\frac{1}{13}$. $u_2 = a - u_1$ = ka 13 − ka $\frac{1}{13}$ = ka $\frac{144}{13}$ (according to BG 12). Therefore, $x^2 = v^2 + u_2^2 = 64/13 + 144/13 = 16$, from which follows $x = 4$.

Note that the symbol yā is not used in this solution. The trilateral presupposed in this solution consists of the two right-angled triangles, $(1, 2, \sqrt{5})$ and $(2, 3, \sqrt{13})$.

Kṛṣṇa rightly makes a bi-quadratic equation for this problem and obtains the two solutions, $s^2 = 20$ and $s^2 = 16$ but rejects the former. He says, 'Here, the former should not be accepted because it is not proved' (atrādyam anupapannatvān na grāhyam).

E51: Perpendicular of a trilateral.

a = base of a trilateral, b, c = two flank sides, u_1, u_2 = segments of the base a touching c and b, respectively, x = perpendicular.

Statements of problem. $\langle x^2 + u_1^2 = c^2,\ x^2 + u_2^2 = b^2,\ u_1 + u_2 = a \rangle$, a = rū $\dot{1}$ ka 18 ($= -1 + \sqrt{18}$), b = ka 6 ($= \sqrt{6}$), and c = ka $\dot{5}$ ka 10 ($= -\sqrt{5} + \sqrt{10}$),

Solution. Let $u_1 = s$ (yā 1). Then, $x^2 = c^2 - u_1^2 = (-\sqrt{5} + \sqrt{10})^2 - s^2 = -s^2 + 15 - \sqrt{200}$, $u_2 = a - u_1 = -s - 1 + \sqrt{18}$, and $x^2 = b^2 - u_2^2 = (\sqrt{6})^2 - (-s - 1 + \sqrt{18})^2 =$

$-s^2 - 2s + \sqrt{72}s - 13 + \sqrt{72}$. Hence follows the equation,

$$-s^2 + 15 - \sqrt{200} = -s^2 - 2s + \sqrt{72}s - 13 + \sqrt{72}.$$

By the equal subtraction etc.,

$$2s - \sqrt{72}s = -28 + \sqrt{512}.$$

By means of the division by rationalization of the divisor (BG 16–17),

$$s = \frac{-28 + \sqrt{512}}{2 - \sqrt{72}} = \frac{-\sqrt{784} + \sqrt{512}}{\sqrt{4} - \sqrt{72}} = \frac{(-\sqrt{784} + \sqrt{512})(\sqrt{4} + \sqrt{72})}{(\sqrt{4} - \sqrt{72})(\sqrt{4} + \sqrt{72})}$$

$$= \frac{\sqrt{36864} - \sqrt{3136} - \sqrt{56448} + \sqrt{2048}}{-68} = \frac{136 - \sqrt{36992}}{-68} = -2 + \sqrt{8}.$$

Raised by this, $u_1 = -2 + \sqrt{8}$ and $u_2 = 1 + \sqrt{2}$. Then, raise the s in $x^2 = -s^2 - 2s + \sqrt{72}s - 13 + \sqrt{72}$ by this value of s, or use the relationships, $x^2 = c^2 - u_1^2 = b^2 - u_2^2$: $x^2 = 3 - \sqrt{8}$. Hence follows $x = \sqrt{3 - \sqrt{8}} = -1 + \sqrt{2}$.

For the root-extraction from a composite karaṇī, see BG 19–20 and 21.

E52: A quadratic and a cubic equations in four unknown numbers each.

Statements of problems. 1. $\sum_{i=1}^4 x_i = \sum_{i=1}^4 x_i^2$. 2. $\sum_{i=1}^4 x_i^2 = \sum_{i=1}^4 x_i^3$.

Solution of 1. Let $x_i = is$ (= yā i). Then, $\sum_{i=1}^4 x_i = 10s$ and $\sum_{i=1}^4 x_i^2 = 30s^2$. Hence follows $10s = 30s^2$. Reduced by s, $10 = 30s$, $s = 1/3$. Raised by this, $x_i = i/3$.

Solution of 2. Assume $x_i = is$ (= yā i). Then, $\sum_{i=1}^4 x_i^2 = 30s^2$ and $\sum_{i=1}^4 x_i^3 = 100s^3$. Hence follows $30s^2 = 100s^3$. Reduced by s^2, $30 = 100s$, $s = 3/10$. Raised by this, $x_i = 3i/10$.

E53: Three sides of a right-angled triangle.

x, y, z = three sides of a right triangle.

Statements of problems.

1. $\langle x^2 + y^2 = z^2$ and$\rangle$ $xy/2 = z$.

2. $\langle x^2 + y^2 = z^2$ and$\rangle$ $xy/2 = xyz$.

Solution of problem 1. Assume $x = 3s$ (= yā 3), $y = 4s$ (= yā 4), and $z = 5s$ (= yā 5). Then, the first statement is realized and $6s^2 = 5s$. Reduced by s, $6s = 5$, $s = 5/6$. Raised by this, $x = 5/2$, $y = 10/3$, and $z = 25/6$. (E53p1)

Solution of problem 2. Assume exactly the same as above. Then, the first statement is realized and $6s^2 = 60s^3$. Reduced by s^2, $6 = 60s$, $s = 1/10$. Raised by this, $x = 3/10$, $y = 2/5$, and $z = 1/2$. (E53p2)

These solutions utilize the right-angled triangle $(3, 4, 5)$.

E54: A system of cubic equations in two main and three auxiliary unknown numbers.

Statements of problem. $x + y = u^2$, $x - y = v^2$, and $xy = w^3$.

Solution. Let $x = 5s^2$ (= yāvava 5) and $y = 4s^2$ (= yāvava 4). Then, the first two statements are realized ($u = 3s$, $v = s$). Let $w = 10s$. Then, $20s^4 = 1000s^3$. Reduced by s^3, $20s = 1000$, $s = 50$. Raised by this, $y = 10000$ and $x = 12500$.

E55: A system of cubic equations in two main and two auxiliary unknown numbers.

Statements of problem. $x^3 + y^3 = u^2$ and $x^2 + y^2 = v^3$.

Solution. Let $x = s^2$ (= yāva 1) and $y = 2s^2$ (= yāva 2). Then, the first statement is realized ($u = 3s^3$). (E55p1)

Objection: Why is $9(s^2)^3$ ($= x^3 + y^3$) a square number?

Answer: Because $(s^2)^3 = (s^3)^2$. In general, a^{2i} is a square number and its square-root is a^i; and a^{3i} is a cube number and its cube-root is a^i. [Note that 'the i-th power' is indicated by the expression 'i-gata' (i is a cardinal number).] (E55p2)

Let $v = 5s$. Then, $5(s^2)^2 = (5s)^3$. Reduced by s^3, $5s = 125$, $s = 25$. Raised by this, $x = 625$ and $y = 1250$. (E55p3)

Bhāskara remarks at the end of E55p3: 'One should think about such ⟨assumptions⟩ that will make it possible to reduce ⟨both sides⟩ by the unknown numbers.'

E56: Perpendicular of a trilateral.

a, b, c = base and flank sides of a trilateral, u_1, u_2 = segments of the base a touching c and b, respectively, x = perpendicular to the base.

Statements of problem. $\langle x^2 + u_1^2 = c^2,\ x^2 + u_2^2 = b^2,\ u_1 + u_2 = a\rangle$, $a = 14$, $b = 15$, and $c = 13$.

Solution. Let $u_1 = s$ (= yā 1). Then, $u_2 = -s + 14$, $c^2 - u_1^2 = x^2 = b^2 - u_2^2$, and $-s^2 + 169 = -s^2 + 28s + 29$. By the equal subtraction etc., $140 = 28s$, $s = 5$. Raised by this, $u_1 = 5$ and $u_2 = 9$. Hence follows $x^2 = 144$, $x = 12$.

The trilateral treated in this problem is the so-called Heron's triangle, which consists of the two right-angled triangles, $(5, 12, 13)$ and $(9, 12, 15)$.

E57=L 150: A broken bamboo on the ground.

a = height or total length of a broken bamboo, b = distance between its foot and its tip touching the ground, x, u = lower and upper portions of the broken bamboo.

Statements of problem. $\langle x^2 + b^2 = u^2\rangle$, $x + u = a$, $a = 32$ hastas, and $b = 16$ hastas.

Solution. Let $x = s$ (= yā 1). Then, $u = -s + 32$ and $s^2 + 16^2 = (-s + 32)^2$ or $s^2 + 256 = s^2 - 64s + 1024$. By the equal subtraction etc., $s = 12$. Raised by this, $x = 12$ and $u = 20$.

This problem utilizes the right-angled triangle $(12, 16, 20)$ or $(3, 4, 5)$. In L 149, Bhāskara prescribes an algorithm for solving this type of problems.

E58=L 155: A leaning lotus in a pond.

a = height of the flower bud of a lotus in a pond, b = distance between the point on the water surface where the lower end of the bud originally touched and the point where the upper end of the leaning lotus touches, x = depth of the water or the length of the stalk of the lotus, u = total length of the lotus.

Statements of problem. $\langle x^2 + b^2 = u^2 \rangle$, $u = x + a$, $a = 1$ vitasti ($= \frac{1}{2}$ hasta), and $b = 2$ hastas.

Solution. Let $x = s$ (= yā 1). Then, $s^2 + 2^2 = (s + \frac{1}{2})^2$ or $s^2 + 4 = s^2 + s + \frac{1}{4}$. By the equal subtraction etc., $s = \frac{15}{4}$. Raised by this, $x = \frac{15}{4}$ and $u = \frac{17}{4}$.

This problem utilizes the right-angled triangle $(2, 15/4, 17/4)$ or $(8, 15, 17)$. In L 153, Bhāskara gives an algorithm for solving this type of problems and, in L 154, explains how to apply that algorithm to this particular problem.

E59=L 157: Equal journeys of two monkeys.

a = height of a tree, b = distance between a pond and the foot of the tree, x = jump of a monkey, u = length of the diagonal rout.

Statements of problem. $\langle (x + a)^2 + b^2 = u^2 \rangle$, $x + u = a + b$, $a = 100$ hastas, and $b = 200$ hastas.

Solution. Let $x = s$ (= yā 1). Then, $(s+100)^2+200^2 = (300-s)^2$ or $s^2+200s+10000+40000 = 90000-600s+s^2$. By the equal subtraction etc., $s = 50$. Raised by this, $x = 50$.

This problem utilizes the right-angled triangle $(150, 200, 250)$ or $(3, 4, 5)$. In L 156, Bhāskara prescribes an algorithm for solving this type of problems.

E60=L 162: Perpendicular thread in between two pieces of bamboo.

a, b = heights of two pieces of bamboo ($a > b$), x = perpendicular from the intersection of the two threads stretched from the tip of one bamboo to the foot of the other, u = distance between the two bamboos, u_1, u_2 = segments of u divided by the perpendicular and touching a and b, respectively.

Statements of problem. $u_1 + u_2 = u$, $\langle a : u = x : u_2,\ b : u = x : u_1 \rangle$, $a = 15$ hastas, and $b = 10$ hastas.

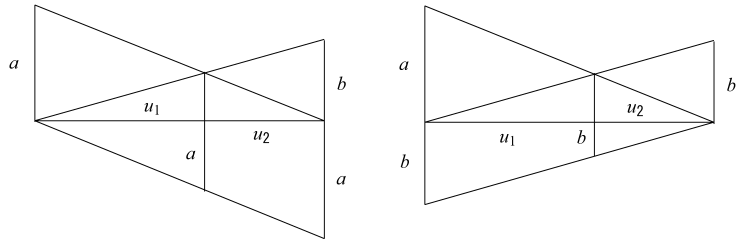
Solution 1. Assume $u = 20$ hastas. Let $x = s$ (= yā 1). Then, $a : u = s : u_2$ and $b : u = s : u_1$, from which $u_1 = 2s$ and $u_2 = \frac{4}{3}s$ are obtained. Hence follows the equation, $2s + \frac{4}{3}s = 20$, or $s = 6$. Raised by this, $x = 6$, $u_1 = 12$, and $u_2 = 8$. (E60p1)

Solution 2 (without using the bījas). Assume $u = 20$. From the three-quantity operations, $(a + b) : (u_1 + u_2) = a : u_1$ and $(a + b) : (u_1 + u_2) = b : u_2$, $u_1 = 12$ and $u_2 = 8$ are obtained. By proportion, $u : a = u_2 : x$ and $u : b = u_1 : x$. From either

one, $x = 6$. (E60p2)

Solution 3 (by an algorithm). $x = ab/(a + b) = 15 \cdot 10/(15 + 10) = 6$. (E60p3)

Solutions 1 and 2 utilize the right-angled triangles, $(15, 20, 25)$ or $(3, 4, 5)$ and $(10, 20, \sqrt{500})$ or $(1, 2, \sqrt{5})$. The three-quantity operations used in solution 2 were presumably obtained geometrically by lengthening the bamboos b and a respectively by a and b downwards (see the figures below). At the end of E60p3, Bhāskara points out that solution 3 shows that the value of x does not depend on the distance u between the two bamboos, and says, 'One should understand this by stretching threads on the ground.' The algorithm used in solution 3 was presumably obtained algebraically from the three relationships, $u_1 + u_2 = u$, $a : u = x : u_2$, and $b : u = x : u_1$. He versifies the algorithm in the former half of L 161; in the latter half of the same verse, he gives an algorithm for obtaining the two segments (u_1, u_2).



III.1.8 Chapter 8: Elimination of the middle term of (equations in) one color

59–61: Rule for the second seed, elimination of the middle term.

0. According to the first two steps of the rule for the first seed (BG 56–58), make two sides (pakṣas) equal to each other (samī-$\sqrt{}$kṛ), reduce every term in the equation to a common denominator (sama-cchedī-$\sqrt{}$kṛ) if the equation includes a fraction or fractions, eliminate the denominators (cheda-gama), and subtract the same terms from both sides (sama-śodhana) so that one side may consist exclusively of an unknown quantity (side of unknown) and the other side of rūpas (side of known). If the side of unknown does not include the square or higher power of the unknown quantity, then apply step 3 of the rule for the first seed. [This step is understood.]

1. If the side of unknown includes the square or higher power of an unknown quantity, then make that side a square number by multiplying both sides by an appropriate number and adding another appropriate number to both sides.

2. Make a new equation from the square-roots of both sides (madhyama-āharaṇa) and apply the first seed (steps 2 and 3).

3. If the side of unknown includes the cube, the square of square, etc. of an unknown quantity, step 1 may not be applicable. In that case, use one's own intelligence (sva-buddhi). See E67.

4. If the square-root of the side of known is smaller than the negative rūpas in the square-root of the side of unknown, then the value of the unknown should be obtained by making the square-root of the side of known both negative and positive. In that case, two values of the unknown are obtained. See E68. But it is not always the case. Even if the above condition is satisfied, if the result makes an element of the statements of problem negative, it should not be accepted. See E69, E70.

The procedure for a quadratic equation is as follows.

Step 0: Make two equal sides, separating known and unknown numbers.

$$Ax^2 + Bx = C.$$

Step 1: Make the side of unknown a square number. Then, the side of known must also become a square number; otherwise, the problem is wrong:

$$(1)\ a^2x^2 + 2abx + b^2 = c^2 \quad \text{or} \quad (2)\ a^2x^2 - 2abx + b^2 = c^2,$$

where a, b, c are positive numbers.

Step 2: From (1) follow (1a) $ax + b = c$ and (1b) $ax + b = -c$. Likewise, from (2) follow (2a) $ax - b = c$ and (2b) $ax - b = -c$. Through this step the middle term ($2abx$) is eliminated (madhyama-āharaṇa).

Seed 1: From (1a) follows $x = (-b + c)/a$. From (1b) follows $x = (-b - c)/a$ but the result, a negative number, is rejected. From (2a) follows $x = (b + c)/a$. From (2b) follows $x = (b - c)/a$, when $b > c$. Step 4 refers to this last case. Bhāskara does not give a condition for b and c in (1a).

Q3: Śrīdhara's method for calculating the root (mūla-upāya).

Multiply both sides of $Ax^2 + Bx = C$ by $4A$,

$$4A^2x^2 + 4ABx = 4AC,$$

and add B^2 to both sides,

$$4A^2x^2 + 4ABx + B^2 = 4AC + B^2.$$

Take the square-roots of both sides,

$$2Ax + B = \pm\sqrt{4AC + B^2}.$$

The AM version of Śrīdhara's verse refers to the last step but the GT(K)P(K) version does not.

Sūryadāsa's algorithm cited by himself in his comment on Śrīdhara's verse (see the footnote on Q3) directly produces both sides of the last equation:

> 'Twice ⟨the coefficient of⟩ the square of the unknown ($2A$) is put as ⟨a new coefficient of⟩ the unknown. When one has assumed it (i.e., the original coefficient of the unknnown, B) as a rūpa, the other ⟨side of the equation⟩ (C) is multiplied by ⟨the new coefficient of⟩ the color ($2A$) and by two and increased by the square of the ⟨new⟩ rūpa (B^2); its root is the "root" ⟨of the side of known⟩ in this case.'

E61=L 71: A flock of bees.

x = number of the bees.

Statement of problem. $\sqrt{x/2} + 8 \cdot (x/9) + 2 = x$.

Solution. Let $x = 2s^2$ (= yāva 2). Then, $\sqrt{x/2} = s$, $8 \cdot (x/9) = (16/9)s^2$, and $s + (16/9)s^2 + 2 = 2s^2$. Reduce all terms to a common denominator and eliminate the denominators: $18s^2 = 16s^2 + 9s + 18$. By the equal subtraction, $2s^2 - 9s = 18$. Multiply both sides by 8 and add 9^2 to them: $16s^2 - 72s + 81 = 225$. Take the square-roots of both sides: $4s - 9 = 15$. Hence follows $s = 6$. Raised by this, $x = 72$.

In the L, this problem is given as an example for the algorithm of the 'multiplier operation' (L 65–66) and, in order to apply that algorithm, the statement is rewritten as $(1/2)\sqrt{x/2} + (8/9)(x/2) + 1 = x/2$ in the prose part of L 71. For the 'multiplier' see under the next example.

E62=L 70: Arrows shot by Arjuna against Karṇa.

x = number of the arrows shot by Arjuna.

Statement of problem. $x/2 + 4\sqrt{x} + 6 + 3 + 1 = x$.

Solution. Let $x = s^2$ (= yāva 1). Then, $s^2/2 + 4s + 10 = s^2$. ⟨By means of the reduction to a common denominator, elimination of the denominators, and equal subtraction, $s^2 - 8s = 20$. Add 4^2 to both sides: $s^2 - 8s + 16 = 36$. Take the square-roots of both sides: $s - 4 = 6$. Hence follows⟩ $s = 10$. Raised by this, $x = 100$.

In the L, this problem is also given as an example for the algorithm of the 'multiplier operation' (L 65–66), where the 'multiplier' indicates that of the square-root that appears in the statement of problem (4 in the present example). For the story of Karṇa-vadha see *Mahābhārata*, Poona ed., 8.67.

E63: An arithmetical progression.

x, y, z, u = the first term, increase (common difference), number of terms, and the sum of an arithmetical progression.

Statements of problem. $(z - 1)/2 = x$, $x/2 = y$, $xyz + xyz/7 = u$, ⟨and $u = \frac{z}{2}\{2x + y(z - 1)\}$⟩.

Solution. Let $z = 4s + 1$ (= yā 4 rū 1). Then, $x = 2s$ and $y = s$. Therefore, $u = 2s \cdot s \cdot (4s + 1) + \{2s \cdot s \cdot (4s + 1)\}/7 = (64/7)s^3 + (16/7)s^2$. On the other hand, according to the algorithm for the sum of an arithmetical progression (L 121),

$u = 8s^3 + 10s^2 + 2s$. Equate the latter u to the former u: $(64/7)s^3 + (16/7)s^2 = 8s^3+10s^2+2s$. By means of the reduction by s, reduction to a common denominator, elimination of the denominators, and equal subtraction, $8s^2 - 54s = 14$. Multiplied by 8 and increased by 27^2, $64s^2 - 54s + 729 = 841$. Take the square-roots of both sides: $8s - 27 = 29$. Hence follows $s = 7$. Raised by this, $x = 14$, $y = 7$, $z = 29$, ⟨and $u = 3248$⟩.

E64: A quantity affected by zero (purely numerical).

Statement of problem. There are three versions.

$$\text{AM:} \quad \left\{ \left(\frac{x}{0} + x - 9 \right)^2 + \sqrt{\left(\frac{x}{0} + x - 9 \right)^2} \right\} \times 0 = 90.$$

$$\text{T:} \quad \left\{ \left(\frac{x}{0} \pm x \right)^2 + \sqrt{\left(\frac{x}{0} \pm x \right)^2} \right\} \times 0 = 90.$$

$$\text{GP:} \quad \left\{ \left(\frac{x}{0} \pm 10^7 \right)^2 + \sqrt{\left(\frac{x}{0} \pm 10^7 \right)^2} \right\} \times 0 = 90.$$

Solution of the AM version. Let $x = s$ (= yā 1). Then, $s \div 0 = (1/0)s$ ('zero-divisor'). 'That this is a zero-divisor is only assumed ⟨in mind⟩' (asya khaharatvaṃ kalpitam eva). $(1/0)s + s = 2s$. $(2s - 9)^2 + (2s - 9) = 4s^2 - 34s + 72$. This is to be multiplied by zero. But previously zero was a divisor and now it is a multiplier. Therefore, both zero's are canceled according to L 46ab. The result is equal to 90: $4s^2 - 34s + 72 = 90$. By the equal subtraction, $4s^2 - 34s = 18$. Multiplied by 16 and increased by 34^2, $64s^2 - 544s + 1156 = 1444$. Take the square-roots of both sides: $8s - 34 = 38$. Hence follows $s = 9$. Raised by this, $x = 9$. (E64p1)

Solution of the T version. Let $x = s$ (= yā 1). Then, $s \div 0 = s/0$ ('zero-divisor'); $s/0 \pm s = s/0 \pm (s \cdot 0)/0 = (s \pm s \cdot 0)/0 = (s \pm 0)/0 = s/0$; $(s/0)^2 = s^2/0^2 = s^2/0$; $\sqrt{s^2/0} = \sqrt{s^2}/\sqrt{0} = s/0$; $s^2/0 + s/0 = (s^2 + s)/0$; $\{(s^2 + s)/0\} \times 0 = s^2 + s$. This is equal to 90: $s^2 + s = 90$. Multiplied by 4 and increased by 1, $4s^2 + 4s + 1 = 361$. Take the square-roots of both sides: $2s + 1 = 19$. Hence follows $s = 9$. Raised by this, $x = 9$. (E64p2)

Solution of the GP version. Let $x = s$ (= yā 1). Then, $s \div 0 = (1/0)s$ ('zero-divisor'); $(1/0)s \pm 10^7 = (1/0)s$; $\{(1/0)s\}^2 = (1/0)s^2$; $\{(1/0)s^2 + (1/0)s\} \times 0 = s^2 + s$. This is equal to 90: $s^2 + s = 90$. The rest of the solution is exactly the same as the second solution. (E64p3)

Sūryadāsa deals with the same equation as AM and his solution is the same as that of E64p1 (see the footnote for E64 in the Text). E64p1 and Sūryadāsa treat kha-hara ('zero-divisor') in a manner which does not agree with the nature of kha-hara alluded to by the simile in BG 6, according to which '$s/0 + s$' (or '$(1/0)s + s$') must be equal to '$s/0$' (or '$(1/0)s$') as in E64p2.

E65: A quantity affected by zero (purely numerical).

Statement of problem.

$$\left[\left\{\left(x+\frac{x}{2}\right)\times 0\right\}^2+2\times\sqrt{\left\{\left(x+\frac{x}{2}\right)\times 0\right\}^2}\right]\div 0=15.$$

Solution. Let $x = s$ (= yā 1). Then, $s + s/2 = (3/2)s$. Multiplied by zero, $(3/2)s \times 0 = (3/2)s$. Remember that this is a 'zero-multiplier' quantity. Squared, $(9/4)s^2$ (zero-multiplier); increased by twice its own square-root, $(9/4)s^2 + 3s = (9s^2+12s)/4$ (zero-multiplier). This is to be divided by zero. But this zero (divisor) and the previous zero (multiplier) are canceled. The result is equal to 15: $(9s^2 + 12s)/4 = 15$. By means of the reduction to a common denominator and elimination of the denominators, $9s^2 + 12s = 60$. Increased by 4, $9s^2 + 12s + 4 = 64$. Take the square-roots of both sides: $3s + 2 = 8$. Hence follows $s = 2$. Raised by this, $x = 2$.

Bhāskara's treatment of zero in this solution may be explained as follows. $\{(3/2)s\cdot 0\}^2 = (9/4)s^2\cdot 0^2 = (9/4)s^2\cdot 0$. $2\sqrt{(9/4)s^2\cdot 0} = 2\cdot(\sqrt{9}/\sqrt{4})\sqrt{s^2}\cdot\sqrt{0} = 2\cdot(3/2)s\cdot 0 = 3s\cdot 0$. $(9/4)s^2\cdot 0+3s\cdot 0 = (9s^2\cdot 0+12s\cdot 0)/4 = (9s^2+12s)\cdot 0/4 = \{(9s^2+12s)/4\}\cdot 0$. $\{(9s^2 + 12s)/4\} \cdot 0 \div 0 = (9s^2 + 12s)/4$.

Q4–5=L 45cd–46: Rules for zero.

$\langle 0+a = a,\ 0^2 = 0,\ 0^3 = 0,\ \sqrt{0} = 0,\ \sqrt[3]{0} = 0\rangle$; $a \div 0 = \frac{a}{0}$ (zero-divisor); $a \times 0 = 0$ in general, but $a \times 0 = a \cdot 0$ (zero-multiplier) if calculation remains, and $(a \cdot 0) \div 0 = a$; $\langle a + 0 = a,\ a - 0 = a\rangle$.

E66: A cubic equation in one unknown number.

Statement of problem. $12x + x^3 = 6x^2 + 35$.

Solution. Let $x = s$ (= yā 1). Then, $s^3+12s = 6s^2+35$. By the equal subtraction, $s^3 - 6s^2 + 12s = 35$. Add -8 to both sides: $s^3 - 6s^2 + 12s - 8 = 27$. Take the cube roots of both sides: $s - 2 = 3$. Hence follows $s = 5$. Raised by this, $x = 5$.

E67: A bi-quadratic equation in one unknown number.

Statement of problem. $(x^2)^2 - (200x + x^2) \times 2 = 10^4 - 1$.

Solution. Let $x = s$ (= yā 1). Then, $s^4 - 2s^2 - 400s = 9999$. When increased by $(400s + 1)$, the first side, $s^4 - 2s^2 + 1$, 'gives a square-root' $(s^2 - 1)$, but the second side does not. At this point, 'one's own intelligence' (sva-buddhi) plays an important role (see item 3 of the rule in BG 59–61). When increased by $(4s^2 + 400s + 1)$, $s^4+2s^2+1 = 4s^2+400s+10000$. Take the square-roots of both sides: $s^2+1 = 2s+100$. ⟨By the equal subtraction, $s^2 - 2s = 99$. Increased by 1, $s^2 - 2s + 1 = 100$. Take the square-roots of both sides: $s - 1 = 10$.⟩ Hence follows $s = 11$. Raised by this, $x = 11$.

E68: A troop of monkeys.

x = number of monkeys.

Statement of problem. $(x/8)^2 + 12 = x$.

Solution. let $x = s$ (= yā 1). Then, $(s^2 + 768)/64 = s$. By the reduction to a common denominator, the elimination of the denominators, and the equal subtraction, $s^2 - 64s = -768$. Increased by 32^2, $s^2 - 64s + 1024 = 256$. Taking the square-roots of both sides, $s - 32 = \pm 16$. (For the two roots see item 4 of the rule in BG 59–61.) From $s - 32 = 16$ follows $s = 48$. Raised by this, $x = 48$. From $s - 32 = -16$ follows $s = 16$. Raised by this, $x = 16$.

E69: A troop of monkeys.

x = number of monkeys.

Statement of problem. $(x/5 - 3)^2 + 1 = x$.

Solution. Let $x = s$. Then, $x/5 - 3 = \frac{s-15}{5}$. Squared, $\left(\frac{s-15}{5}\right)^2 = \frac{s^2-30s+225}{25}$. Increased by 1, $\frac{s^2-30s+225}{25} + 1 = \frac{s^2-30s+250}{25}$, which is equal to s: $\frac{s^2-30s+250}{25} = s$. By the reduction to a common denominator, $\frac{s^2-30s+250}{25} = \frac{25s}{25}$. By the elimination of the denominators, $s^2 - 30s + 250 = 25s$. By the equal subtraction, $s^2 - 55s = -250$. Multiplied by 4 and increased by 55^2, $4 \times (s^2 - 55s) + 55^2 = 4 \times (-250) + 55^2$, or $4s^2 - 220s + 3025 = 2025$. Take the square-roots of both sides: $2s - 55 = \pm 45$. From $2s - 55 = 45$ follows $s = 50$. Raised by this, $x = 50$. From $2s - 55 = -45$ follows $s = 5$. But this 'should not be taken here because it is not appropriate, for people do not have a conviction concerning negative known number.' By the 'negative known number' Bhāskara evidently refers to the element, $x/5 - 3$, of the statement which turns out to be negative when $x = 5$.

E70: Peg (gnomon), shadow, and ear (hypotenuse).

x = shadow, u = ear or hypotenuse (distance between the tips of the peg and the shadow), a = peg or gnomon.

Statements of problem. $x - u/3 = 14$, $\langle x^2 + a^2 = u^2 \rangle$, and $a = 12$ aṅgulas.

Solution. Let $x = s$. Then, $s - 14 = u/3$. Multiplied by 3, $3s - 42 = u$. Squared, $9s^2 - 252s + 1764 = u^2$. On the other hand, $u^2 = x^2 + a^2 = s^2 + 144$. Therefore, $9s^2 - 252s + 1764 = s^2 + 144$. By the equal subtraction, $8s^2 - 252s = -1620$. Multiplied by 2 and increased by $(-63)^2$, $16s^2 - 504s + 3969 = 729$. Take the square-roots of both sides: $4s - 63 = \pm 27$. From $4s - 63 = 27$ follows $s = 45/2$. Raised by this, $x = 45/2$. From $4s - 63 = -27$ follows $s = 9$. But this should not be taken because it is inappropriate; for it makes $u = 3(x - 14) < 0$.

Q6: Padmanābha's meta-rule for two solutions of a quadratic equation.

'If the square-root of the side of known is smaller than the negative rūpas in the other side, then the value ⟨of the unknown ⟩ is produced twice by making the former root both positive and negative.'

Bhāskara points out that E70 is an anomaly to this meta-rule of Padmanābha. Item 4 of Bhāskara's rule (BG 59–61) deals with the same case but it also makes

provision for the case the two-root rule should not be applied.

E71–72: A system of quadratic equations in four main and seven auxiliary unknown numbers.

p = additive to quantity (rāśi-kṣepa), q = additive to product (vadha-kṣepa).

Statements of problem. $x_i + p = u_i^2$ $(i = 1, 2, 3, 4)$, $x_i x_{i+1} + q = u_{i+4}^2$ $(i = 1, 2, 3)$, $\sum_{i=1}^{7} u_i + a = b^2$, $a = 11$, $b = 13$, $p = 2$, and $q = 18$.

Solution. If $q = p(u_{i+1} - u_i)^2$ $(i = 1, 2, 3)$, then $x_i x_{i+1} + q = (u_i u_{i+1} - p)^2$. Therefore, if one determines $u_1, ..., u_4$ such that $u_{i+1} = u_i + \sqrt{q/p}$ $(i = 1, 2, 3)$, then $u_{i+4} = u_i u_{i+1} - p$ $(i = 1, 2, 3)$. Since $p = 2$ and $q = 18$ in the present example, put $u_{i+1} = u_i + 3$ $(i = 1, 2, 3)$, and let $u_1 = s$ (= yā 1). Then, $u_2 = s + 3$, $u_3 = s + 6$, $u_4 = s + 9$, $u_5 = s^2 + 3s - 2$, $u_6 = s^2 + 9s + 16$, and $u_7 = s^2 + 15s + 52$. Hence follows $3s^2 + 31s + 84 = 13^2 - 11$, or $3s^2 + 31s = 74$. Multiplied by 12 and increased by 31^2, $36s^2 + 372s + 961 = 1849$. Take the square-roots of both sides: $6s + 31 = 43$. Hence follows $s = 2$. Raised by this, $u_1 = 2$, $u_2 = 5$, $u_3 = 8$, and $u_4 = 11$; and, therefore, $x_1 = 2$, $x_2 = 23$, $x_3 = 62$, and $x_4 = 119$.

Q7: A meta rule by predecessors for the same type of problem.

Determine $u_1, ..., u_4$ such that $u_{i+1} = u_i + \sqrt{q/p}$ $(i = 1, 2, 3)$. Then, $x_i = u_i^2 - p$.

E73: Ear or hypotenuse of a right-angled triangle and 'proof of that popular calculation' of the hypotenuse (based on the so-called Pythagorean theorem).

a, b, x = arm (side), edge (upright) and ear (hypotenuse) of a right-angled triangle, u_1, u_2 = segments of the base x touching a and b, respectively, v = perpendicular to the base x.

Statements of problem. $\langle u_1 + u_2 = x,\ x : a = a : u_1,\ x : b = b : u_2 \rangle$, and $a = 15$, $b = 20$. The value of x as well as a proof of the algorithm, $x = \sqrt{a^2 + b^2}$, should be told.

Solution 1. Let $x = s$ (yā 1). Then, by the conformity (anurūpa) of the arms and the edges of the largest and the smallest right-angled triangles (see the figure in E73p1), $s : 15 = 15 : u_1$, from which follows $u_1 = \frac{15^2}{s}$. Likewise, $s : 20 = 20 : u_2$, from which follows $u_2 = \frac{20^2}{s}$. From $s = u_1 + u_2$ ⟨it follows that $s = \frac{15^2}{s} + \frac{20^2}{s}$. Reduced to a common denominator, $\frac{s^2}{s} = \frac{15^2}{s} + \frac{20^2}{s}$. The denominators being eliminated, $s^2 = 15^2 + 20^2 = 625$. Take the square-roots of both sides⟩: $s = 25$. Raised by this, $x = 25$, $u_1 = 9$, and $u_2 = 16$. From these follows $v = 12$ (which is not essential to this problem). In the course of this solution, the algorithm, $x = \sqrt{a^2 + b^2}$, was proved by $s^2 = 15^2 + 20^2$.

Solution 2. Make a large square consisting of four of the right-angled triangle (a, b, x) with a small square, whose side is equal to the difference $\mid a - b \mid$, at its center (see the figure in E73p2). Since the side of the large square is the ear (x) of the right-angled triangle, $s^2 = (20 - 15)^2 + 2 \times (15 \times 20) = 625$. Hence follows

$s = 25$. In the course of this solution, the relationship,

$$x^2 = \mid a - b \mid^2 + 2ab,$$

was proved by $s^2 = (20-15)^2 + 2 \times (15 \times 20)$. This relationship, combined with the identity given in the next verse (BG 62), proves the algorithm, $x = \sqrt{a^2 + b^2}$.

This problem utilizes two right-angled triangles both similar to $(3, 4, 5)$.

62: An identity.

Using the same notation as in E73,

$$\mid a - b \mid^2 + 2ab = a^2 + b^2.$$

This identity holds true for the arm and the edge of a right-angled triangle as well as for any two unknown quantities.

Bhāskara points out in the prose part (62p) that this identity can be proved geometrically by rearranging the five parts of the large square constructed in solution 2 of E73 (see the figure in 62p).

From the relationship proved in solution 2 of E73 and the relationship proved here follows the relationship, $x^2 = a^2 + b^2$, from which follows $x = \sqrt{a^2 + b^2}$.

E74: Three sides of a right-angled triangle.

x, y, z = arm (side), edge (upright) and ear (hypotenuse) of a right-angled triangle.

Statements of problem. $\langle x^2 + y^2 = z^2$ and$\rangle$ $\sqrt{x-3} - 1 = z - y$.

Solution. Let $z - y = 2$. Then, by the inverse operation (L 48–50), $\sqrt{x-3} = 2 + 1 = 3$, $x - 3 = 3^2 = 9$, or $x = 12$. Hence follows $z^2 - y^2 = x^2 = 144$. On the other hand, $z^2 - y^2 = (z + y)(z - y)$. Therefore, $z + y = 144/2 = 72$. By the rule of concurrence (saṃkramaṇa, L 56), $z = 37$ and $y = 35$. The solution in this case is $(x, y, z) = (12, 35, 37)$. Likewise, if $z - y = 1$, then $(7, 24, 25)$; if $z - y = 3$, then $(19, 176/3, 185/3)$; if $z - y = 4$, then $(28, 96, 100)$; etc.

In the course of this solution, Bhāskara demonstrates the identity, $z^2 - y^2 = (z + y)(z - y)$, by rearranging the unit squares (koṣṭhaka) when $z = 7$ and $y = 5$ (see the three figures in E74p).

Note that none of the 'four seeds' is employed in this soltution.

63: An identity.

When a and b are any two quantities,

$$(a + b)^2 - (a^2 + b^2) = 2ab.$$

In 63p, Bhāskara demonstrates this identity both numerically and geometrically by taking $a = 3$ and $b = 5$ (see the four figures in 63p).

64: An identity.

When a and b are any two quantities,

$$(a+b)^2 - 4ab = \mid a-b \mid^2 .$$

In 64p, Bhāskara demonstrates this identity geometrically by taking $a = 3$ and $b = 5$ (see the figure in 64p).

E75: Three sides of a right-angled triangle.

x, y, z = arm (side), edge (upright) and ear (hypotenuse) of a right-angled triangle.

Statements of problem. $\langle x^2 + y^2 = z^2 \rangle$, $x + y + z = 40$, and $xy = 120$.

Solution. According to BG 63, $2xy = (x+y)^2 - (x^2+y^2) = (x+y)^2 - z^2 = (x+y+z)(x+y-z)$, from which follows $x+y-z = 2xy/(x+y+z) = 240/40 = 6$. By the rule of concurrence (L 56), $x + y = 23$ and $z = 17$. According to BG 64, $(x-y)^2 = (x+y)^2 - 4xy = 49$, from which follows $x - y = 7$ (assuming $x > y$). By the rule of concurrence (L 56), $x = 15$ and $y = 8$.

Note that none of the 'four seeds' is employed in this solution.

E76: Three sides of a right-angled triangle.

x, y, z = arm (side), edge (upright) and ear (hypotenuse) of a right-angled triangle.

Statements of problem. $\langle x^2 + y^2 = z^2 \rangle$, $x + y + z = 56$, and $xyz = 4200$.

Solution. Let $z = s$ (yā 1). Then, $x^2 + y^2 = s^2$, $x + y = -s + 56$, and $xy = xyz/z = \frac{4200}{s}$. By the identity of BG 63 a one-color equation (ekavarṇa-samīkaraṇa) is obtained: $(s^2 - 112s + 3136) - s^2 = \frac{8400}{s}$, or $-112s + 3136 = \frac{8400}{s}$. Reduced to a common denominator, $\frac{-112s^2+3136s}{s} = \frac{8400}{s}$; the denominators being eliminated, $-112s^2+3136s = 8400$; divided by 112, $-s^2+28s = 75$; multiplied by -1, $s^2-28s = -75$; increased by the square of half the coefficient of s, $s^2 - 28s + 196 = 121$; the square-roots of both sides being taken, $s - 14 = \pm 11$. Hence follow $s = 25$ and $s = 3$. Out of these two, $s = 3$ should not be taken because it is inappropriate (anupapanna). ⟨For, if $s = 3$, then $xy = 4200/3 = 1400$ and $x + y = 56 - 3 = 53$, and, by the identity of BG 64, $\mid x-y \mid^2 = 53^2 - 4 \times 1400 = -2791$.⟩ When $s = 25$, on the other hand, $xy = 4200/25 = 168$ and $x + y = 56 - 25 = 31$. From the identity of BG 64 follows $\mid x-y \mid^2 = (x+y)^2 - 4xy = 31^2 - 4 \times 168 = 289$, from which follows $x - y = 17$ (or $x - y = -17$ when $x < y$). By the rule of concurrence (L 56), $x = 24$ and $y = 7$. The solution is therefore $(x, y, z) = (24, 7, 25)$ or $(7, 24, 25)$.

III.1.9 Chapter 9: Equations in more than one color

Hereafter I use the notation, TR $[a, b, c]$, for indicating the algorithm of trairāśika: TR $[a, b, c] = bc/a$.

65–68: Rule for the third seed, multi-color equations.

1. Subtract one color (unknown) from one side of the equation and the other colors and rūpas from the other side. Divide the other side by the first side. The result is an evaluation of the first color.

2. If there is more than one evaluation for one color, then make those evaluations equated with each other and get evaluations of a second color. Repeat this procedure and apply kuṭṭaka to the last evaluation if only one color remains in its dividend. The multiplier and the quotient obtained by kuṭṭaka are the values of the two colors, one in the dividend and the other in the divisor, of the last evaluation.

3. If there is more than one color in the dividend of the last evaluation, then assume any optional quantities for them except one.

4. Raise the other colors one by one inversely by the values beginning with those of the two colors just obtained by kuṭṭaka.

5. If a fraction is obtained for some color in the course of the inverse operation of raising, then apply kuṭṭaka and once again raise the colors beginning with the last one inversely.

Q8=E38: Properties of two persons in three kinds of gems and money.

x_i = price of a piece of the i-th kind of gems ($i = 1, 2, 3$), u_i = property of the i-th person ($i = 1, 2$).

Statements of problem. $5x_1 + 8x_2 + 7x_3 + 90 = u_1$, $7x_1 + 9x_2 + 6x_3 + 62 = u_2$, and $u_1 = u_2$.

Solution. Let $x_1 = s_1$ (yā 1), $x_2 = s_2$ (kā 1), and $x_3 = s_3$ (nī 1). Then, $5s_1 + 8s_2 + 7s_3 + 90 = u_1 = u_2 = 7s_1 + 9s_2 + 6s_3 + 62$, from which an evaluation of s_1 is obtained: $s_1 = \frac{-s_2+s_3+28}{2}$. This is 'the last evaluation.' Raise s_3 by 1: $s_1 = \frac{-s_2+29}{2} = \frac{-s_2+1}{2} + 14$. Apply kuṭṭaka to $y = \frac{-x+1}{2}$: $(y, x) = (0 - k, 1 + 2k)$. Hence follows $(s_1, s_2) = (y + 14, x) = (14 - k, 1 + 2k) = (-s_4 + 14, 2s_4 + 1)$, where $k = s_4$ (pī 1). When s_4 is raised by 0, $(s_1, s_2, s_3) = (14, 1, 1)$; by 1, $(13, 3, 1)$; by 2, $(12, 5, 1)$; and by 3, $(11, 7, 1)$.

Q9=E39: Properties of two persons after mutual donation.

x_i = properties of two persons ($i = 1, 2$).

Statements of problem. $x_1 + 100 = 2(x_2 - 100)$ and $6(x_1 - 10) = x_2 + 10$.

Solution. Let $x_1 = s_1$ (yā 1) and $x_2 = s_2$ (kā 1). Then, from $s_1 + 100 = 2s_2 - 200$ follows $s_1 = 2s_2 - 300$, and from $6s_1 - 60 = s_2 + 10$ follows $s_1 = \frac{s_2+70}{6}$. The first evaluation being reduced to the same denominator, $s_1 = \frac{12s_2-1800}{6}$. Hence follows the equation, $12s_2 - 1800 = s_2 + 70$. By the first seed, $s_2 = 170$. Raised by this, $s_1 = 40$.

E77: Equal properties of four persons in horses, camels, mules, and oxen.

x_i = prices of a horse, a camel, a mule, and an ox ($i = 1, 2, 3, 4$), u_i = property of the i-th person ($i = 1, 2, 3, 4$).

Statements of problem. $5x_1 + 2x_2 + 8x_3 + 7x_4 = u_1$, $3x_1 + 7x_2 + 2x_3 + x_4 = u_2$, $6x_1 + 4x_2 + x_3 + 2x_4 = u_3$, $8x_1 + x_2 + 3x_3 + x_4 = u_4$, and $u_1 = u_2 = u_3 = u_4$.

Solution. Let $x_1 = s_1$ (yā 1), $x_2 = s_2$ (kā 1), $x_3 = s_3$ (nī 1), and $x_4 = s_4$ (pī 1). Then, the properties of the four persons are: $5s_1+2s_2+8s_3+7s_4$, $3s_1+7s_2+2s_3+s_4$, $6s_1 + 4s_2 + s_3 + 2s_4$, and $8s_1 + s_2 + 3s_3 + s_4$. From the first and the second follows the equation, $5s_1 + 2s_2 + 8s_3 + 7s_4 = 3s_1 + 7s_2 + 2s_3 + s_4$, from which an evaluation of s_1 is obtained, $s_1 = \frac{5s_2-6s_3-6s_4}{2}$. Likewise, from the second and the third another evaluation of s_1 is obtained, $s_1 = \frac{3s_2+s_3-s_4}{3}$; and from the third and the fourth still another evaluation of s_1 is obtained, $s_1 = \frac{3s_2-2s_3+s_4}{2}$. From the first two of these three evaluations follows the equation, $15s_2 - 18s_3 - 18s_4 = 6s_2 + 2s_3 - 2s_4$, from which an evaluation of s_2 is obtained, $s_2 = \frac{20s_3+16s_4}{9}$. Likewise, from the second and the third, $s_2 = \frac{8s_3-5s_4}{3}$. From these two evaluations of s_2 follows an evaluation of s_3, $s_3 = \frac{31s_4}{4}$. This is 'the last evaluation' to be solved by kuṭṭaka: KU $(31, 4, 0)\,[y, x]$. By the rules of BG 35 and 36ab, $(y, x) = (0 + 31k, 0 + 4k)$. Let $k = s_5$ (lo 1). Then, $s_3 = y = 31s_5 + 0$ and $s_4 = x = 4s_5 + 0$. Raised by these, $s_2 = 76s_5 + 0$. Then, raised by these values of s_2, s_3, and s_4, $s_1 = 85s_5 + 0$. When $s_5 = 1$, $(x_1, x_2, x_3, x_4) = (s_1, s_2, s_3, s_4) = (85, 76, 31, 4)$; when $s_5 = 2$, $(170, 152, 62, 8)$; when $s_5 = 3$, $(255, 228, 93, 12)$; etc.

E78–79: A hundred birds by a hundred drammas.

x_i = number of birds of the i-th kind ($i = 1, 2, 3, 4$), y_i = price of birds of the i-th kind ($i = 1, 2, 3, 4$).

Statements of problem. $x_1+x_2+x_3+x_4 = 100$ (x_i's are integers), $y_1+y_2+y_3+y_4 = 100$ dramma, $\frac{y_1}{x_1} = \frac{3}{5}$, $\frac{y_2}{x_2} = \frac{5}{7}$, $\frac{y_3}{x_3} = \frac{7}{9}$, and $\frac{y_4}{x_4} = \frac{9}{3}$.

Solution 1. Let $y_1 = s_1$ (= yā 1) etc. Then, $s_1+s_2+s_3+s_4 = 100$. Calculate x_i by proportion. Then, $\frac{5}{3}s_1 + \frac{7}{5}s_2 + \frac{9}{7}s_3 + \frac{3}{9}s_4 = 100$. The rest of this solution is omitted. According to the commentator Kṛṣṇa, the last equation is reduced to a common denominator and the denominators are eliminated: $175s_1 + 147s_2 + 135s_3 + 35s_4 = 10500$. 'The rest is the same as before.' This refers to the next solution which is treated first in his commentary.

Solution 2. In order that the statements, $\frac{y_1}{x_1} = \frac{3}{5}$ etc. are realized, let $x_1 = 5s_1$, $x_2 = 7s_2$, $x_3 = 9s_3$, $x_4 = 3s_4$, $y_1 = 3s_1$, $y_2 = 5s_2$, $y_3 = 7s_3$, and $y_4 = 9s_4$. Then, $3s_1 + 5s_2 + 7s_3 + 9s_4 = 100$, and $5s_1 + 7s_2 + 9s_3 + 3s_4 = 100$. From these follow two evaluations of s_1, $s_1 = \frac{-5s_2-7s_3-9s_4+100}{3}$ and $s_1 = \frac{-7s_2-9s_3-3s_4+100}{5}$. By the reduction to a common denominator and elimination of the denominators, $-25s_2 - 35s_3 - 45s_4 + 500 = -21s_2 - 27s_3 - 9s_4 + 300$. From this follows an evaluation of s_2, $s_2 = -2s_3 - 9s_4 + 50$. Assume $s_4 = 4$. Then, $s_2 = -2s_3 + 14$. Solve KU $(-2, 1, 14)\,[y, x]$: $(y, x) = (14 - 2k, 0 + k)$. Hence follow s_2 and s_3: $(s_2, s_3) = (y, x) = (-2s_5 + 14, s_5 + 0)$, where $k = s_5$ (= lo 1). Raise s_2, s_3, s_4 in the evaluations of s_1 with these values: $s_1 = s_5 - 2$. Assume $s_5 = 3$. Then, $(s_1, s_2, s_3, s_4) = (1, 8, 3, 4)$, from which, by raising s_i in x_i

and in y_i with these values, follows the solution, $(y_1, y_2, y_3, y_4) = (3, 40, 21, 36)$ and $(x_1, x_2, x_3, x_4) = (5, 56, 27, 12)$. Assume $s_5 = 4$. Then, $(s_1, s_2, s_3, s_4) = (2, 6, 4, 4)$, from which follows the solution, $(y_1, y_2, y_3, y_4) = (6, 30, 28, 36)$ and $(x_1, x_2, x_3, x_4) = (10, 42, 36, 12)$. Assume $s_5 = 5$. Then, $(s_1, s_2, s_3, s_4) = (3, 4, 5, 4)$, from which follows the solution, $(y_1, y_2, y_3, y_4) = (9, 20, 35, 36)$ and $(x_1, x_2, x_3, x_4) = (15, 28, 45, 12)$. Bhāskara's solution ends here but we have another set of solutions for $s_5 = 6$ when $s_4 = 4$, that is, $(s_1, s_2, s_3, s_4) = (4, 2, 6, 4)$, from which follows the solution, $(y_1, y_2, y_3, y_4) = (12, 10, 42, 36)$ and $(x_1, x_2, x_3, x_4) = (20, 14, 54, 12)$.

Bhāskara concludes his solution by the words, 'Likewise, there are many solutions according to the optional numbers.' In fact, there are two sets of solutions for $s_4 = 11/3$, five sets for $s_4 = 13/3$, three sets for $s_4 = 14/3$, and two sets for $s_4 = 5$; in total, there are sixteen sets of solutions.

E80: Four divisions (purely numerical).

Statements of problem. $x = 6q_1 + 5$, $x = 5q_2 + 4$, $x = 4q_3 + 3$, and $x = 3q_4 + 2$.

Solution 1. Let $x = s_1$ (= yā 1), and $q_1 = s_2$ (= kā 1). Then, an evaluation of s_1 is: $s_1 = 6s_2 + 5$. Likewise, let $q_2 = s_3$ (= nī 1), $q_3 = s_4$ (= pī 1), and $q_4 = s_5$ (= lo 1). Then, evaluations of s_1 are: $s_1 = 5s_3 + 4$, $s_1 = 4s_4 + 3$, and $s_1 = 3s_5 + 2$. From the first and the second evaluations follows an evaluation of s_2, $s_2 = \frac{5s_3-1}{6}$. From the second and the third evaluations follows an evaluation of s_3, $s_3 = \frac{4s_4-1}{5}$. From the third and the fourth evaluations follows an evaluation of s_4, $s_4 = \frac{3s_5-1}{4}$. This is 'the last evaluation,' to which kuṭṭaka is applied: $s_4 = 3s_6+2$ and $s_5 = 4s_6+3$ (s_6 = ha 1). Raised by this, $s_3 = \frac{12s_6+7}{5}$. Since this is a fraction, kuṭṭaka is applied again: $\langle s_3 = 12s_7+11\rangle$, $s_6 = 5s_7+4$ (s_7 = śve 1). Raised by this, $s_5 = 4s_6+3 = 20s_7+19$, $s_4 = 3s_6+2 = 15s_7+14$, $s_3 = (4s_4-1)/5 = 12s_7+11$, $s_2 = (5s_3-1)/6 = 10s_7+9$, and $s_1 = 6s_2+5 = 60s_7+59$. ⟨By raising s_7 in s_1 by 0, 1, 2, etc., there are many solutions: $x = s_1 = 59$, 119, 179, etc.⟩ (E80p1)

Solution 2. From the first two statements follow two evaluations of s_1, that is, $s_1 = 6s_2+5$ and $s_1 = 5s_3+4$, from which an evaluation of s_2 is obtained, $s_2 = \frac{5s_3-1}{6}$. Since this is a fraction, kuṭṭaka is applied: $s_2 = 5s_4 + 4$ and $s_3 = 6s_4 + 5$. Raised by this value of s_2, $s_1 = 30s_4 + 29$. From the third statement, $s_1 = 4s_5 + 3$. The last two evaluations of s_1 being combined, an evaluation of s_4 is obtained, $s_4 = \frac{4s_5-26}{30} = \frac{2s_5-13}{15}$. Since this is a fraction, kuṭṭaka is applied again: $s_4 = 2s_6+1$, $s_5 = 15s_6 + 14$. Raised by this value of s_4, $s_1 = 30(2s_6 + 1) + 29 = 60s_6 + 59$. With this evaluation, the last statement is automatically realized. By raising s_6 in s_1 by 0, 1, 2, etc., there are many solutions: ⟨$x = s_1 = 59$, 119, 179, etc.⟩ (E80p2)

E81: Three divisions with conditions (purely numerical).

Statements of problem. $5x = 20q + r$, $7y = 20(q + 1) + (r + 1)$, $9z = 20(q + 2) + (r + 2)$, and $0 \le q = r < 18$.

Solution. Let $q = r = s_1$ (= yā 1), $x = s_2$ (= kā 1), $y = s_3$ (= nī 1), and

$z = s_4$ (= pī 1). Then, $5s_2 - 20s_1 = s_1$, from which follows an evaluation of s_1, $s_1 = \frac{5s_2}{21}$. Also, $7s_3 - 20s_1 - 20 = s_1 + 1$, from which follows another evaluation of s_1, $s_1 = \frac{7s_3-21}{21}$. Finally, $9s_4 - 20s_1 - 40 = s_1 + 2$, from which follows still another evaluation of s_1, $s_1 = \frac{9s_4-42}{21}$. By equating the first evaluation to the second and the second to the third, one evaluation each of s_2 and s_3 is obtained, $s_2 = \frac{7s_3-21}{5}$, $s_3 = \frac{9s_4-21}{7}$. The latter is 'the last evaluation,' to which kuṭṭaka is applied: $(s_3, s_4) = (9s_5 + 6, 7s_5 + 7)$. By raising s_3 in s_2 by this value of s_3, $s_2 = \frac{63s_5+21}{5}$. By kuṭṭaka, $(s_2, s_5) = (63s_6 + 42, 5s_6 + 3)$. Raised by this value of s_5, $(s_3, s_4) = (45s_6 + 33, 35s_6 + 28)$. By raising any one of the evaluations of s_1 by these s_2, s_3, and s_4, $s_1 = 15s_6 + 10$. Since $0 \leq s_1 < 18$, there exists a solution only when $s_6 = 0$: $(x, y, z) = (s_2, s_3, s_4) = (42, 33, 28)$, and $(q, q + 1, q + 2) = (r, r + 1, r + 2) = (s_1, s_1 + 1, s_1 + 2) = (10, 11, 12)$.

E82: Three divisions with conditions (purely numerical).

Statements of problem. $x = 2q_1 + 1$, $x = 3q_2 + 2$, $x = 5q_3 + 3$, $q_1 = 2q_4 + 1$, $q_2 = 3q_5 + 2$, and $q_3 = 5q_6 + 3$.

Solution. Let $x = s_1$ (= yā 1) and $q_4 = s_2$ (= kā 1). Then, from $s_1 = 2q_1 + 1$ and $q_1 = 2s_2 + 1$ follows an evaluation of s_1, $s_1 = 4s_2 + 3$. Let $q_5 = s_3$ (= nī 1). Then, from $s_1 = 3q_2 + 2$ and $q_2 = 3s_3 + 2$ follows another evaluation of s_1, $s_1 = 9s_3 + 8$. Equate the two evaluations of s_1: $4s_2 + 3 = 9s_3 + 8$, from which follows an evaluation of s_2, $s_2 = \frac{9s_3+5}{4}$. Since this is a fraction, kuṭṭaka is applied: $s_2 = 9s_4 + 8$ ⟨and $s_3 = 4s_4 + 3$⟩ (s_4 = pī 1). Raised by this value of s_2, $s_1 = 36s_4 + 35$. Let $q_6 = s_5$ (= lo 1). Then, from $s_1 = 5q_3 + 3$ and $q_3 = 5s_5 + 3$ follows still another evaluation of s_1, $s_1 = 25s_5 + 18$. Equate the last two evaluations: $36s_4 + 35 = 25s_5 + 18$, from which follows an evaluation of s_4, $s_4 = \frac{25s_5-17}{36}$. Since this is a fraction, kuṭṭaka is applied: $s_4 = 25s_6 + 3$ ⟨and $s_5 = 36s_6 + 5$⟩ (s_6 = ha 1). Raised by this value of s_4, $s_1 = 900s_6 + 143$. By raising s_6 by 0, 1, 2, etc., there are many solutions: ⟨143, 1043, 1943, etc.⟩

E83: Five divisions (purely numerical).

Statements of problem. $x = 5q_1 + 1$, $y = 6q_2 + 2$, $| x - y | = 3q_3 + 2$, $x + y = 9q_4 + 5$, and $xy = 7q_5 + 6$.

Solution 1. Let $q_1 = q_2 = s_1$ (= yā 1). Then, from the first two statements, $| x - y | = s_1 + 1$. Let $q_3 = s_2$ (= kā 1). Then, from the third statement, $| x - y | = 3s_2 + 2$. Therefore, $s_1 + 1 = 3s_2 + 2$, from which follows an evaluation of s_1, $s_1 = 3s_2 + 1$. Raised by this, $x = 15s_2 + 6$ and $y = 18s_2 + 8$. Let $q_4 = s_3$ (= nī 1). Then, from the fourth statement, $x + y = 9s_3 + 5$. Therefore, $33s_2 + 14 = 9s_3 + 5$, from which follows an evaluation of s_2, $s_2 = \frac{9s_3-9}{33}$. Since this is a fraction, kuṭṭaka is applied: $s_2 = 3s_4 + 0$ ⟨and $s_3 = 11s_4 + 1$⟩ (s_4 = pī 1). Raised by this value of s_2, $x = 45s_4 + 6$ and $y = 54s_4 + 8$. The product of these x and y will contain the square of s_4 and therefore the calculation will become long. Therefore, assume s_4 in x to be unity. Then, $x = 51 = 7 \cdot 7 + 2$. On the other hand, $y = 7 \cdot (7s_4 + 1) + (5s_4 + 1)$.

Therefore, $xy = 7q_5' + (3s_4 + 2)$. Assume $q_5 - q_5' = s_5$ (= lo 1). Then, $7s_5 + 6 = 3s_4 + 2$, from which follows an evaluation of s_4, $s_4 = \frac{7s_5+4}{3}$. Since this is a fraction, kuṭṭaka is applied: $s_4 = 7s_6 + 6$ ⟨and $s_5 = 3s_6 + 2$⟩ (s_6 = ha 1). Raised by this value of s_4, $y = 378s_6 + 332$. On the other hand, $x = 45 \cdot 7s_6 + 51 = 315s_6 + 51$. ⟨Hence follow the solutions $(x, y) = (315s_6 + 51, 378s_6 + 332)$.⟩

Solution 2. Assume, at the very beginning, x to be a known number that satisfies the first statement and obtain y by calculation. For example, if one assumes $x = 51$, then $y = 126s_7 + 80$ (s_7 = śve 1). C (p. 240) omits this solution and instead (in fn. 2) refers to $(x, y) = (6, 126s_6 + 8)$ and $(36, 126s_6 + 104)$ given in Rāmakṛṣṇa's commentary.

E84: Two divisions with a condition (purely numerical).

Statements of problem. $9x = 30q_1 + r_1$, $7x = 30q_2 + r_2$, $q_1 + q_2 + r_1 + r_2 = 26$, and $0 \le r_1,\ r_2 < 30$.

Solution. Let $x = s_1$ (= yā 1) and $q_1 + q_2 = s_2$ (= kā 1). Then, $r_1 + r_2 = 16s_1 - 30s_2$. Add s_2 ($= q_1 + q_2$) to both sides: $16s_1 - 29s_2 = 26$, from which follows an evaluation of s_1, $s_1 = \frac{29s_2+26}{16}$. Since this is a fraction, kuṭṭaka is applied: $s_1 = 29s_3 + 27$ ⟨and $s_2 = 16s_3 + 14$⟩ (s_3 = nī 1). Since $s_2 = q_1 + q_2 = 26 - (r_1 + r_2) \le 26$, there is a solution, ⟨$x = s_1 = 27$⟩, only when $s_3 = 0$.

E85: Three divisions with a condition (purely numerical).

Statements of problem. $3x = 30q_1 + r_1$, $7x = 30q_2 + r_2$, $9x = 30q_3 + r_3$, $r_1 + r_2 + r_3 = 30q_4 + 11$, and $0 \le r_i < 30$ ($i = 1, 2, 3$).

Solution. Let $x = s_1$ (= yā 1). Then, from the first three statements, $r_1 + r_2 + r_3 = 19s_1 - 30(q_1 + q_2 + q_3)$, which is equal to $(30q_4 + 11)$ according to the fourth statement. Hence follows the equation, $19s_1 - 30(q_1 + q_2 + q_3 + q_4) = 11$. Let $q_1 + q_2 + q_3 + q_4 = s_2$ (= kā 1). Then, $19s_1 - 30s_2 = 11$, from which follows an evaluation of s_1, $s_1 = \frac{30s_2+11}{19}$. By kuṭṭaka, $s_1 = 30s_3 + 29$, ⟨$s_2 = 19s_3 + 18$⟩ (s_3 = nī 1).

E86: Two divisions with a condition (purely numerical).

Statements of problem. $23x = 60q_1 + r_1$, $23x = 80q_2 + r_2$, $r_1 + r_2 = 100$, $0 \le r_1 < 60$, and $0 \le r_2 < 80$.

Solution is given after the following meta-rule.

69: A meta-rule.

'Here (in this type of problems), the values of more than one color in the dividend of the quotient of division should not be assumed optionally. If so done, the calculation would deviate from the right course.'

If in E86 we assume $x = s_1$ (= yā 1), $q_1 = s_2$ (= kā 1), and $q_2 = s_3$ (= nī 1), then from the first two statements follow $r_1 = 23s_1 - 60s_2$ and $r_2 = 23s_1 - 80s_3$. Hence, by the third statement, follows the equation, $46s_1 - 60s_2 - 80s_3 = 100$, from

which an evaluation of s_1 is obtained, $s_1 = \frac{30s_2+40s_3+50}{23}$. Usually, s_3 can optionally be assumed to be a known number before kuṭṭaka is applied, but in this case it can not. For, if we do so, s_2 must also be determined because s_2 and s_3 are not independent of each other.

Solution 1 of E86. Assume $r_1 = 40$ and $r_2 = 60$, which realize the third statement, and let $x = s_1$ (= yā 1), $q_1 = s_2$ (= kā 1), and $q_2 = s_3$ (= nī 1). Then, from the first two statements follow two evaluations of s_1, $s_1 = \frac{60s_2+40}{23}$ and $s_1 = \frac{80s_3+60}{23}$, from which follows an evaluation of s_2, $s_2 = \frac{4s_3+1}{3}$. By kuṭṭaka, $s_2 = 4s_4 + 3$ and $s_3 = 3s_4 + 2$ (s_4 = pī 1). Raised by either of these, $s_1 = \frac{240s_4+220}{23}$. Again by kuṭṭaka, $s_1 = 240s_5 + 20$ and $s_4 = 23s_5 + 1$ (s_5 = lo 1). Raised by this value of s_1, $x = 240s_5 + 20$.

Solution 2 of E86. Assume $r_1 = 30$ and $r_2 = 70$. Then, ⟨in the same manner as solution 1, $s_2 = \frac{4s_3+2}{3}$. By kuṭṭaka, $s_2 = 4s_4 + 2$ and $s_3 = 3s_4 + 1$. Raised by either of these, $s_1 = \frac{240s_4+150}{23}$. Again by kuṭṭaka, $s_1 = 240s_5 + 90$ and $s_4 = 23s_5 + 8$. Raised by this value of s_1,⟩ $x = 240s_5 + 90$.

E87: A division with a condition (purely numerical).

Statements of problem. $5x = 13q + r$, $x + q = 30$, and $0 \leq r < 13$.

Solution. Let $x = s_1$ (= yā 1) and $q = s_2$ (= kā 1). Then, $5s_1 = 13s_2 + r$ and $s_1+s_2 = 30$. At this point of his solution, Bhāskara says, 'Since this computation has no grounds, neither a multiplier nor divisor is recognized here,' cites the following maxim, and begins a new solution after that. His statement, 'neither a multiplier nor divisor is recognized here,' seems to mean that kuṭṭaka cannot be applied to this problem, though, in fact, it can be.

Q10: A maxim on the ground (ādhāra) of computation.

'If a computation has no grounds or insecure grounds, one should not employ that (computation). Why does it go well?'

Solution of E87. Assume $r = 0$ and apply the iṣṭa-karman (L 51). That is, when $r = 0$, if $x = 13$, then $q = 5$. Hence follows the trairāśka: 'If q is 5 when $(x + q)$ is 18, then what is q when $(x+q)$ is 30?' That is, $q = \mathrm{TR}\,[18, 5, 30] = 25/3$. Therefore, $x = 30 - 25/3 = 65/3$.

Bhāskara's solution merely gives an approximation to the real one. In fact, from the first two statements follows the equation, $5x = 390 - 13x + r$, from which an evaluation of x is obtained, $x = \frac{r+390}{18}$. To this kuṭṭaka is applied; the only solution that satisfies the condition of r is $(x, r) = (22, 6)$, and $q = 8$.

E88: Buying and selling of fruits.

x = buying rate (quantity/paṇa), y = selling rate (quantity/paṇa), q_i = paṇas obtained by the i-th person when the fruits are sold for the selling rate y ($i = 1, 2, 3$), r_i = number of the remaining fruits ($i = 1, 2, 3$).

Statements of problem. $6x = yq_1 + r_1$, $8x = yq_2 + r_2$, $100x = yq_3 + r_3$, $q_1 + 5r_1 = q_2 + 5r_2 = q_3 + 5r_3$, and $0 \le r_i < y$ $(i = 1, 2, 3)$.

Solution. Let $x = s_1$ (= yā 1) and $q_1 = s_2$ (= kā 1) and assume $y = 110$. Then, from the first statement, $r_1 = 6s_1 - 110s_2$, and therefore $q_1 + 5r_1 = 30s_1 - 549s_2$. By trairāśika, $q_2 = \mathrm{TR}\,[6, s_2, 8] = \frac{4}{3}s_2$ and $q_3 = \mathrm{TR}\,[6, s_2, 100] = \frac{50}{3}s_2$ (which implies that s_2 is divisible by 3), and therefore $q_2 + 5r_2 = \frac{120}{3}s_1 - \frac{2196}{3}s_2$ and $q_3 + 5r_3 = \frac{1500}{3}s_1 - \frac{27450}{3}s_2$. From $q_1 + 5r_1 = q_2 + 5r_2$ the equation, $30s_1 - 549s_2 = \frac{120}{3}s_1 - \frac{2196}{3}s_2$, is obtained, from which follows an evaluation of s_1, $s_1 = \frac{549s_2}{30}$ (which should not be reduced to $\frac{183s_2}{10}$ because s_2 must be divisible by 3). Also from the other two statements, $q_2 + 5r_2 = q_3 + 5r_3$ and $q_1 + 5r_1 = q_3 + 5r_3$, the same evaluation of s_1 is obtained. By kuṭṭaka, $s_1 = 549s_3 + 0$ ⟨and $s_2 = 30s_3 + 0$⟩ (s_3 = nī 1). When $s_3 = 1$, $x = s_1 = 549$. ⟨By the first three statements with $(x, y) = (549, 110)$, the quotients and the corresponding remainders are obtained: $(q_1, q_2, q_3) = (29, 39, 499)$, $(r_1, r_2, r_3) = (104, 102, 10)$, from which follows $q_i + 5r_i = 549$ for every i.⟩ (For other solutions see after Q11.)

Note that this solution has a contradiction caused by the unwarranted use of trairāśika: the trairāśika in Bhāskara's solution brings the relationship $30s_1 = 549s_2$, which in turn makes the property of each person after the selling of the fruits zero: $q_i + 5r_i = 30s_1 - 549s_2 = 0$. Bhāskara's remarks after the solution are presumably related with this fact. He says (in E88p2): 'This ⟨example⟩ was told by our predecessors for the case of insecure computation and solved after an equation was somehow made. Here, an assumption was made ⟨by me⟩ in such a way that the computation, though its grounds were insecure, might come to an answer like a computation with secure grounds. Wherever ⟨a computation⟩ is deviating from the right course due to the contraction of computation based on this kind of assumption, ⟨the answer⟩ should be reconciled ⟨with the statements⟩ by means of intelligence by intelligent people.' And then he cites the next maxim which refers to five causes of the computation of bīja-gaṇita, including the intelligence (mati).

Q11: A maxim on the cause (hetu) of computation.

'Statement, stainless intelligence, assumption of unknown numbers, equation, and trairāśika: these must be the cause of computation everywhere in bīja-⟨gaṇita⟩.'

Other solutions of E88. Substituting r_i obtained from the first three statements for those in the next three statements, we have $q_1 + 5(6x - yq_1) = q_2 + 5(8x - yq_2) = q_3 + 5(100x - yq_3)$, from which follow $(5y-1)(q_2 - q_1) = 10x$, $(5y-1)(q_3 - q_2) = 460x$, and $(5y - 1)(q_3 - q_1) = 470x$. By putting $q_2 - q_1 = 5n$, we have $n(5y - 1) = 2x$, $q_3 - q_2 = 230n$, and $q_3 - q_1 = 235n$.

When $n = 1$, solving $y = (2x + 1)/5$ by kuṭṭaka, we have $(y, x) = (1 + 2k, 2 + 5k)$, and $q_2 = q_1 + 5$ and $q_3 = q_1 + 235$. From the first three statements, we have $6(2 + 5k) = (1 + 2k)q_1 + r_1$, $8(2 + 5k) = (1 + 2k)(q_1 + 5) + r_2$, and $100(2 + 5k) =$

$(1+2k)(q_1+235)+r_3$. Therefore, $r_1-r_2=1$, $r_2-r_3=46$, $r_1-r_3=47$. Hence follows $r_1\geq 48$. The solutions are as follows ($p=q_i+5r_i$).

k	x	y	q_1	r_1	q_2	r_2	q_3	r_3	p
25	127	51	14	48	19	47	249	1	254
26	132	53	14	50	19	49	249	3	264
27	137	55	14	52	19	51	249	5	274
					etc.				

When $n=2$, solving $y=(x+1)/5$ by kuṭṭaka, we have $(y,x)=(1+k,4+5k)$, and $q_2=q_1+10$ and $q_3=q_1+470$. In exactly the same way as above, $r_1-r_2=2$, $r_2-r_3=92$, $r_1-r_3=94$. Hence follows $r_1\geq 95$. The solutions are as follows. Bhāskara's solution falls in this group ($k=109$).

k	x	y	q_1	r_1	q_2	r_2	q_3	r_3	p
100	504	101	29	95	39	93	499	1	504
101	509	102	29	96	39	94	499	2	509
102	514	103	29	97	39	95	499	3	514
					⋮				
109	549	110	29	104	39	102	499	10	549
					etc.				

When $n=3$, solving $y=(2x+3)/15$ by kuṭṭaka, we have $(y,x)=(1+2k,6+15k)$, and $q_2=q_1+15$ and $q_3=q_1+705$. In exactly the same way as above, $r_1-r_2=3$, $r_2-r_3=138$, $r_1-r_3=141$. Hence follows $r_1\geq 142$. The solutions are as follows. Etc., etc.

k	x	y	q_1	r_1	q_2	r_2	q_3	r_3	p
75	1131	151	44	142	59	139	749	1	754
76	1146	153	44	144	59	141	749	3	764
77	1161	155	44	146	59	143	749	5	774
					etc.				

III.1.10 Chapter 10: Elimination of the middle term of (equations in) more than one color

70–73: Rule 1.

0. If the equation after the equal subtraction contains the square etc. of unknown number, make the side of unknown a square number (cf. steps 0 and 1 of the rule for the second seed, BG 59–61).

1. Type $(as_1+b)^2=cs_2^2+d$. Apply varga-prakṛti to the second side: VP $(c)\,[\alpha,\beta,d]$. Then, $s_2=\alpha$, and from $as_1+b=\beta$ follows s_1. (70–71ab)

2. Type $(as_1+b)^2=cs_2^2+ds_2+e$ $(d\neq 0)$. Let $cs_2^2+ds_2+e=s_3^2$. By the equal subtraction, $cs_2^2+ds_2=s_3^2-e$. Make the first side a square number:

$(cs_2 + f)^2 = cs_3^2 + g$ (where $f = d/2$, $g = -ce + d^2/4$). Apply varga-prakṛti to the second side: VP (c) $[\alpha, \beta, g]$. Then, from $as_1 + b = \alpha$ follows s_1 and from $cs_2 + f = \beta$ follows s_2. (71cd–72ab)

3. 'Intelligent people should consider in various ways so that one side of the equation may become the object of varga-prakṛti.' (72cd)

4. 'The ⟨bona fide⟩ seed is the intelligence accompanied by various colors, which, explained fully in order to awaken dull people by my learned predecessors who are for calculators just as the sun is for red lotus, has come to possess the state of being what is called seed mathematics (bīja-gaṇita).' (73)

74–75: Rule 2.

Type $(as_1+b)^2 = cs_2^2+d$. Apply varga-prakṛti to the second side: VP (c) $[\alpha, \beta, d]$. Then, $s_2 = \alpha$, and s_1 follows from $as_1 + b = \beta$.

This rule is the same as rule 1.1 but detailed fully here.

E89: A quadratic equation in two unknown numbers.

Statement of problem. $6x^2 + 2x = u^2$.

Solution. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $6s_1^2 + 2s_1 = s_2^2$. Multiplied by 6 and increased by 1, $36s_1^2 + 12s_1 + 1 = 6s_2^2 + 1$ or $(6s_1 + 1)^2 = 6s_2^2 + 1$. Apply rule 1 of varga-prakṛti to the second side: VP (6) $[2, 5, 1]$. By rule 2, VP (6) $[20, 49, 1]$. Hence follow $s_2 = 2$ and 20. From $6s_1 + 1 = 5$ and 49 follow $s_1 = 2/3$ and 8. Raised by these, $(x, u) = (2/3, 2)$ and $(8, 20)$. Likewise, there are many solutions according to the solutions of VP (6) $[x, y, 1]$.

E90: A cubic equation in two unknown numbers.

Statement of problem. $(x + y)^2 + (x + y)^3 = 2(x^3 + y^3)$.

Solution. Let $x = s_1 - s_2$ (= yā 1 kā 1) and $y = s_1 + s_2$ (= yā 1 kā 1). Then, $x+y = 2s_1$ and therefore the first side $= 8s_1^3+4s_1^2$. From $x^3 = s_1^3-3s_1^2s_2+3s_1s_2^2-s_2^3$ and $y^3 = s_1^3 + 3s_1^2s_2 + 3s_1s_2^2 + s_2^3$ follows that the second side $= 2(2s_1^3 + 6s_1s_2^2) = 4s_1^3 + 12s_1s_2^2$. The statement is rewritten as $8s_1^3 + 4s_1^2 = 4s_1^3 + 12s_1s_2^2$. By the equal subtraction, $4s_1^3 + 4s_1^2 = 12s_1s_2^2$. Divided by s_1 and increased by 1, $4s_1^2 + 4s_1 + 1 = 12s_2^2 + 1$ or $(2s_1 + 1)^2 = 12s_2^2 + 1$. Apply rule 1 of varga-prakṛti to the second side: VP (12) $[2, 7, 1]$. By rule 2, VP (12) $[28, 97, 1]$. Hence follow $s_2 = 2$ and 28. From $2s_1+1 = 7$ and 97 follow $s_1 = 3$ and 48. Raised by these, $(x, y) = (s_1-s_2, s_1+s_2) = (1, 5)$, $(20, 76)$, etc.

76–77ab: Rule 3.

1. Type $(as_1 + b)^2 = cs_2^4 + ds_2^2$. Divide the second side by s_2^2: $cs_2^2 + d$. To this apply varga-prakṛti: VP (c) $[\alpha, \beta, d]$. Then, $s_2 = \alpha$, and from $as_1 + b = \alpha\beta$ follows s_1.

2. Type $(as_1 + b)^2 = cs_2^6 + ds_2^4$. Divide the second side by $(s_2^2)^2$: $cs_2^2 + d$. To this apply varga-prakṛti: VP (c) $[\alpha, \beta, d]$. Then, $s_2 = \alpha$, and from $as_1 + b = \alpha^2\beta$ follows

s_1.

E91: A bi-quadratic equation in two unknown numbers.

Statement of problem. $5(x^2)^2 - 100x^2 = u^2$.

Solution. Let $x = s_1$ (= yā 1) and $u^2 = s_2^2$ (= kāva 1). Then, $5(s_1^2)^2 - 100s_1^2 = s_2^2$. Divided by s_1^2, $5s_1^2 - 100 = (s_2/s_1)^2$. By varga-prakṛti, VP (5) $[10, 20, -100]$, VP (5) $[170, 380, -100]$, etc. That is to say, $(s_1, s_2/s_1) = (10, 20)$, $(170, 380)$, etc. Hence follow $(x, u) = (s_1, s_2) = (10, 200)$, $(170, 64600)$, etc.

E92: A system of cubic equations in two main and two auxiliary unknown numbers.

Statements of problem. $x - y = u^2$ and $x^2 + y^2 = v^3$.

Solution. Let $y = s_1$ (= yā 1), $x = s_2$ (= kā 1), and $u = s_3$ (= nī 1). Then, from the first statement follows the value of s_1, $s_1 = s_2 - s_3^2$. Therefore, $x^2 + y^2 = s_2^2 + (s_2 - s_3^2)^2 = 2s_2^2 - 2s_2s_3^2 + (s_3^2)^2$. Let $v = s_3^2$. Then, from the second statement follows the equation, $2s_2^2 - 2s_2s_3^2 + (s_3^2)^2 = (s_3^2)^3$. By the equal subtraction, $(s_3^2)^3 - (s_3^2)^2 = 2s_2^2 - 2s_2s_3^2$. Multiplied by 2 and increased by $(s_3^2)^2$, $2(s_3^2)^3 - (s_3^2)^2 = 4s_2^2 - 4s_2s_3^2 + (s_3^2)^2$. The second side is $(2s_2 - s_3^2)^2$. The first side, divided by $(s_3^2)^2$, is $2s_3^2 - 1$. To this apply varga-prakṛti: VP (2) $[5, 7, -1]$, VP (2) $[29, 41, -1]$, etc. Hence follow the roots of the first side, $5^2 \cdot 7 = 175$, $29^2 \cdot 41 = 34481$, etc. On the other hand, the corresponding roots of the second side are $2s_2 - 25$, $2s_2 - 841$, etc. Hence follow the equations, $175 = 2s_2 - 25$, $34481 = 2s_2 - 841$, etc. Therefore, $s_2 = 100$, 17661, etc. Raised by these values, $s_1 = 75$, 16820, etc. Hence follow the solutions, $(x, y) = (s_2, s_1) = (100, 75)$, $(17661, 16820)$, etc.

77cd–78: Rule 4.

Type $(as_1 + b)^2 = cs_2^2 + ds_2 + e$ $(d \neq 0)$. Let $cs_2^2 + ds_2 + e = s_3^2$. Make the second side (of the original equation) a square number, $(cs_2 + d/2)^2 = cs_3^2 - ce + d^2/4$. To this apply rule 2 (BG 74–75). In other words, apply varga-prakṛti to the third side, $cs_3^2 - ce + (d/2)^2$: VP (c) $[\alpha, \beta, -ce + d^2/4]$. Then, from $as_1 + b = \alpha$ follows s_1, and from $cs_2 + d/2 = \beta$ follows s_2.

This rule is the same as rule 1.2 but detailed fully here.

E93: Two sums of an arithmetical progression (quadratic equation in two unknown numbers).

a, d = the first term and the increase (common difference) of an arithmetical progression, x, y = numbers of terms, $A(n)$ = the sum of the first n terms of the progression.

Statements of problem. $a = 3$, $d = 2$, $3A(x) = A(y)$, ⟨and $A(n) = \frac{n}{2}\{2a + d(n - 1)\}$⟩.

Solution. Let $x = s_1$ (= yā 1) and $y = s_2$ (= kā 1). Then, $3s_1^2 + 6s_1 = s_2^2 + 2s_2$. Multilpied by 3 and increased by 9, $9s_1^2 + 18s_1 + 9 = 3s_2^2 + 6s_2 + 9$. The first side is $(3s_1 + 3)^2$. The second side is $3s_2^2 + 6s_2 + 9$, which is equated to a third

side, s_3^2 (= nīva 1): $3s_2^2 + 6s_2 + 9 = s_3^2$. Multiplied by 3 and increased by -18, $9s_2^2 + 18s_2 + 9 = 3s_3^2 - 18$. The second side (of the original equation) is $(3s_2 + 3)^2$. Apply varga-prakṛti to the third side: VP (3) $[9, 15, -18]$, VP (3) $[33, 57, -18]$, etc. From $3s_1 + 3 = s_3 = 9$, 33, etc. follow $s_1 = 2$, 10, etc.; from $3s_2 + 3 = 15$, 57, etc. follow $s_2 = 4$, 18, etc. Raised by these, $(x, y) = (s_1, s_2) = (2, 4)$, $(10, 18)$, etc.

79–80: Rule 5.

1. Type $(as_1 + b)^2 = cs_2^2 + ds_3^2 + e$. Apply varga-prakṛti to the second side, regarding s_2 as unknown number (c as prakṛti) and the rest ($ds_3^2 + e$) as the additive: VP (c) $[\alpha, \beta, ds_3^2 + e]$, where α (= s_2) is assumed to be $fs_3 + g$ by choosing such f and g that make the second side a square number. Then, β will be obtained as $hs_3 + i$, ⟨which is the root of the second side and therefore the root of the first side as well. Hence follows the linear equation, $as_1 + b = hs_3 + i$, while $s_2 = \alpha = fs_3 + g$.⟩ (BG 79)

2. Type $(as_1 + b)^2 = cs_2^2 + ds_2s_3 + es_3^2$ (with bhāvita). 'Take the square-root of as much part as possible of the second side,' that is to say, let $cs_2^2 + ds_2s_3 + es_3^2 = (fs_2 + gs_3)^2 + hs_3^2$, where $f = \sqrt{c}$, $g = d/2\sqrt{c}$, and $h = (4ce - d^2)/4c$. Then,

$$fs_2 + gs_3 = \left(\frac{hs_3^2}{m} - m\right) \div 2, \left\langle as_1 + b = \left(\frac{hs_3^2}{m} + m\right) \div 2 \right\rangle,$$

where m is any optional number. (BG 80)

Bhāskara does not refer to the latter relationship; his example (E96) does not require $as_1 + b$.

If we assume $m = is_3$, then $fs_2 + gs_3 = \frac{h-i^2}{2i}s_3$, $\quad as_1 + b = \frac{h+i^2}{2i}s_3$. These relationships are not mentioned in rule 5 but used in Bhāskara's solution of E96.

Before one takes the square-root of part of the second side, one may multiply the second side by an appropriate square number so that the coefficients may be integers. In his solution of E96, Bhāskara multiply it by 36 and obtain $c = d = e = 1$. In that case, of course, the root obtained, $as_1 + b$, should be divided by its square-root but, as mentioned above, Bhāskara's example does not require its value.

The following are the supplementary rules briefly mentioned in 80p1 and in 80p3–p4.

3. Supplementary rule to 5.1. If the prakṛti is a square number, apply rule 9 for varga-prakṛti (BG 54). That is to say, if the second side is $c^2s_2^2 + ds_3^2 + e$, then

$$\mathrm{VP}\left(c^2\right)\left[\left(\frac{ds_3^2 + e}{m} - m\right) \div 2 \div c, \left(\frac{ds_3^2 + e}{m} + m\right) \div 2, ds_3^2 + e\right],$$

where m is any optional number. Therefore, $s_2 = \left(\frac{ds_3^2+e}{m} - m\right) \div 2 \div c$ and $as_1 + b = \left(\frac{ds_3^2+e}{m} + m\right) \div 2$. (BG 80p1)

4. Supplementary rule to 5.1 and 5.2. If there are more than two unknown numbers in the second side, assume known numbers for them except two. (BG 80p3)

5. Supplementary rule to 5.1 and 5.2. These rules are applicable only when other statement or condition exists. If not, assume known numbers for them except one. (BG 80p4)

E94: A system of quadratic equations in two main and two auxiliary unknown numbers.

Statements of problem. $7x^2 + 8y^2 = u^2$ and $7x^2 - 8y^2 + 1 = v^2$.

Solution. Let $x = s_1$ (= yā 1), $y = s_2$ (= kā 1), and $u = s_3$ (= nī 1). Then, from the first statement follows the equation, $7s_1^2 + 8s_2^2 = s_3^2$. Solve VP (7) $[s_1, s_3, 8s_2^2]$ according to rule 1 of varga-prakṛti: VP (7) $[2s_2, 6s_2, 8s_2^2]$. Raise x in the second statement by this value ($2s_2$) of x: VP (20) $[s_2, v, 1]$. Solve this by rule 1 of varga-prakṛti: VP (20) $[2, 9, 1]$. By rule 2, $\mathrm{BH}^+(20)\begin{bmatrix}2&9&1\\2&9&1\end{bmatrix} = \mathrm{VP}\,(20)\,[36, 161, 1]$, from which follow $s_2 = 2$, 36, etc. Raised by these values, $(x, y) = (s_1, s_2) = (2s_2, s_2) = (4, 2)$, $(72, 36)$, etc.

E95: A system of cubic equations in two main and two auxiliary unknown numbers.

Statements of problem. $x^2 + y^3 = u^2$ and $x + y = v^2$.

Solution 1. $x = s_1$ (= yā 1), $y = s_2$ (= kā 1), and $u = s_3$ (nī 1). Then, from the first statement follows the equation, $s_1^2 + s_2^3 = s_3^2$. Solve VP (1) $[s_1, s_3, s_2^3]$ according to rule 9 for the varga-prakṛti (BG 54) with $m = s_2$:

$$s_1 = \left(\frac{s_2^3}{s_2} - s_2\right) \div 2 \div 1 = \frac{s_2^2 - s_2}{2}, \quad s_3 = \left(\frac{s_2^3}{s_2} + s_2\right) \div 2 = \frac{s_2^2 + s_2}{2}.$$

Therefore, $x + y = \frac{s_2^2+s_2}{2}$. Let $v = s_4$ (= pī 1). Then, from the second statement follows the equation, $\frac{s_2^2+s_2}{2} = s_4^2$, or $s_2^2 + s_2 = 2s_4^2$. Multiplied by 4 and increased by 1, $4s_2^2 + 4s_2 + 1 = 8s_4^2 + 1$, or $(2s_2 + 1)^2 = 8s_4^2 + 1$. Solve VP (8) $[s_4, w, 1]$ by rule 1 of varga-prakṛti: VP (8) $[1, 3, 1]$. By rule 2, $\mathrm{BH}^+(8)\begin{bmatrix}1&3&1\\1&3&1\end{bmatrix} = \mathrm{VP}\,(8)\,[6, 17, 1]$. Again by rule 2, $\mathrm{BH}^+(8)\begin{bmatrix}1&3&1\\6&17&1\end{bmatrix} = \mathrm{VP}\,(8)\,[35, 99, 1]$. Then, from $2s_2 + 1 = w = 17$ follow $s_2 = 8$ and $s_1 = 28$; from $2s_2 + 1 = w = 99$ follow $s_2 = 49$ and $s_1 = 1176$. Raised by these, $(x, y) = (s_1, s_2) = (28, 8)$ and $(1176, 49)$. (E95p1)

Solution 2. Let $y = 2s_1^2$ (= yāva 2) and $x = 7s_1^2$ (= yāva 7). Then, since $x + y = (3s_1)^2$, the second statement is automatically realized. Let $u = s_2$ (= kā 1). Then, from the first statement follows the equation, $49(s_1^2)^2 + 8(s_1^2)^3 = s_2^2$, or $8s_1^2 + 49 = (s_2/s_1^2)^2$. Solve VP (8) $[s_1, s_2/s_1^2, 49]$ by rule 1 of varga-prakṛti: VP (8) $[2, 9, 49]$ and VP (8) $[3, 11, 49]$. By rule 2, $\mathrm{BH}^+(8)\begin{bmatrix}2&9&49\\3&11&49\end{bmatrix} = \mathrm{VP}\,(8)\,[49, 147, 49^2]$, from which, by rule 3 of varga-prakṛti with $a = 7$, follows VP (8) $[7, 21, 49]$. Therefore, $(y, x) = (2s_1^2, 7s_1^2) = (8, 28)$, $(18, 63)$, and $(98, 343)$. (E95p2)

E96: A system of quadratic equations in two main and two auxiliary unknown numbers.

Statements of problem. $x^2+xy+y^2=u^2$, $(x+y)u+1=v^2$.

Solution. Let $x=s_1$ (= yā 1), $y=s_2$ (= kā 1), and $u=s_3$ (= nī 1). Then, from the first statement follows the equation, $s_1^2+s_1s_2+s_2^2=s_3^2$. By the equal subtraction, $s_1^2+s_1s_2=s_3^2-s_2^2$; increased by s_2^2, $s_1^2+s_1s_2+s_2^2=s_3^2$; and multiplied by 36, $36s_1^2+36s_1s_2+36s_2^2=36s_3^2$. The second side is $(6s_3)^2$, while the first side is $(6s_1+3s_2)^2+27s_2^2$, to which rule 5.2 (BG 80) is applied: with $m=s_2$, $6s_1+3s_2=(27s_2^2/s_2-s_2)/2=13s_2$, from which follows $s_1=\frac{5}{3}s_2$. Raised by this, $(x,y)=(\frac{5}{3}s_2,s_2)$. Hence follows $s_3^2=s_1^2+s_1s_2+s_2^2=\frac{49}{9}s_2^2$, or $s_3=\frac{7}{3}s_2$. Let $v=s_4$ (= pī 1). Then, from the second statement follows the equation, $(\frac{5}{3}s_2+s_2)\times\frac{7}{3}s_2+1=s_4^2$, or $(56s_2^2+9)/9=s_4^2$. Through the reduction to a common denominator, elimination of the denominators and equal subtraction, $56s_2^2=9s_4^2-9$. Increased by 9, $56s_2^2+9=9s_4^2$. Solve VP (56) $[s_2,3s_4,9]$ by rule 1 of varga-prakṛti: VP (56) $[6,45,9]$. By rule 2, BH$^+$(56) $\left[\begin{smallmatrix}6&45&9\\6&45&9\end{smallmatrix}\right]$ = VP (45) $[540,4041,9^2]$, from which, by rule 3 of varga-prakṛti with $a=3$, follows VP (56) $[180,1347,9]$. Therefore, $(x,y)=(10,6)$ and $(300,180)$. Likewise, there are many other solutions.

E97: A system of cubic equations in two main and six auxiliary unknown numbers.

Statements of problem. $x+y+2=r^2$, $x-y+2=u^2$, $x^2+y^2=v^2$, $x^2-y^2+8=w^2$, $(xy+y)/2=t^3$, $r+u+v+w+t=q^2$.

Solution 1. Let $x=s_1^2-1$ (= yāva 1 rū $\dot{1}$), $y=2s_1$ (= yā 2), and $q=s_2$ (= kā 1). Then, from all the six statements follows the equation, $2s_1^2+3s_1-2=s_2^2$. Multiplied by 8 and increased by 25, $16s_1^2+24s_1+9=8s_2^2+25$, or $(4s_1+3)^2=8s_2^2+25$. Solve VP (8) $[s_2,s_3,25]$ by rule 1 of varga-prakṛti: VP (8) $[5,15,25]$. By rule 2 of varga-prakṛti, BH$^+$(8) $\left[\begin{smallmatrix}5&15&25\\5&15&25\end{smallmatrix}\right]$ = VP (8) $[150,425,25^2]$, from which, by rule 3 of varga-prakṛti with $a=5$, follows VP (8) $[30,85,25]$. By rule 2 of varga-prakṛti, BH$^+$(8) $\left[\begin{smallmatrix}5&15&25\\30&85&25\end{smallmatrix}\right]$ = VP (8) $[875,2475,25^2]$, from which, by rule 3 for the varga-prakṛti with $a=5$, follows VP (8) $[175,495,25]$. From $4s_1+3=s_3$ follow the values of s_1: $s_1=3$ when $s_3=15$; $s_1=\frac{41}{2}$ when $s_3=85$; and $s_1=123$ when $s_3=495$. Raised by these, $(x,y)=(8,6)$, $(\frac{1677}{4},41)$, and $(15128,246)$. Likewise, there are many other solutions. (E97p1–p2)

In E97p3, Bhāskara also gives three kinds of 'assumption' (kalpanā) or the initial setting of unknown numbers for other solutions.

Solution 2. Let $x=s_1^2+2s_1$ (yāva 1 yā 2) and $y=2s_1+2$ (yā 2 rū 2).

Solution 3. Let $x=s_1^2-2s_1$ (yāva 1 yā $\dot{2}$) and $y=2s_1-2$ (yā 2 rū $\dot{2}$).

Solution 4. Let $x=s_1^2+4s_1+3$ (yāva 1 yā 4 rū 3) and $y=2s_1+4$ (yā 2 rū 4).

81: A meta rule on the assumption.

'In this way, there are thousands of assumptions ⟨even for a single problem⟩ but

they are hidden against ignorant people. In mercy to them, therefore, a method for assumption is told here.'

82–83: Rule 6.

Type $x+y+a=r^2$, $x-y+a=u^2$, $x^2+y^2+b=v^2$, $x^2-y^2+c=w^2$. Let $u=s_1+p$ and $r=u+\sqrt{c/a}$, and obtain x and y expressed in s_1 from $x+y=r^2-a$ and $x-y=u^2-a$ by means of the rule of concurrence (L 56). ⟨Then, raise $x^2+y^2+b=v^2$ by these values of x and y to obtain s_1.⟩

E98: A system of cubic equations in two main and six auxiliary unknown numbers.

Statements of problem. $x+y+3=r^2$, $x-y+3=u^2$, $x^2+y^2-4=v^2$, $x^2-y^2+12=w^2$, $xy/2+y=t^3$, $r+u+v+w+t+2=q^2$.

Solution.

Assumption 1. According to rule 6, let $p=-1$, that is, $u=s_1-1$ (= yā 1 rū $\dot{1}$). Then, $r=s_1-1+\sqrt{12/3}=s_1+1$, and $x+y=(s_1+1)^2-3=s_1^2+2s_1-2$, and $x-y=(s_1-1)^2-3=s_1^2-2s_1-2$. By the rule of concurrence (L 56), $x=s_1^2-2$ and $y=2s_1$.

Assumption 2. Or, otherwise, let $p=0$, that is, $u=s_1$ (= yā 1). Then, $r=s_1+\sqrt{12/3}=s_1+2$, and $x+y=(s_1+2)^2-3=s_1^2+4s_1+1$, and $x-y=s_1^2-3$. By the rule of concurrence (L 56), $x=s_1^2+2s_1-1$ and $y=2s_1+2$.

On assumption 1, $x+y+3=(s_1+1)^2$, $x-y+3=(s_1-1)^2$, $x^2+y^2-4=(s_1^2)^2$, $x^2-y^2+12=(s_1^2-4)^2$, and $xy/2+y=s_1^3$. Therefore, $r+u+v+w+t+2=2s_1^2+3s_1-2$, which is a square number: $2s_1^2+3s_1-2=s_2^2$ (= kāva 1). Multiplied by 8 and increased by 9, $(4s_1+3)^2=8s_2^2+25$. The second side is solved by varga-prakṛti: VP (8) $[5,15,25]$, VP (8) $[175,495,25]$, etc. From $4s_1+3=15$ follows $s_1=3$; from $4s_1+3=495$ follows $s_1=123$; etc. Raised by these, $(x,y)=(s_1^2-2,2s_1)=(7,6)$, $(15127,246)$, etc. (E98p1)

On assumption 2, $x+y+3=(s_1+2)^2$, $x-y+3=s_1^2$, $x^2+y^2-4=(s_1^2+2s_1+1)^2$, $x^2-y^2+12=(s_1^2+2s_1-3)^2$, and $xy/2+y=(s_1+1)^3$. Therefore, $r+u+v+w+t+2=2s_1^2+7s_1+3$, which is a square number: $2s_1^2+7s_1+3=s_2^2$ (= kāva 1). Multiplied by 8 and increased by 49, $(4s_1+7)^2=8s_2^2+25$. The second side is solved by varga-prakṛti: VP (8) $[5,15,25]$, VP (8) $[175,495,25]$, etc. From $4s_1+7=15$ follows $s_1=2$; from $4s_1+7=495$ follows $s_1=122$; etc. Raised by these, $(x,y)=(s_1^2+2s_1-1,2s_1+2)=(7,6)$, $(15127,246)$, etc. (E98p2)

E98p3 explains the process of 'raising' for assumption 2 step by step. As this is too explanatory, E98p3, except the last sentence (evaṃ bahudhā), may be a later interpolation.

E99: Two systems of quadratic equations in two main and two auxiliary unknown numbers each.

Statements of problems.

1. $y^2+x^2+1=u^2$ and $y^2-x^2+1=v^2$.

2. $y^2 + x^2 - 1 = u^2$ and $y^2 - x^2 - 1 = v^2$.

Solution of problem 1. Assume $x^2 = 4s_1^2$ and $y^2 = 5s_1^2 - 1$ ($s_1 =$ yā 1). Then, the two statements are automatically realized. The last equation is solved by varga-prakṛti. By rule 1, VP (5) $[1, 2, -1]$. Also, since VP (5) $[4, 9, 1]$, by rule 2, BH$^+$(5) $\begin{bmatrix} 1 & 2 & -1 \\ 4 & 9 & 1 \end{bmatrix}$ = VP (5) $[17, 38, -1]$. From the first solution follows $(x, y) = (2, 2)$; from the second solution follows $(x, y) = (34, 38)$. (E99p1)

Solution of problem 2. Assume $x^2 = 4s_1^2$ and $y^2 = 5s_1^2 + 1$ ($s_1 =$ yā 1). Then, the two statements are automatically realized. The last equation is solved by varga-prakṛti. By rule 1, VP (5) $[4, 9, 1]$. By rule 2, BH$^+$(5) $\begin{bmatrix} 4 & 9 & 1 \\ 4 & 9 & 1 \end{bmatrix}$ = VP (5) $[72, 161, 1]$. From the first solution follows $(x, y) = (8, 9)$; from the second solution follows $(x, y) = (144, 161)$. (E99p2)

Assumption method 1. Assume $x^2 = a^2 s_1^2$ and $y^2 = bs_1^2 \mp 1$ (the minus sign for problem 1 and the plus sign for problem 2). In either problem, from the two statements follow $(b+a^2)s_1^2 = u^2$ and $(b-a^2)s_1^2 = v^2$. Let $b+a^2 = k^2$ and $b-a^2 = \ell^2$. Then, $2a^2 = k^2 - \ell^2 = (k + \ell)(k - \ell)$. Let $k - \ell = c$. Then, $k + \ell = 2a^2/c$. By the rule of concurrence (L 56), $k = (2a^2/c + c)/2$ and $\ell = (2a^2/c - c)/2$. Therefore, define b as $b = k^2 - a^2 = \ell^2 + a^2$, and a in such a way that b may be an integer. For example, if one assumes $a^2 = 4$, then from $2a^2 = 8 = 2 \cdot 4$ follows $b = 5$ (this is the case of the above two solutions); if one assumes $a^2 = 36$, then from $2a^2 = 72 = 6 \cdot 12$ follows $b = 45$, from $72 = 4 \cdot 18$ follows $b = 85$, and from $72 = 2 \cdot 36$ follows $b = 325$. (E99p3–p4)

Assumption method 2. Assume $x^2 = 2abs_1^2$ and $y^2 = (a^2 + b^2)s_1^2 \mp 1$ (the minus sign for problem 1 and the plus sign for problem 2). Then, in either problem, the two statements are realized: $y^2 + x^2 \pm 1 = (a + b)^2 s_1^2$, $y^2 - x^2 \pm 1 = (a - b)^2 s_1^2$. Therefore, assume $a = k^2$ and $b = \ell^2/2$ so that $2ab$ may be a square number, and solve $y^2 = (a^2 + b^2)s_1^2 \mp 1$ by varga-prakṛti. For example, if one assumes $a = 1^2 = 1$ and $b = 2^2/2 = 2$, then $x^2 = 4s_1^2$, $y^2 = 5s_1^2 \mp 1$ (this is the case of the above two solutions); if one assumes $a = 3^2 = 9$ and $b = 2^2/2 = 2$, then $x^2 = 36s_1^2$, $y^2 = 85s_1^2 \mp 1$. (E 99p5)

In L 60–61, Bhāskara gives two algorithms for problem 2 of BG E99.

84–85: Rule 7.

1. Type $as_1 + b = s_2^2$. (1a) If there is no other statement, assume s_2 to be a known number (c) to obtain s_1: $s_1 = (c^2 - b)/a$. (1b) If there is another statement, assume $s_2 = cs_3 + d$, obtain an evaluation of s_1, $s_1 = (c^2/a)s_3^2 + (2cd/a)s_3 + (d^2 - b)/a$, and to this apply that statement.

2. Type $as_1 + b = s_2^3$. Do in the same way as above.

E100: A system of quadratic equations in one main and two auxiliary unknown numbers.

Statements of problem. $3x + 1 = u^2$ and $5x + 1 = v^2$.

Solution 1. Let $x = s_1$ (= yā 1), and $u = s_2$ (= kā 1). Then, from the first statement follows the equation, $3s_1 + 1 = s_2^2$. Let $s_2 = 3s_3 + 1$ (s_3 = nī 1). Then, $3s_1 + 1 = (3s_3 + 1)^2 = 9s_3^2 + 6s_3 + 1$, from which follows an evaluation of s_1: $s_1 = 3s_3^2 + 2s_3$. To this apply the second statement: $5(3s_3^2 + 2s_3) + 1 = s_4^2$ (s_4 = pī 1), or $15s_3^2 + 10s_3 = s_4^2 - 1$. Multiplied by 15 and increased by 25, $(15s_3 + 5)^2 = 15s_4^2 + 10$. The second side is solved by varga-prakṛti. By rule 1, VP (15) $[1, 5, 10]$. Since VP (15) $[1, 4, 1]$, by rule 2, $\mathrm{BH}^+(15)\begin{bmatrix}1 & 5 & 10\\ 1 & 4 & 1\end{bmatrix} = \mathrm{VP}\,(15)\,[9, 35, 10]$. Again by rule 2, $\mathrm{BH}^+(15)\begin{bmatrix}9 & 35 & 10\\ 1 & 4 & 1\end{bmatrix} = \mathrm{VP}\,(15)\,[71, 275, 10]$. When $s_4 = 9$, from $15s_3 + 5 = 35$ follows $s_3 = 2$, and $s_1 = 3s_3^2 + 2s_3 = 16$ ($= x$); when $s_4 = 71$, from $15s_3 + 5 = 275$ follows $s_3 = 18$, and $s_1 = 3s_3^2 + 2s_3 = 1008$ ($= x$). (E100p1)

Solution 2. Let $x = \frac{1}{3}s_1^2 - \frac{1}{3}$ (s_1 = yā 1). Then, the first statement is automatically realized: $3x + 1 = s_1^2$ ($u = s_1$). From the second statement, $\frac{5}{3}s_1^2 - \frac{2}{3} = s_2^2$ ($v = s_2$ = kā 1). This is solved by varga-prakṛti. By rule 1, VP (5/3) $[1, 1, -2/3]$, Since VP (5/3) $[3, 4, 1]$, by rule 2, VP (5/3) $[7, 9, -2/3]$. Again by rule 2, VP (5/3) $[55, 71, -2/3]$. That is, $(s_1, s_2) = (7, 9)$ and $(55, 71)$. Therefore, $x = \frac{1}{3}s_1^2 - \frac{1}{3} = 16$ and 1008. (E100p2)

E101: A system of cubic equations in one main and two auxiliary unknown numbers.

Statements of problem. $3x + 1 = u^3$ and $3u^2 + 1 = v^2$.

Solution. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, from the first statement an evaluation of s_1 is obained: $s_1 = \frac{1}{3}s_2^3 - \frac{1}{3}$. Let $v = s_3$ (= nī 1). Then, from the second statement follows the equation, $3s_2^2 + 1 = s_3^2$. This is solved by varga-prakṛti: VP (3) $[s_2, s_3, 1]$. By rule 1, VP (3) $[1, 2, 1]$. By rule 2, VP (3) $[4, 7, 1]$. Again by rule 2, VP (3) $[15, 26, 1]$. When $s_2 = 4$, $s_1 = 21$ ($= x$); when $s_2 = 15$, $s_1 = 3374/3$ ($= x$).

E102: A system of quadratic equations in two main and two auxiliary unknown numbers.

Statements of problem. $2(x^2 - y^2) + 3 = u^2$ and $3(x^2 - y^2) + 3 = v^2$.

This is solved after the next meta-rule.

86: A meta-rule on the starting point of calculation.

'The learned begin calculation sometimes from its beginning, sometimes from its middle, and sometimes from its end so that the calculation may become easier and may be accomplished.'

Solution of E102. Let $x^2 - y^2 = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, from the first statement, $2s_1 + 3 = s_2^2$, from which an evaluation of s_1 is obtained: $s_1 = \frac{1}{2}s_2^2 - \frac{3}{2}$. Let $v = s_3$ (= nī 1). Then, from the second statement, $\frac{3}{2}s_2^2 - \frac{3}{2} = s_3^2$. By the equal subtraction etc., $3s_2^2 = 2s_3^2 + 3$. Multiplied by 3, $(3s_2)^2 = 6s_3^2 + 9$. This is solved by varga-prakṛti, VP (6) $[s_3, 3s_2, 9]$: VP (6) $[6, 15, 9]$ and VP (6) $[60, 147, 9]$. If $3s_2 = 15$, then $s_2 = 5$ and $s_1 = \frac{1}{2}s_2^2 - \frac{3}{2} = 11$. If $3s_2 = 147$, then $s_2 = 49$ and $s_1 = 1199$. Therefore, let $x^2 - y^2 = s_1 = 11$. Then, if $x - y = 1$, then $x + y = 11$

and, by the rule of concurrence (L 56), $(x, y) = (6, 5)$. ⟨$x - y = 11$ would bring the negative solution, $y = -5$, which is not acceptable.⟩ Let $x^2 - y^2 = s_1 = 1199$. Then, if $x - y = 1$, then $x + y = 1199$ and $(x, y) = (600, 599)$; if $x - y = 11$, then $x + y = 109$ and $(x, y) = (60, 49)$.

87: Rule 8. Square-kuṭṭaka etc. 1.

Type $(x^n + c)/b = u$, where $n \geq 2$ and x and u are integers.

When $n = 2$, let $x = s_1$ and $u = s_2$. Then, $s_1^2 = bs_2 - c$. Equate the second side to $(kbs_3 + d)^2$. Then $s_2 = k^2bs_3^2 + 2kds_3 + (d^2 + c)/b$. Take such d that makes s_2 an integer.

E103: Two indeterminate quadratic equations in one main and one auxiliary unknown numbers each.

Statements of problems. 1. $(x^2 - 4)/7 = u$. 2. $(x^2 - 30)/7 = u$.

Solution of 1. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $s_1^2 = 7s_2 + 4$. Equate the second side to $(7s_3 + 2)^2$ (s_3 = nī 1). Then, $s_2 = 7s_3^2 + 4s_3$, which means that s_2 (= u) is an integer for any integer s_3. Therefore, if $s_3 = 1$, then $s_1 = 7s_3 + 2 = 9$ and $x^2 = s_1^2 = 81$.

Solution of 2 is given after the next rule.

88–90: Rule 9. Square-kuṭṭaka etc. 2.

1. Type $(x^2 \pm c)/b = u$. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $s_1^2 = bs_2 \mp c$.

1a. When $s_1^2 = bs_2 + c$ and $\sqrt{c}$ is an integer (say, d), take such p that satisfies $p^2 = bq_1$ and $2pd = bq_2$, and let the second side be $(ps_3 \pm d)^2$. Then, $s_2 = q_1s_3^2 \pm q_2s_3$, which means that s_2 is an integer for any integer s_3. Hence follow solutions, $(u, x) = (q_1s_3^2 \pm q_2s_3, ps_3 \pm d)$.

1b. When $s_1^2 = bs_2 + c$ and $\sqrt{c}$ is not an integer, ⟨or when $s_1^2 = bs_2 - c$⟩, c is pared by b: $c = bq + r$ ($0 \leq r < b$). If there exist such m and d that $r + mb = d^2 = c'$, then $c = bq - mb + c'$ and therefore $u = (x^2 - c)/b = (x^2 - c')/b - (q - m)$, or $(x^2 - c')/b = u + (q - m) = u'$. To this apply the rule of 1a and obtain (u', x). If there do not exist such m and d, then 'the example is barren (khila).'

2. Type $(ax^2 \pm c)/b = u$. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $as_1^2 = bs_2 \mp c$. Multiplied by such k that makes ka a square number (say, a'^2), $(a's_1)^2 = b(ks_2) \mp kc$. To this apply the rule of 1.

The following are additional rules given in 90p2.

3. Type $(x^3 \pm c)/b = u$. This is solved also by the rule of 1. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $s_1^3 = bs_2 \mp c$.

3a. When $\sqrt[3]{c}$ is an integer (say, d), take such p that $p^3 = bq_1$ and $3pd = bq_2$, and let the second side be $(ps_3 \mp d)^3$. The rest is the same as 1a.

3b. When $\sqrt[3]{c}$ is not an integer, c is pared by b: $c = bq + r$ ($0 \leq r < b$). If there

exist such m and d that $r + mb = d^3 = c'$, then $c = bq - mb + c'$. The rest is the same as 3a. If there do not exist such m and d, then 'the example is barren.'

4. Type $(ax^3 \pm c)/b = u$. This case is only vaguely referred to by Bhāskara in his statement that the last statement of 3b (if ... barren) 'should also be applied ahead' (agre 'pi yojyam). The first step of the procedure for this type must be the same as 2; that is, both sides of $as_1^3 = bs_2 \mp c$ are multiplied by such k that makes ka a cubic number (say, a'^3): $(a's_1)^3 = b(ks_2) \mp kc$. The rest is the same as 3.

Solution of E103.2. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $s_1^2 = 7s_2 + 30$. As this 30 does not have an integer root, it is pared by the divisor 7: $30 = 7{\cdot}4{+}2$. The resulting 2, increased twice by the divisor 7, is 16, a square number: $2{+}7{\cdot}2 = 16 = 4^2$. Equate the second side to $(7s_3 \pm 4)^2$. Then, $s_2 = 7s_3^2 \pm 8s_3 - 2$. This s_2 is an integer for any integer s_3. Hence follow solutions, $(u, x) = (7s_3^2 \pm 8s_3 - 2, 7s_3 \pm 4)$. (90p3)

E104: An indeterminate cubic equation in one main and one auxiliary unknown numbers.

Statement of problem. $(x^3 - 6)/5 = u$.

Solution. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $s_1^3 = 5s_2 + 6$, whose second side is equated to $(5s_3 + 6)^3$ (s_3 = nī 1). Then, from $s_1^3 = 125s_3^3 + 450s_3^2 + 540s_3 + 216 = 5s_2 + 6$ follows $s_2 = 25s_3^3 + 90s_3^2 + 108s_3 + 42$. This s_2 is an integer for any integer s_3. Hence follow the solutions, $x = s_1 = 5s_3 + 6$. For example, when $s_3 = 0$, $(x, u) = (6, 42)$; when $s_3 = 1$, $(x, u) = (11, 265)$.

E105: An indeterminate quadratic equation in one main and one auxiliary unknown numbers.

Statement of problem. $(5x^2 + 3)/16 = u$.

Solution. Let $x = s_1$ (= yā 1) and $u = s_2$ (= kā 1). Then, $5s_1^2 = 16s_2 - 3$. Multiplied by 5, $(5s_1)^2 = 16(5s_2) - 15$. Substitute s_2 for $5s_2$: $(5s_1)^2 = 16s_2 - 15$. Equate the second side to $(8s_3 + 1)^2$ (s_3 = nī 1). Then, $s_2 = 4s_3^2 + s_3 + 1$. This s_2 is an integer for any integer s_3. Solving $5s_1 = 8s_3 + 1$ by kuṭṭaka, KU $(8, 5, 1)$ $[5, 3]$. That is, $(s_1, s_3) = (8s_4 + 5, 5s_4 + 3)$ (s_4 = pī 1). When $\langle s_4 = 0$, $x = s_1 = 5$; when$\rangle$ $s_4 = 1$, $x = s_1 = 13$. (E105p1)

Or, otherwise, equate the second side to $(8s_3 - 1)^2$ (s_3 = nī 1). Then, $s_2 = 4s_3^2 - s_3 + 1$. This s_2 is an integer for any integer s_3. Solve $5s_1 = 8s_3 - 1$ by kuṭṭaka: KU $(8, 5, -1)$ $[3, 2]$. That is, $(s_1, s_3) = (8s_4 + 3, 5s_4 + 2)$ (s_4 = pī 1). (E105p2)

III.1.11 Chapter 11: Bhāvita

91: Rule 1 for bhāvita equations.

If an equation contains a bhāvita or product of two or more colors, then optionally assume a known number for each of them except one, and apply the first seed (BG 56–58).

E106: An indeterminate bhāvita equation in two unknown numbers.

Statement of problem. $xy = 4x + 3y + 2$.

Solution. Let $x = s_1$ (= yā 1) and $y = s_2$ (= kā 1). Then, $s_1 s_2 = 4s_1 + 3s_2 + 2$. If one assumes $s_2 = 5$, then $5s_1 = 4s_1 + 17$. By the equal subtraction, $s_1 = 17$. Raised by this, $(x, y) = (17, 5)$. If one assumes $s_2 = 6$, then $(x, y) = (10, 6)$. Likewise, there are infinite solutions according to the optional numbers.

E107: An indeterminate bhāvita equation in four unknown numbers.

Statement of problem. $20(x_1 + x_2 + x_3 + x_4) = x_1 x_2 x_3 x_4$.

Solution. Let $x_1 = s_1$ (= yā 1), and assume $x_2 = 5$, $x_3 = 4$, and $x_4 = 2$. Then, ⟨from $20(s_1 + 11) = 40s_1$ follows⟩ $s_1 = 11$. Therefore, $(x_1, x_2, x_3, x_4) = (11, 5, 4, 2)$. Or, otherwise, assume $x_2 = 10$, $x_3 = 3$, and $x_4 = 1$. Then, ⟨from $20(s_1 + 14) = 30s_1$ follows⟩ $s_1 = 28$. Therefore, $(x_1, x_2, x_3, x_4) = (28, 10, 3, 1)$. Or, otherwise, assume $x_2 = 6$, $x_3 = 4$, and $x_4 = 1$. Then, ⟨from $20(s_1 + 11) = 24s_1$ follows⟩ $s_1 = 55$. Therefore, $(x_1, x_2, x_3, x_4) = (55, 6, 4, 1)$. Or, otherwise, assume $x_2 = 8$, $x_3 = 3$, and $x_4 = 1$. Then, ⟨from $20(s_1 + 12) = 24s_1$ follows⟩ $s_1 = 60$. Therefore, $(x_1, x_2, x_3, x_4) = (60, 8, 3, 1)$. There are many solutions.

E108: Two indeterminate bhāvita equations in two main and one auxiliary unknown numbers each.

Statements of problems.

1. $x + y + xy + x^2 + y^2 = u^2$ and $x + y + u = 23$.
2. $x + y + xy + x^2 + y^2 = u^2$ and $x + y + u = 53$.

Solution of 1. Let $x = s_1$ (= yā 1), and assume $y = 2$. Then, from the first statement follows $u^2 = x + y + xy + x^2 + y^2 = s_1^2 + 3s_1 + 6$, and from the second statement $u^2 = \{23 - (x+y)\}^2 = (21 - s_1)^2 = s_1^2 - 42s_1 + 441$. Therefore, $s_1^2 + 3s_1 + 6 = s_1^2 - 42s_1 + 441$. By the equal subtraction, $45s_1 = 435$, from which follows $s_1 = 29/3$. Therefore, $(x, y) = (29/3, 2)$. Or, otherwise, assume $y = 3$. Then $(x, y) = (97/11, 3)$. Or, otherwise, assume $y = 5$. Then, $(x, y) = (7, 5)$. (E108p1)

Solution of 2. Let $x = s_1$ (= yā 1), and assume $y = 2$. Then, $s_1^2 + 3s_1 + 6 = s_1^2 - 102s_1 + 2601$. By the equal subtraction, $105s_1 = 2595$, from which follows $s_1 = 173/7$. Therefore, $(x, y) = (173/7, 2)$. Or, otherwise, assume $y = 17$. Then, $(x, y) = (11, 17)$. (E108p2)

At the end of solution 2 (E108p2) Bhāskra remarks that it is not easy to get integer solutions by rule 1, i.e., by assuming a known number for one of the two unknown numbers, and gives another rule in the next two verses.

92–93: Rule 2 for bhāvita equations in two unknown numbers.

1. Subtract bhāvitas from one side and the two colors and the rūpas from the other side. Divide both sides by the digit (i.e., coefficient) of the bhāvita to obtain the equation, $xy = ax + by + c$.

2. Optionally factorize $(ab+c)$, i.e., choose such p and q that satisfy $ab+c=pq$. Then, $(x,y)=(b\pm p, a\pm q)$ and $(b\pm q, a\pm p)$ are solutions.

After illustrating this rule with the example of E106 in 93p2, Bhāskara gives two proofs of the rule, one based on figures (kṣetra-gata) in 93p3 and the other based on quantities (rāśi-gata) in 93p4. He maintains that the proof (upapatti) is of those two kinds everywhere (sā ca dvidhā sarvatra syāt/ ekā kṣetragatānyā rāśigateti, 93p3).

Q12=E106: $xy=4x+3y+2$.

Solution of E106 according to rule 2. $ab+c=4\times 3+2=14$. From the factorization, $14=1\times 14$, follow $(x,y)=(3+1,4+14)=(4,18)$ and $(x,y)=(3+14,4+1)=(17,5)$. Also, from the factorization, $14=2\times 7$, follow $(x,y)=(3+2,4+7)=(5,11)$ and $(x,y)=(3+7,4+2)=(10,6)$. (BG 93p2)

Proof of rule 2 based on figures. Bhāskara uses the notation of E106 for the proof, that is, yā 1 and kā 1 for the two unknown numbers, and 4, 3, and 2 for the three known numbers, but I use s_1 and s_2 for the two unknown numbers, and a, b, and c for the three known numbers. Regard s_1 and s_2 in the equation, $s_1s_2=as_1+bs_2+c$, as the numbers of unit squares on the two orthogonal sides (called 'arm' and 'edge') of a rectangle, which Bhāskara calls bhāvita figure (see the first figure in 93p3). Then the bhāvita figure, whose area is s_1s_2, consists of a of s_1, b of s_2, and c rūpas (unit squares). If one removes $as_1+b(s_2-a)$ from the bhāvita figure, then a small rectangle remains on the bottom left corner (see the second figure in 93p3). If, on the other hand, one subtracts the same, $as_1+b(s_2-a)$, from both sides of the equation, one obtains $s_1s_2-\{as_1+b(s_2-a)\}=as_1+bs_2+c-\{as_1+b(s_2-a)\}=(ab+c)$. This is the area of the small rectangle. If, therefore, one regards its two orthogonal sides as consisting of p and q unit squares, respectively, then $ab+c=pq$, and $(x,y)=(s_1,s_2)=(b+p,a+q)$ or $(b+q,a+p)$. (BG 93p3)

Proof of rule 2 based on quantities. Let the two orthogonal sides of the small rectangle be s_3 (= nī 1) and s_4 (= pī 1). Then, $(s_1,s_2)=(b+s_4,a+s_3)$ or $(b+s_3,a+s_4)$. Raised by these, the first side of the equation is $(ab+as_4+bs_3+s_3s_4)$, and the second side $(ab+as_4+ab+bs_3+c)$. By the equal subtraction, $s_3s_4=ab+c$. The rest of the proof is the same as above. (BG 93p4)

After the next verse on the affiliation of proof, Bhāskara explains in 93p5 two more possible layouts of the bhāvita figure and the rectangle s_3s_4, the second case of which corresponds to the negative sign of the solutions by rule 2.

94: Affiliation of proof.

'Calculators say that bīja-gaṇita is accompanied by proof. For, otherwise, there would be no difference between pāṭī and bīja.'

Two more layouts of the bhāvita figure s_1s_2 and the rectangle s_3s_4.

1. If $a < 0$, $b < 0$, and $c > 0$, then the bhāvita figure $s_1 s_2$ is included in the rectangle $s_3 s_4$ (see the first figure in 93p5).

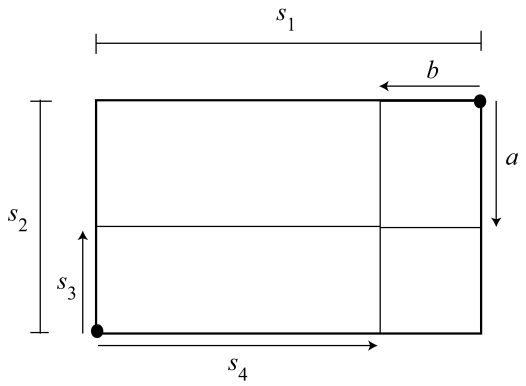
2. If $a > s_2 > 0$ and $b > s_1 > 0$, then $s_3 < 0$ and $s_4 < 0$, and the rectangle ab consists of the bhāvita figure $s_1 s_2$ and three rectangles, $s_3 s_4$, $s_1(a - s_2)$, and $(b - s_1)s_2$. In this case, the bhāvita figure $s_1 s_2$ touches the rectangle $s_3 s_4$ from outside only at a corner (see the second figure in 93p5). (BG 93p5)

Note that the last three figures (the second figure in 93p3 and the two figures in 93p5) illustrate the following three cases, respectively, under the conditions, $s_1 = s_4 + b > 0$ and $s_2 = s_3 + a > 0$.

(1) $0 < a < s_2$ and $0 < b < s_1$;

(2) $a < 0$ and $b < 0$; and

(3) $a > s_2$ and $b > s_1$ (that is, $s_3 < 0$ and $s_4 < 0$).



The above figure interprets the first case (cf. the second figure in 93p3): the four arrows indicate the positive directions of a, b, s_3, and s_4. When they are negative, they point to the opposite directions as a and b in the second case (cf. the first figure in 93p5) and s_3 and s_4 in the third case (cf. the second figure in 93p5) do. This is the way Bhāskara explained negative lengths in the L as well. In his prose comment on L 168, he calculates the two segments of the base 9 of the trilateral $(9, 10, 17)$ by means of his own rule. He says, 'Here, what is obtained by means of "The sum of the two sides of a trilateral" etc. (L 165–166) is 21. The base (9) cannot be diminished by this (21). From this the base should be subtracted and half the remainder is a negative segment (ṛṇagatābādhā) (-6), which means ⟨a segment⟩ in the opposite direction (digvaiparītyena).'

E109: An indeterminate bhāvita equation in two unknown numbers.

Statement of problem. $2xy = 10x + 14y - 58$.

Solution. Let $x = s_1$ (=yā 1) and $y = s_2$ (= kā 1). According to rule 2, divide both sides by the coefficient of the bhāvita: $s_1 s_2 = 5s_1 + 7s_2 - 29$. Therefore, $ab + c = 5 \times 7 - 29 = 6$. From the factorization, $6 = 2 \times 3$, follow $(x, y) = (7+3, 5+2) = (10, 7)$, $(7 + 2, 5 + 3) = (9, 8)$, $(7 - 3, 5 - 2) = (4, 3)$, and $(7 - 2, 5 - 3) = (5, 2)$.

E110: An indeterminate bhāvita equation in two unknown numbers.

Statement of problem. $xy + 3x + 5y = 62$.

Solution. Let $x = s_1$ (=yā 1) and $y = s_2$ (= kā 1). Then, by rule 2, $s_1 s_1 = -3s_1 - 5s_2 + 62$, and therefore $ab + c = (-3) \times (-5) + 62 = 77$. From the factorization, $77 = 7 \times 11$, follow $(x, y) = (-5 + 11, -3 + 7) = (6, 4)$, $(-5 + 7, -3 + 11) = (2, 8)$, $(x, y) = (-5 - 11, -3 - 7) = (-16, -10)$, and $(-5 - 7, -3 - 11) = (-12, -14)$. The negative solutions are not accepted.

Q13=E108.1: $x + y + xy + x^2 + y^2 = u^2$ and $x + y + u = 23$.

Solution by rule 2. Let $x = s_1$ (= yā 1) and $y = s_2$ (= kā 1). Then, $x + y + xy + x^2 + y^2 = s_1 + s_2 + s_1 s_2 + s_1^2 + s_2^2$. 'As this has no root' (asya mūla-abhāvāt), equate it to $\{23 - (x + y)\}^2 = s_1^2 + s_2^2 + 2s_1 s_2 - 46s_1 - 46s_2 + 529$, make the equal subtraction, and divide both sides by the coefficient of the bhāvita: $s_1 s_2 = 47s_1 + 47s_2 - 529$. Hence follows $ab + c = 47 \times 47 - 529 = 1680$. From the factorization, $1680 = 40 \times 42$, follow $(x, y) = (47 - 40, 47 - 42) = (7, 5)$ ⟨or $(5, 7)$⟩ and $(47 + 40, 47 + 42) = (87, 89)$, the latter of which is inappropriate (it is a solution of $x + y - u = 23$).

Q14=E108.2: $x + y + xy + x^2 + y^2 = u^2$ and $x + y + u = 53$.

Solution by rule 2. In exactly the same way as above, $s_1 s_2 = 107s_1 + 107s_2 - 2809$. Hence follows $ab + c = 107 \times 107 - 2809 = 8640$. From the factorization, $8640 = 90 \times 96$, follow $(x, y) = (107 - 96, 107 - 90) = (11, 17)$ ⟨or $(17, 11)$⟩ and $(107 + 96, 107 + 90) = (203, 197)$, the latter of which is inappropriate (it is a solution of $x + y - u = 53$).

E110p4 refers to a system of simultaneous bhāvita equations, where more than one equation contains a bhāvita or bhāvitas. In that case, new equations are to be obtained from evaluations (unmiti) of the bhāvitas.

III.1.12 Chapter 12: Epilogue

95: Father.

Bhāskra refers to his father, Maheśvara, who initiated him into mathematics.

96: Predecessors.

Bhāskara mentions his predecessors, Brahmagupta, Śrīdhara, and Padmanābha, who wrote copious books on bīja-gaṇita. Taking the essence of their works, he says, he made a small book with correct reasoning in order to satisfy pupils.

97ab: Size of this book.

According to Bhāskra, the size of this book, consisting of rules and examples, is 1,000 anuṣṭubhs, that is, $1,000$ anuṣṭubhs $\times$ 32 syllables/anuṣṭubh $= 32,000$ syllables (or syllabic letters), but this number does not agree with my counting of the syllables that compose the present edition as the table below shows.

IA1, IC1, IIA1, and IIE1 include the number of the syllables in Chapter 12,

which is indicated in the parentheses. Obviously, the number of the syllables of the verses for the rules (IA1) and for the examples (IB1) is too small: IA1 + AB1 = 8,766 syllables = 273.9 anuṣṭubhs. But, if we add the syllables of the prose paragraphs (IIB1) to them, the sum exceeds that number by 3,662 syllables, i.e., by 11.4% (10.4% if we exclude Chapter 12): IA1 + AB1 + IIB1 = 35,662 syllables = 1,114.4 anuṣṭubhs. This may suggest that the present *Bījagaṇita* contains later interpolations. See E12p5, E15p3, E64p1–p3, E98p3, and 101p.

		1: Syllables	2: Numerals
I (verse)	A: BG 1–102	4,124 (320)	0
	B: BG E1–E110	4,642	0
	C: BG Q1–Q15	414 (32)	0
II (prose)	A: Introductory phrases	1,523 (41)	0
	B: Prose paragraphs	26,896	3,878
	C: Displayed matters	674	834
	D: Figures	54	184
	E: Ending remarks	382 (23)	0

97cd–98: Aims of multiple examples.

The reason why the author gave more than one example for a single rule and one and the same example at more than one place is to show (1) the object area (artha-viṣaya) of a rule, (2) the validity (vyāpti) of a rule or of a thesis, (3) different assumptions or settings (kalpanā-bheda), and (4) the reasoning (yukti). But only a limited number of examples are given in this book because examples are endless.

According to Kṛṣṇa, the following examples are designed for the above aims: (1) Q12 (=E106), E109, E110, Q13 (=E108.1), and Q14 (=E108.2) for rule 2 for bhāvita equations given in BG 92–93; (2) E43, in addition to E42, for the validity of the easiness of the algorithm given in E42p2; (3) E39=Q9 (E38=Q8 also); and (4) many examples (he does not specify).

99–100: Copious books unnecessary.

A copious treatise is a vast ocean which is difficult for less intelligent people to cross over. It is useless, on the other hand, for intelligent people, for whom a fraction of instruction makes a treatise, that is to say, it spreads by itself once it reaches them, (as the following maxim suggests.)

101=CV 14.5: A maxim on the innate power.

'Oil to water, a secret to a wicked person, an offering to a bowl, and a treatise to a wise person: they spread themselves by means of their own innate power ⟨once they reached their targets⟩, however small fractions they might be.'

This is a maxim belonging to the *Vṛddhacāṇakya* (CV 14.5), the best-known

among the six versions of the aphorism collections attributed to Cāṇakya. See CNTT vol. 1, pt. 1, p. 82; and vol. 2, pt. 2, pp. 245–246.

Q15=GA praśna 3: Characterization of pāṭī-gaṇita and bīja-gaṇita.
pāṭī-gaṇita = trairāśika or three-quantity operation
bīja-gaṇita = vimala-mati or stainless intelligence

102: Merits of this book.

'This book is pleasant for reciting (reading), is easy to understand even for young people, is the essence of the whole mathematics, and is accompanied by proof methods. In short, this book is full of merits and free from faults. Read, calculator, this small book in order to enhance your intelligence and to obtain maturity.'

III.2 Classified List of Algebraic Problems in the *Bīja-gaṇita*

Here I give a classified list of the algebraic problems that were solved by Bhāskara in the *Bīja-gaṇita*. The classification was first made according to the highest order of the equations of each problem: linear, quadratic, cubic, and bi-quadratic. Then, in each category, a problem, which consists of an equation or of a system of equations, is listed according to the numbers of the unknown numbers whose values are required (a), of the unknown numbers whose values are not required (b), and of the equations in the problem (c). I indicate them by $[a, b, c]$ in the subheadings of the list that follows. As in Appendix 1, here also I express the equations in modern algebraic notation, as close to the expression of the Sanskrit verses as possible, but the implicit equations such as $x^2 + y^2 = z^2$ of the Pythagorean theorem, which were put in a pair of angular parentheses in Appendix 1, are here listed without them.

III.2.1. Linear Equations

$[1, 0, 1]$

$$x/5 + x/3 + 3\,(x/3 - x/5) + 1 = x \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E41}$$

$[1, 1, 2]$

$$\begin{cases} u = 5 \cdot 12 \cdot x/100 \\ x + u = 2x - 16 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E45}$$

$[1, 2, 2]$

$$\begin{cases} 5x = 63q_1 + 7 \\ 10x = 63q_2 + 14 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E27}$$

$$\begin{cases} 5x = 13q + r \\ x + q = 30 \\ 0 \le r < 13 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E87}$$

$[1, 2, 3]$

$$\begin{cases} 6x + 300 = u_1 \\ 10x - 100 = u_2 \\ u_1 = u_2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E36–37.1}$$

$$\begin{cases} 6x + 300 = u_1 \\ 10x - 100 = u_2 \\ u_1/2 + 2 = u_2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E36–37.2}$$

$$\begin{cases} 6x + 300 = u_1 \\ 10x - 100 = u_2 \\ u_1 = 3u_2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E36–37.3}$$

$[1, 3, 4]$

$$\begin{cases} (x - 10) \times 2 - 10 - 10 = u_1 \\ (u_1 - 10) \times 2 - 10 - 10 = u_2 \\ (u_2 - 10) \times 2 - 10 - 10 = u_3 \\ u_3 = 3x \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E47}$$

$[1, 4, 3]$

$$\begin{cases} 9x = 30q_1 + r_1 \\ 7x = 30q_2 + r_2 \\ q_1 + q_2 + r_1 + r_2 = 26 \\ 0 \le r_1,\ r_2 < 30 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E84}$$

$$\begin{cases} 23x = 60q_1 + r_1 \\ 23x = 80q_2 + r_2 \\ r_1 + r_2 = 100 \\ 0 \le r_1 < 60,\ 0 \le r_2 < 80 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E86}$$

$[1,4,4]$

$$\begin{cases} x = 6q_1 + 5 \\ x = 5q_2 + 4 \\ x = 4q_3 + 3 \\ x = 3q_4 + 2 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E80}$$

$[1,6,4]$

$$\begin{cases} 3x = 30q_1 + r_1 \\ 7x = 30q_2 + r_2 \\ 9x = 30q_3 + r_3 \\ r_1 + r_2 + r_3 = 30q_4 + 11 \\ 0 \le r_1,\ r_2,\ r_3 < 30 \end{cases} \quad \ldots\ldots\ldots \text{E85}$$

$[1,6,6]$

$$\begin{cases} x = 2q_1 + 1,\ q_1 = 2q_4 + 1 \\ x = 3q_2 + 2,\ q_2 = 3q_5 + 2 \\ x = 5q_3 + 3,\ q_3 = 5q_6 + 3 \end{cases} \quad \ldots\ldots \text{E82}$$

$[2,0,1]$

$$y = (221x + 65)/195 \ \ldots\ldots\ldots\ldots\ldots \text{E21}$$

$$y = (100x \pm 90)/63 \ \ldots\ldots\ldots\ldots\ldots \text{E22}$$

$$y = (-60x \pm 3)/13 \ \ldots\ldots\ldots\ldots\ldots \text{E23}$$

$$y = (18x \pm 10)/(-11) \ \ldots\ldots\ldots\ldots \text{E24}$$

$$y = (5x \pm 23)/3 \ \ldots\ldots\ldots\ldots\ldots\ldots \text{E25}$$

$$y = 5x/13 \ \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{E26.1}$$

$$y = (5x + 65)/13 \ \ldots\ldots\ldots\ldots\ldots \text{E26.2}$$

$[2,0,2]$

$$\begin{cases} x_1 + 100 = 2(x_2 - 100) \\ 6(x_1 - 10) = x_2 + 10 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E39, Q9}$$

$[2,6,3]$

$$\begin{cases} 6x = yq_1 + r_1 \\ 8x = yq_2 + r_2 \\ 100x = yq_3 + r_3 \\ 0 \le r_1,\ r_2,\ r_3 < y \end{cases} \quad \ldots\ldots\ldots\ldots \text{E88}$$

$[3,0,5]$

$$\begin{cases} x_1 + x_1/2 = x_2 + x_2/5 = x_3 + x_3/9 \\ x_1 - x_2/5 - x_3/9 = 60 \\ x_2 - x_1/2 - x_3/9 = 60 \\ x_3 - x_1/2 - x_2/5 = 60 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{E49}$$

$[3,1,4]$

$$\begin{cases} 8x_1 = u,\ 10x_2 = u,\ 100x_3 = u \\ x_1 + x_2 + x_3 = 47 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{E40}$$

$[3,2,3]$

$$\begin{cases} 5x_1 + 8x_2 + 7x_3 + 90 = u_1 \\ 7x_1 + 9x_2 + 6x_3 + 62 = u_2 \\ u_1 = u_2 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E38, Q8}$$

$[3,2,4]$

$$\begin{cases} 5x = 20q + r \\ 7y = 20(q+1) + (r+1) \\ 9z = 20(q+2) + (r+2) \\ 0 \le q = r < 18 \end{cases} \quad \ldots\ldots\ldots \text{E81}$$

$[3,4,7]$

$$\begin{cases} x_1 + x_2 + x_3 = 390 \\ u_1 = 5 \cdot 7 \cdot x_1/100 \\ u_2 = 2 \cdot 10 \cdot x_2/100 \\ u_3 = 4 \cdot 5 \cdot x_3/100 \\ x_i + u_i = v \ (i = 1,2,3) \end{cases} \quad \ldots\ldots\ldots \text{E46}$$

$[4,0,4]$

$$\begin{cases} x_1 : x_2 = 2 : 1 \\ y_1 + y_2 = 13/64 \\ x_1/y_1 = 3\tfrac{1}{2} \\ x_2/y_2 = 8 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E48}$$

$[4,4,7]$

$$\begin{cases} (8-3)x_1+x_2+x_3+x_4=u_1 \\ x_1+(10-3)x_2+x_3+x_4=u_2 \\ x_1+x_2+(100-3)x_3+x_4=u_3 \\ x_1+x_2+x_3+(5-3)x_4=u_4 \\ u_1=u_2=u_3=u_4 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E44}$$

$$\begin{cases} 5x_1+2x_2+8x_3+7x_4=u_1 \\ 3x_1+7x_2+2x_3+x_4=u_2 \\ 6x_1+4x_2+x_3+2x_4=u_3 \\ 8x_1+x_2+3x_3+x_4=u_4 \\ u_1=u_2=u_3=u_4 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E77}$$

$[8,0,6]$

$$\begin{cases} x_1+x_2+x_3+x_4=100 \\ y_1+y_2+y_3+y_4=100 \\ y_1/x_1=3/5,\ y_2/x_2=5/7 \\ y_3/x_3=7/9,\ y_4/x_4=9/3 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E78–79}$$

III.2.2. Quadratic Equations

$[1,0,1]$

$\sqrt{x/2}+8\cdot(x/9)+2=x$ E61

$x/2+4\sqrt{x}+6+3+1=x$ E62

$\left\{\left(\frac{x}{0}+x-9\right)^2+\sqrt{\left(\frac{x}{0}+x-9\right)^2}\right\}\times 0 = 90$ ..... E64 in AM

$\left\{\left(\frac{x}{0}\pm x\right)^2+\sqrt{\left(\frac{x}{0}\pm x\right)^2}\right\}\times 0=90$ ..... E64 in T

$\left\{\left(\frac{x}{0}\pm 10^7\right)^2+\sqrt{\left(\frac{x}{0}\pm 10^7\right)^2}\right\}\times 0 = 90$ E64 in GP

$\left[\left\{\left(x+\frac{x}{2}\right)\cdot 0\right\}^2+2\cdot\sqrt{\left\{\left(x+\frac{x}{2}\right)\cdot 0\right\}^2}\right] \div 0 = 15$ E65

$(x/8)^2+12=x$ E68

$(x/5-3)^2+1=x$ E69

$[1,1,1]$

$6x^2+2x=u^2$ E89

$(x^2-4)/7=u$ E103.1

$(x^2-30)/7=u$ E103.2

$(5x^2+3)/16=u$ E105

$[1,1,2]$

$$\begin{cases} x^2+b^2=u^2 \\ x+u=a \\ a=32,\ b=16 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E57}$$

$$\begin{cases} x^2+b^2=u^2 \\ u=x+a \\ a=\frac{1}{2},\ b=2 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E58}$$

$$\begin{cases} (x+a)^2+b^2=u^2 \\ x+u=a+b \\ a=100,\ b=200 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E59}$$

$$\begin{cases} x^2+a^2=u^2 \\ x-u/3=14 \\ a=12 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E70}$$

$[1,2,2]$

$3x+1=u^2,\ 5x+1=v^2$ E100

$[1,2,3]$

$$\begin{cases} x^2+u_1^2=c^2 \\ x^2+u_2^2=b^2 \\ u_1+u_2=a \\ a=-1+\sqrt{18},\ b=\sqrt{6} \\ c=-\sqrt{5}+\sqrt{10} \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E51}$$

$$\begin{cases} x^2+u_1^2=c^2 \\ x^2+u_2^2=b^2 \\ u_1+u_2=a \\ a=14,\ b=15,\ c=13 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E56}$$

$$\begin{cases} u_1 + u_2 = x \\ x : a = a : u_1 \\ x : b = b : u_2 \\ a = 15,\ b = 20 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E73}$$

$[1, 3, 3]$

$$\begin{cases} u_1 + u_2 = u \\ a : u = x : u_2 \\ b : u = x : u_1 \\ a = 15,\ b = 10 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E60}$$

$[1, 3, 4]$

$$\begin{cases} v^2 + u_1^2 = b^2 \\ v^2 + u_2^2 = x^2 \\ u_1 + u_2 = a \\ A = (a/2) \cdot v \\ a = \sqrt{13},\ b = \sqrt{5},\ A = 4 \end{cases} \quad \ldots\ldots \text{E50}$$

$[2, 0, 1]$

$8x^2 + 1 = y^2$ E28.1

$11x^2 + 1 = y^2$ E28.2

$67x^2 + 1 = y^2$ E29.1

$61x^2 + 1 = y^2$ E29.2

$13x^2 - 1 = y^2$ E30.1

$8x^2 - 1 = y^2$ E30.2

$6x^2 + 3 = y^2$ E31.1

$6x^2 + 12 = y^2$ E31.2

$6x^2 + 75 = y^2$ E31.3

$6x^2 + 300 = y^2$ E31.4

$32x^2 + 1 = y^2$ E32

$9x^2 + 52 = y^2$ E33.1

$4x^2 + 33 = y^2$ E33.2

$13x^2 - 13 = y^2$ E34.1

$13x^2 + 13 = y^2$ E34.2

$-5x^2 + 21 = y^2$ E35

$$\begin{cases} A(n) = (n/2) \cdot \{2a + d(n-1)\} \\ 3A(x) = A(y) \\ a = 3,\ d = 2 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E93}$$

$xy = 4x + 3y + 2$ E106, Q12

$2xy = 10x + 14y - 58$ E109

$xy + 3x + 5y = 62$ E110

$[2, 1, 2]$

$$\begin{cases} x + y + xy + x^2 + y^2 = u^2 \\ x + y + u = 23 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E108.1, Q13}$$

$$\begin{cases} x + y + xy + x^2 + y^2 = u^2 \\ x + y + u = 53 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E108.2, Q14}$$

$[2, 2, 2]$

$$\begin{cases} 7x^2 + 8y^2 = u^2 \\ 7x^2 - 8y^2 + 1 = v^2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E94}$$

$$\begin{cases} x^2 + xy + y^2 = u^2 \\ (x + y)u + 1 = v^2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E96}$$

$$\begin{cases} y^2 + x^2 + 1 = u^2 \\ y^2 - x^2 + 1 = v^2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E99.1}$$

$$\begin{cases} y^2 + x^2 - 1 = u^2 \\ y^2 - x^2 - 1 = v^2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E99.2}$$

$$\begin{cases} 2(x^2 - y^2) + 3 = u^2 \\ 3(x^2 - y^2) + 3 = v^2 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E102}$$

[2, 5, 5]

$$\begin{cases} x = 5q_1 + 1 \\ y = 6q_2 + 2 \\ \mid x - y \mid = 3q_3 + 2 \\ x + y = 9q_4 + 5 \\ xy = 7q_5 + 6 \end{cases} \quad \ldots\ldots\ldots\ldots \text{E83}$$

[3, 0, 2]

$$\begin{cases} x^2 + y^2 = z^2 \\ xy/2 = z \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E53.1}$$

$$\begin{cases} x^2 + y^2 = z^2 \\ xy/2 = xyz \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E53.2}$$

$$\begin{cases} x^2 + y^2 = z^2 \\ \sqrt{x-3} - 1 = z - y \end{cases} \quad \ldots\ldots\ldots\ldots \text{E74}$$

[3, 0, 3]

$$\begin{cases} x^2 + y^2 = z^2 \\ x + y + z = 40 \\ xy = 120 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E75}$$

[4, 0, 1]

$$\textstyle\sum_{i=1}^{4} x_i = \sum_{i=1}^{4} x_i^2 \quad \ldots\ldots\ldots\ldots \text{E52.1}$$

[4, 0, 3]

$$\begin{cases} y = 5x_1 z/100 \\ x_2 = x_1 - y^2 \\ y = 10x_2 z/100 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E42}$$

$$\begin{cases} y = 1x_1 z/100 \\ x_2 = x_1 - y^2 \\ y = 5x_2 z/100 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots \text{E43}$$

[4, 7, 8]

$$\begin{cases} x_i + p = u_i^2 \ (i = 1, 2, 3, 4) \\ x_i x_{i+1} + q = u_{i+4}^2 \ (i = 1, 2, 3) \\ \sum_{i=1}^{7} u_i + a = b^2 \\ a = 11, \ b = 13, \ p = 2, \ q = 18 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E71–72}$$

III.2.3. Cubic Equations

[1, 0, 1]

$$12x + x^3 = 6x^2 + 35 \quad \ldots\ldots\ldots\ldots \text{E66}$$

[1, 1, 1]

$$(x^3 - 6)/5 = u \quad \ldots\ldots\ldots\ldots\ldots \text{E104}$$

[1, 2, 2]

$$3x + 1 = u^3, \ \ 3u^2 + 1 = v^2 \quad \ldots\ldots \text{E101}$$

[2, 0, 1]

$$(x + y)^2 + (x + y)^3 = 2(x^3 + y^3) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{E90}$$

[2, 2, 2]

$$x^3 + y^3 = u^2, \quad x^2 + y^2 = v^3 \quad \ldots\ldots \text{E55}$$

$$x - y = u^2, \ \ x^2 + y^2 = v^3 \quad \ldots\ldots\ldots \text{E92}$$

$$x^2 + y^3 = u^2, \ \ x + y = v^2 \quad \ldots\ldots\ldots \text{E95}$$

[2, 3, 3]

$$\begin{cases} x + y = u^2 \\ x - y = v^2 \\ xy = w^3 \end{cases} \quad \ldots\ldots\ldots\ldots\ldots\ldots \text{E54}$$

[2, 6, 6]

$$\begin{cases} x + y + 2 = r^2 \\ x - y + 2 = u^2 \\ x^2 + y^2 = v^2 \\ x^2 - y^2 + 8 = w^2 \\ (xy + y)/2 = t^3 \\ r + u + v + w + t = q^2 \end{cases} \quad \ldots\ldots\ldots \text{E97}$$

$$\begin{cases} x+y+3=r^2 \\ x-y+3=u^2 \\ x^2+y^2-4=v^2 \\ x^2-y^2+12=w^2 \\ xy/2+y=t^3 \\ r+u+v+w+t+2=q^2 \end{cases}$$
. . . . . E98

$[3,0,3]$

$$\begin{cases} x^2+y^2=z^2 \\ x+y+z=56 \\ xyz=4200 \end{cases}$$
. . . . . E76

$[3,1,4]$

$$\begin{cases} (z-1)/2=x \\ x/2=y \\ xyz+xyz/7=u \\ u=(z/2)\cdot\{2x+y(z-1)\} \end{cases}$$
. . . . . E63

$[4,0,1]$

$\sum_{i=1}^{4} x_i^2=\sum_{i=1}^{4} x_i^3$ E52.2

III.2.4. Bi-quadratic Equations

$[1,0,1]$

$(x^2)^2-(200x+x^2)\times 2=10^4-1$
. . . . . E67

$[1,1,1]$

$5(x^2)^2-100x^2=u^2$ E91

$[4,0,1]$

$20(x_1+x_2+x_3+x_4)=x_1x_2x_3x_4$
. . . . . E107

III.3 Glossary of Technical Terms in the *Bījagaṇita*

I include in this glossary not only purely mathematical terms but also related words like sat ('correct'), asat ('incorrect'), mati ('intellect'), etc. On the other hand, I exclude ordinary numerals, ordinary expressions of fractions, word numerals (the so-called bhūtasaṃkhyās, for which see Appendix 4), and weights and measures (for which also see Appendix 4). Under each item I list notable compounds and modifiers or modified words that occur in the *Bījagaṇita*, indicating the item heading by '∗', with a hyphen (or hyphens) for a compound. abbr. = abbreviation, caus. = causative, esp. = especially, pass. = passive. Order of the Indian letters: a, ā, i, ī, u, ū, ṛ, ṝ, ḷ, e, ai, o, au, ṃ, ḥ; k, kh, g, gh, ṅ; c, ch, j, jh, ñ; ṭ, ṭh, ḍ, ḍh, ṇ; t, th, d, dh, n; p, ph, b, bh, m; y, r, l, v; ś, ṣ, s, h.

a

aṃśa. Part. Numerator of a fraction.
cheda-∗-viparyāsa.

akṛti-tva. The state of being a non-square number.

akṣara. Letters of the alphabet. Those beginning with ka (consonantal letters) are referred to by Bhāskara as examples of symbols for unknown numbers. See BG 68p1. Cf. nāma-aṅkita.
varṇa-∗.

akhila. Not barren, soluble (problem).

agra. Tip.
mūla-∗-ga.

agra. Residue.
lava-∗,
liptā-∗.

aṅka. Digit. Coefficient of unknown number.
kālaka-∗,
bhāvita-∗,
yāvattāvad-∗,
yāvad-∗,
varṇa-∗,
vyakta-∗.

aṅkita. Marked (with a letter).
nāma-∗.

ajñāta. Unknown (quantity).

adhana. Negative quantity.

adhika. Greater than. Increased by.

ananta. Infinite (quantity).
∗(o) rāśiḥ.

analpa. Greater (quantity).

aniyata-ādhāra-kriyā. Operation whose ground is uncertain.

aniyata-ādhārika. (Operation) whose ground is uncertain.

aniyama. Without rule, without restriction.

anupapanna-tva. The state of not being proved or derived.

anupāta. Proportion.

aneka-pada-ānayana. Bringing (calculating) many roots (by means of varga-prakṛti).

aneka-varṇa-madhyama-āharaṇa. Elimination of the middle term of a quadratic equation in many colors (unknown numbers) or the solution

procedure by means of it.

aneka-varṇa-samīkaraṇa. Equation in many colors (unknown numbers) or the solution procedure for algebraic problems by means of it. The third item of bīja-catuṣṭaya.

anta. End.

antaḥkṣetraphala. The area of the inner figure.

antar. Inside.
kṣetra-∗-gata.

antara. Difference.

antara-bhāvanā. Generative method by difference. See bhāvanā.

antar-bhūta-tva. The state of being inside (a figure).

antar-vartin. Existing inside.

antya. Last.

anvita. Accompanied with.

apagama. Elimination (of letters in equations).

apa-$\sqrt{}$nī. To subtract.

apavarta(na). Reduction of two or more integers by a common factor. Reducer, common factor.

apa-$\sqrt{}$vṛt. Caus. to reduce, divide two or more integers by a common factor without remainder. The common factor is naturally expected to be an integer but once (in BG E30p3) Bhāskara uses this verb with ardha ('half') for the divisor.

apahṛta. Divided.

apās (apa-$\sqrt{}$as). To subtract.

abhāva. Non-existence.
avyakta-pakṣa-mūla-∗,
karaṇī-gata-mūla-∗,
kṣepa-∗,
prayojana-∗,
phala-viśeṣa-∗,
mūla-∗.

abhinna. Undivided, integer.

abhihati. Product.

abhīpsita. Desired, optional.

abhīṣṭa. Desired, optional.

abhyadhika. Increased by.

abhyasta. Multiplied by.

abhyāsa. Multiplication. Product.
vajra-∗.

arūpa(ka). Without invariable number.

ardha. Half.

ardhita. Halved.

alpa(ka). Smaller.

avataraṇa. Introduction (of operation).
kriyā-∗.

avatāra. Introduction (of rule).
sūtra-∗.

avarga-tva. The state of being a non-square number.

avalambaka. Perpendicular.

avaśiṣṭa. Remaining.
∗-kṣetra.

avaśeṣa. Remainder.
kalā-∗,
vikalā-∗.

avāpti. Quotient.

avikṛta. Unchanged (quantity).

avyakta. Invisible, unknown (quantity). Cf. vyakta.
∗-apavartana,
∗-kalpanā,
∗-kṛti,
∗-māna,
∗-miti,
∗-mūla,
∗-yukti,
∗-rāśi,
∗-rāśi-śeṣa,
∗-varga,

∗-varga-ādi-samīkaraṇa,
∗-varga-rāśi,
∗-śeṣa,
ṛṇa-∗-ṣaṭka,
dhana-∗-yugma,
śeṣa-∗,
sa-∗.

avyakta-gaṇita. Mathematics with unknown numbers. Cf. vyakta-gaṇita.

avyakta-pakṣa. The side of unknown numbers of an equation, which exclusively consists of unknown numbers. Cf. vyakta-pakṣa.
∗-mūla-abhāva.

aṣṭa-gata. Raised to the eighth power.

asakṛt. Repeatedly.

asakṛt-kriyā. Repeated calculation.

asat. Incorrect.

asama. Different.

asama-jāti. Of different category.

asamāna. Different.

asra. Side of a geometric figure.
āyata-catur-∗-kṣetra,
catur-∗,
try-∗,
try-∗-kṣetra,
viṣama-try-∗,
sama-catur-∗-kṣetra.

asva. Negative quantity.

ahar-gaṇa. Number of the days accumulated from an epoch.

ā

āgata. Obtained.
yathā-∗.

ā-$\sqrt{}$gam. To arrive at, obtain.

āḍhya. Increased by.

ādi(ka). The first of a series of things or numbers.

ādya. First. The first of a series of things or numbers.
∗-akṣara,
∗-udāharaṇa,
∗-karaṇī,
∗-khaṇḍa,
∗-dhana,
∗-pakṣa,
∗-pada-sāmya,
∗-bīja-kriyā,
∗-miti,
∗-mūla,
∗-varṇa,
∗-varṇa-unmiti,
∗-varṇa-śeṣa,
∗-vitta.

ādhāra. Ground (of operation).
aniyata-∗,
aniyata-∗-kriyā,
niyata-∗-kriyā-vat,
nir-∗.

-ādhārika. Having such and such ground.
aniyata-∗.

ānantya. Infinity.

ānayana. Bringing (answer), computing, solving.
aneka-pada-∗,
pada-∗,
mūla-∗,
rūpa-kṣepa-pada-∗.

ā-$\sqrt{}$nī. To bring, compute, solve.

ānīta. Brought, computed, solved.

āpta. Reached, obtained (by computation, esp. by division).

āpti. Quotient.

ābādhā. See āvādhā.

āyata-caturasra-kṣetra. Elongated quadrilateral figure, oblong.

ā-$\sqrt{}$yā. To reach, attain (by computation).

ā-√rabh. To begin (calculation).

ālāpa. Statement (of a condition of a mathematical problem).
uddeśaka-∗,
pūrva-∗.

ālāpita. Stated, given (in mathematical problem).

āvādhā. Segment (lit. oppression) of the base of a trilateral from the perpendicular to each end of the base, or of a quadrilateral from a perpendicular to the near end of the base.
∗-pramāṇa,
koṭy-āśrita-∗,
bṛhad-vaṃśa-āśrita-∗,
bhuja-āśrita-∗,
laghu-vaṃśa-āśrita-∗.

āśrita. Depending. Cf. āvādhā.

āsanna. Near, approximate.
yathā-∗.

āsanna-mūla. Approximate root.
∗-karaṇa.

āhata. Multiplied.

āhati. Product.
varṇa-aṅka-∗.

āharaṇa. Taking away, eliminating (the middle term of a quadratic equation).
aneka-varṇa-madhyama-∗,
eka-varṇa-madhyama-∗.

i

√i. To go to (a particular state such as the state of being a negative number).

icchā. Requisite, esp. the third term of trairāśika. Cf. pramāṇa, pramāṇa-phala.

iyat-tā. The state of being so much, limit.
∗-vaśāt.

iṣṭa. Desired, optionally chosen (quantity or unknown number).
∗-varṇa,
∗-vaśāt,
∗-siddhi.

ī

īpsita. Desired, optionally chosen (quantity).
yathā-∗.

u

ucchraya/ucchrāya. Height.
vṛkṣa-∗.

uttara. Common difference (of an arithmetical progression).

-uttha. Produced from, originating from.
rūpa-kṣepa-pada-∗.

utthā (ud-√sthā). Caus. to raise. See the next item.

utthāpana. Raising. 'Raising A by B' means 'substituting B for A'. For a definition see BG 68p4.
∗-prakāra,
vilomaka-∗,
śūnya-eka-dvy-ādy-∗.

utthāpita. Raised.

utthāpya. To be raised.

utpad (ud-√pad). To be produced.

utpanna. Produced from, originating from.
ṛṇa-∗.

udāharaṇa. Illustration, example for a mathematical rule. Functions also as a kind of proof of that rule.
∗-anta,
ādya-∗.

ud-ā-$\sqrt{}$hṛ. To illustrate (a mathematical rule with examples).
udāhṛta. Illustrated.
udāhṛti. Illustration, example.
uddiṣṭa. Mentioned, questioned.
khila-∗.
uddeśaka. Questioner. Illustrative example.
∗-ālāpa,
sa-sūtra-∗.
uddhṛ (ud-$\sqrt{}$hṛ). To divide.
uddhṛta. Divided.
udbhava. Produced from, originating from.
dhana-bhājya-∗.
unmāna = unmiti.
kālaka-∗,
nīlaka-∗,
yāvattāvad-∗.
unmiti. Measure, estimation, evaluation of a particular unknown number, which contains other unknown numbers.
antya-∗,
kālaka-∗,
nīlaka-∗,
pītaka-∗,
bhāvita-∗,
yāvattāvad-∗,
varṇa-∗.
upadeśa. Instruction.
upapatti. Proof. According to Bhāskara (BG 93p3–p4), there are two kinds of proof, kṣetra-gatā and rāśi-gatā.
∗-yuta,
∗-prakāra,
kṣetra-gatā ∗(ḥ),
bhāvita-∗,
rāśi-gata-∗.
upa-$\sqrt{}$pad. To be fit, right, proved.
upapanna. Fit, right, proved.
upari. Upper.
∗-tana-pakṣa.
upalakṣaṇa. Mark, sign.
upasaṃhāra. Contracting (calculations).
kriyā-∗.
upāntima. Penultimate.
upāya. Mode, way, strategy.
kalpanā-∗.
upeta. Accompanied by, increased by.

ū

ūna. Less by.
ūnita. Less by.
ūrdhva. Upper.
∗-khaṇḍa,
∗-pakṣa.

ṛ

ṛṇa. Debt. Negative quantity.
∗-avyakta,
∗-ātmika,
∗-utpanna,
∗-karaṇī,
∗-kṣepa,
∗-triṣaṣṭi,
∗-tva,
∗-bhājaka,
∗-bhājya,
∗-rūpa,
dhana-∗-tā-vyatyaya,
dhana-∗-tva-vyatyāsa,
dhana-∗-vyatyāsa,
vyasta-dhana-∗-ga,
sva-sva-∗-ga.
ṛṇa-ga. In the state of being a negative quantity.
∗-rūpa.
ṛṇa-gata = ṛṇa-ga.

e

eka-dvi-tri-gata. Raised to the first, the second and the third powers.

eka-dvi-tri-catur-gata. Raised to the first, the second, the third, and the fourth powers.

eka-varṇa-madhyama-āharaṇa. Elimination of the middle term of a quadratic equation in one color (unknown number) or the solution procedure by means of it.

eka-varṇa-samīkaraṇa. Equation in one color (unknown number) or the solution procedure for algebraic problems by means of it. The first item of bīja-catuṣṭaya.

ai

aikya. Sum.

k

ka. The first consonant of the alphabet, mentioned by Bhāskara as an example of symbols for unknown numbers. See BG 68p1. Cf. akṣara, nāma-aṅkita.

ka. Abbr. of kaniṣṭha.

ka. Abbr. of karaṇī.

kati. How much, how many.

kaniṣṭha. Abbr. of kaniṣṭha-pada and kaniṣṭha-mūla.

kaniṣṭha-pada = kaniṣṭha-mūla.

kaniṣṭha-mūla. 'The least root,' the smaller of the two roots of varga-prakṛti.

kapilaka. Tawny. One of the words for unknown numbers; its initial letter, ka, is used as a symbol. See BG 68p1.

karaṇa. Making (arithmetical calculation, modulo operation, equation, etc.). Computation, esp. a series of mathematical operations made for a specific type of problems.
kuṭṭaka-∗,
taṣṭi-∗,
yukta-ūnī-∗,
sama-cchedī-∗,
samī-∗,
sāmya-∗.

karaṇa-sūtra. Computational rule designed for a specific type of problems.

karaṇī. Making (a square). Number whose square root is to be extracted.
∗-khaṇḍa,
∗-tva-hetu,
ṛṇa-∗,
dhana-∗,
mūla-∗.

karaṇī-gata. In the state of being a karaṇī.
∗-mūla.

karṇa. 'Ear,' indicating the hypotenuse of a right-angled triangle and the diagonal of a rectangle.

karman. Computation.

kalpanā (rarely kalpana). Assuming, setting (a symbol or symbols and/or a number for an unknown number in particular).
∗-upāya,
∗-bheda,
∗-vaśāt,
avyakta-∗,
evaṃ-vidha-∗,

bhūmi-∗,
varṇa-∗,
yāvattāvat-∗.

kalpita. Assumed.
∗-pada,
∗-rāśi.

kalpya. To be assumed.

kā. Abbr. of kālaka. Symbol for the second unknown number.

kāgha. Abbr. of kālaka-ghana.

kānībhā. Abbr. of kālaka-nīlaka-bhāvita.

kāra. Letter (for expressing unknown number).
yā-∗.

kārya. To be made in general, to be calculated in particular.

kālaka. Black. Word for the second unknown number; its initial letter, kā, is used as a symbol for it. See BG 7, 68p1.
∗-aṅka,
∗-unmāna,
∗-unmiti,
∗-ghana,
∗-nīlaka-māna,
∗-pakṣa,
∗-pakṣa-mūla,
∗-māna,
∗-varga,
∗-varṇa-māna,
yāvattāvat-∗-māna,
yāvattāvat-∗-varṇa.

kāva. Abbr. of kālaka-varga.

kāvayābhā. Abbr. of kālaka-varga-yāvattāvad-bhāvita.

kim. What (quantity).

kuṭṭaka (rarely kuṭṭa). Pulverizer: method for solving the linear indeterminate equation $y = \frac{ax+c}{b}$ where the coefficients, a and b, are 'pulverized' successively.
∗-adhyāya,
∗-artha,
∗-karaṇa,
∗-jña,
∗-vidhi,
∗-vedin,
ghana-∗,
varga-∗,
saṃśliṣṭa-∗,
sthira-∗,
sphuṭa-∗.

√kṛ. To do, make in general, to calculate in particular.
tri-guṇī-∗,
ṣaḍ-guṇī-∗,
sama-cchedī-∗,
samī-∗.

kṛta. Made in general, calculated in particular.
kṛtī-∗,
dalī-∗,
sama-cchedī-∗,
samī-∗.

kṛta-sama-ccheda. (Fractions) reduced to the same denominator.

kṛti. Square.
∗(ī)-kṛta,
∗(ī)-bhūta,
∗-yuti-viyuti,
avyakta-∗,
varga-∗,
varṇa-∗.

kṛti-prakṛti = varga-prakṛti.

kṛti-mūla = varga-mūla.

√kḷp. To assume (the positive or negative sign for a number, a symbol or symbols and/or a number for an unknown number, etc).

koṭi. 'Edge,' indicating one of the two sides that contain the right corner of a right-angled triangle, the other being bhuja. For a definition see L 135.
∗-āśrita-āvādhā,
∗-karṇa-antara,
∗-bhuja-antara,
doḥ-∗-antara-varga,
bhuja-∗-māna,
bhuja-∗-vadha.

koṇa. Corner.
∗-stha,
bahiḥ-∗-stha.

koṣṭhaka. Box, cell, unit square.

krama. Step, order, procedure.
∗-śas,
yathā-∗.

kraya. Buying rate (of commodity per price). Cf. vikraya.

kriyā. Action in general, computation in particular.
∗-avataraṇa-artha,
∗-upasaṃhāra,
∗-lāghava-artha,
∗-saṃkoca,
∗-hetu,
aniyata-ādhāra-∗,
asakṛt-∗,
niyata-ādhāra-∗,
bīja-∗,
sama-∗.

kṣaya. Loss. Negative quantity.
∗-avyakta-yugma,
∗-ātmika,
∗-rūpa.

kṣaya-ga. In the state of being a negative quantity.
∗-prakṛti.

√kṣip. To add.

kṣipta. Added.

kṣuṇṇa. Multiplied.

kṣe. Abbr. of kṣepa.

kṣetra. Field, geometric (plane) figure.
∗-antar,
∗-antar-gata,
∗-phala,
∗-bhuja,
∗-mūla-antar-bhūta,
antaḥ-∗,
antaḥ-∗-phala,
avaśiṣṭa-∗,
tryasra-∗,
bahiḥ-∗,
bṛhat-∗,
bhāvita-∗,
laghu-∗.

kṣetra-gata-upapatti. Proof based on figures. See BG 93p3.

kṣetra-darśana. Showing figures for illustration.

kṣetra-vyavahāra. Procedure for plane figures, which is one of the eight kinds of 'procedures' (vyavahāra) treated in the L.

kṣepa(ka). Additive (number, term).
∗-abhāva,
∗-takṣaṇa-lābha,
ṛṇa-∗,
catuḥ-∗-mūla,
trayodaśa-∗-mūla,
dvi-∗-mūla,
dhana-∗,
pañca-∗-pada,
prakṛti-sama-∗,
rāśi-∗,
rūpa-∗-artha-bhāvanā,
rūpa-∗-pada,
rūpa-∗-bhāvanā,
rūpa-∗-mūla,
vadha-∗,
sa-∗,

sama-∗.

kṣepya. To be added.

kh

kha. Zero.

kha-guṇa. (A quantity) having zero as its multiplier. Cf. kha-hara/hāra.

khaṇḍa(ka). Part.
∗-saṃkhyā,
karaṇī-∗,
guṇaka-∗.

khaṇḍa-guṇanā. Multiplication by parts. See L 14.
∗-vidhi.

kha-hara/hāra. (A quantity) having zero as its divisor. Cf. kha-guṇa.

khila. Barren, impossible, insoluble.
∗-tva.

khila-uddiṣṭa. Questioned in vain, insoluble problem.

g

-ga. In, in the state of.
ṛṇa-∗-rūpatas,
kṣaya-∗-ekādaśa,
kṣaya-∗-prakṛti,
kṣaya-∗-ṣaṣṭi,
dhana-ṛṇa-∗,
vyasta-dhana-ṛṇa-∗,
sva-sva-ṛṇa-∗.

gaccha. Number of terms of a series.

$\sqrt{}$gaṇ. To compute.

gaṇa. A flock, group.
bha-∗,
mārgaṇa-∗,
śara-∗.

gaṇaka. Calculator, mathematician.
∗-ānanda-kāraka,

gaṇita. Computation, mathematics.
∗-jña,
avyakta-∗,
graha-∗,
pāṭī-∗,
bīja-∗,
bīja-∗-adhyāya,
bīja-∗-āhvayatā,
bīja-∗-jña,
bīja-∗-saṃjña,
vyakta-∗,
śreḍhī-∗,
sakala-∗-sāra.

-gata. In, in the sate of. Depending on. Raised to (the n-th power of ten).
kṣetra-antar-∗,
aṣṭa-∗,
ṛṇa-∗,
ekadvitri-∗,
ekadvitricatur-∗,
karaṇī-∗,
karaṇī-∗-mūla,
kṣetra-∗(ā) upapattiḥ,
catur-∗,
triṣaṇṇava-∗,
dvi-∗,
dhana-∗,
bhājya-∗,
rāśi-∗-upapatti,
varga-ādi-∗,
varga-∗,
ṣaḍ-∗.

gati. Journey, distance.
sama-∗.

gama. Removal, elimination.
cheda-∗,
sama-varga-∗,
samīkṛta-cheda-∗.

gāmbhīrya. Depth.
jala-∗.

√guṇ. To multiply.

guṇa. Multiplier. Multiplication.
∗-aikya,
∗-kāra,
∗-mūla,
kha-∗,
yāvattāvad-varga-∗.

guṇaka. Multiplier.
∗-ja-phala.

guṇana(or -ā). Multiplication.
∗-phala,
∗-vidhi,
khaṇḍa-∗.

guṇita. Multiplied.

guṇī-√kṛ. To multiply.
tri-∗,
ṣaḍ-∗.

guṇya. To be multiplied.

gṛhīta. Obtained (in most cases the subject is 'the square root').

gola. Sphere. Spherical astronomy.

gola-adhyāya. Study on the Spherical Astronomy, the name of the fourth book of Bhāskara's masterpiece, *Siddhānta-śiromaṇi*.

√grah. To obtain (the square root).

graha. Planet.

graha-gaṇita. Computation on planets, the theme treated in the *Graha-gaṇita-adhyāya*, the third book of Bhāskara's masterpiece, *Siddhānta-śiromaṇi*.

grāhya. To be obtained (in most cases the subject is 'the square root').

gh

√ghaṭ. To be accomplished, fulfilled, realized (the subject is ālāpa).

ghana. Cube.
∗-ātmaka,
∗-aikya,
∗-yoga,
kālaka-∗,
yāvattāvad-∗,
yoga-∗,
varga-∗.

ghana-kuṭṭaka. Cube pulverizer: method for solving the equation $y = \frac{ax^3+c}{b}$.

ghana-pada = ghana-mūla.

ghana-mūla. Cube root.

ghana-varga. Square of cube, the sixth power.

ghāta. Product.
yoga-antara-∗,
rāśi-∗.

-ghna. Multiplied by.

c

cakra-vāla. Cyclic method (used in varga-prakṛti).

catuḥ-kṣepa-pada/mūla. Root for the additive four of varga-prakṛti.

catur-asra-kṣetra. Quadrilateral figure.
āyata-∗,
sama-∗.

catur-gata. Raised to the fourth power.

catur-dvi-kṣepa-mūla. Root for the additives, four and two, of varga-prakṛti.

catur-bhuja. Quadrilateral.

caya. Common difference (of an arithmetical progression).

citraka. Variegated color. One of the words for unknown numbers; its initial letter, ci, is used as a symbol. See BG 68p1.

ced. If.

cyuta. Subtracted.

ch

chid. Divisor, denominator of a fraction.

chinna. Divided.

cheda. Divisor, denominator of a fraction.
∗-aṃśa-viparyāsa,
kṛta-sama-∗,
sama-∗,
sama-∗(ī)-karaṇa,
sama-∗(ī)-kṛtya.

cheda-gama. Elimination of the denominators.
samīkṛta-∗.

j

-ja. Produced from, originating from.
ṛṇa-bhājya-∗,
guṇaka-∗,
yoga-∗,
viyoga-∗.

√jan. To be born, produced (by calculations).

jāta. Produced (by calculations).

jāti(ka). Category.
asama-∗,
dramma-∗,
vibhinna-∗,
samāna-∗.

-jātīya. Belonging to a particular category.
kṣepa-∗.

-jña. Knowing about, well-versed in.
kuṭṭaka-∗,
gaṇita-∗,
bīja-∗,
bīja-gaṇita-∗,
bhāvita-∗.

√jñā. To know (the answer to a mathematical problem), solve.

jñāta. Known (quantity).

jñātavya. To be known (quantity).

jñāna. Knowledge, knowing (quantity).
∗-prakāra,
karṇa-∗.

jñeya. To be known (quantity).

jye. Abbr. of jyeṣṭha.

jyeṣṭha. Abbr. of jyeṣṭha-pada and jyeṣṭha-mūla.
∗-kaniṣṭha-mūla,
kaniṣṭha-∗-vaśāt.

jyeṣṭha-pada = jyeṣṭha-mūla.

jyeṣṭha-mūla. 'The greatest root,' the greater of the two roots of varga-prakṛti.
kaniṣṭha-∗.

t

takṣaṇa. Paring, abrading, modulo operation, i.e., division for obtaining the remainder. Divisor of that division.
kṣepa-∗-lābha.

taṣṭa. Pared, abraded, divided for obtaining the remainder.
hara/hāra-∗.

taṣṭi. Paring, abrading, modulo operation, i.e., division for obtaining the remainder.
∗-karaṇa.

tulya. Equal.
∗-tva,
∗-dhana,
∗-maulya,
∗-rūpa,
∗-vitta,
∗-śuddhi.

tulya-bhāvanā. Generative method with the same (sets of roots), a kind of samāsa-bhāvanā.

√tyaj. To throw away in general, to subtract in particular.

tri-bhuja. Trilateral.

tri-ṣaṇ-ṇava-gata. Raised to the third, the sixth and the ninth powers.

trairāśika. Three quantity operation, rule of three. The three terms are called pramāṇa, pramāṇa-phala and icchā, and the fourth term to be obtained is called icchā-phala.
∗-mātra.

try-asra. Trilateral.
∗-kṣetra,
viṣama-∗.

d

-da. Giving (a number, square root).
daśa-∗,
mūla-∗.

darśana. Seeing, showing.
kṣetra-∗,
pada-ānayana-∗.

dala. Half.
∗(ī)-kṛta.

√dā. To give in general, to give square root in particular.

duṣṭa. Corrupted (problem).

dūṣaṇa. Objection, refutation.

dṛḍha. Firm, relatively prime.
∗-bhājaka-bhājya,
∗-bhājya-hāra,
∗-saṃjñaka.

√dṛś. To see. Pass. to be seen. Caus. to show.

dṛṣṭa. Seen, and therefore 'known' (quantity).

deya. To be given in general, to be added in particular.

dos = bhuja
∗-koṭy-antara-varga.

dvi-kṣepa-mūla. Root for the additive two of varga-prakṛti.

dvi-gata. Raised to the second (square) power.

dvi-tri. Thirty-two (= dvātriṃśat).

dh

dhana. Property. Positive quantity.
∗-avyakta-yugma,
∗-ātmaka,
∗-ātmika,
∗-ṛṇa-tā-vyatyaya,
∗-ṛṇa-tva-vyatyāsa,
∗-ṛṇa-vyatyāsa,
∗-karaṇī,
∗-kṣepa,
∗-gata,
∗-tva,
∗-bhājya,
∗-bhājya-udbhava,
∗-bhājya-vidhi,
∗-rūpa,
∗-labdhi,
tulya-∗,
mūla-∗,
vyasta-∗-ṛṇa-ga,
sama-∗,
sarva-∗.

dhātrī = bhū.

dhī. Intellect. Probably used by Bhāskara synonymously with buddhi and mati but, unlike those words, always in compounds.
∗-mat,
manda-∗,
su-∗.

dhūmraka. Smoke-colored, grey. One of the words for unknown numbers; its initial letter, dhū, is used as a symbol. See BG 68p1.

n

nāma-aṅkita. Marked by name (modifying unknown numbers). The initial letters of the names of the things whose quantities are to be known may be used as symbols for them. See BG E44p.

nāśa. Disappearance, elimination.

niḥśeṣa. Having no remainder (when divided).

ni-√kṣip. To add.

nikhila. Whole, entire.

nighna. Multiplied.

niyata-ādhāra-kriyā. Operation whose ground is certain.

niyama. Law, rule.

niyojanīya. To be employed (the subject is varga-prakṛti).

niragra(ka). Without remainder.

nirasana. Dropping (letters for unknown numbers). A word essential for Bhāskara's definition of utthāpana. See BG 68p4.

nirādhāra. Without ground.

nir-√vah. To be finished, accomplished (the subject is computation).

nirvaha. Accomplishment (of computation).

ni-√viś. Caus. to put, place (numbers on calculating board).

niveśya. (Numbers) to be put, placed (on calculating board).

nihata. Multiplied by.

nihati. Product.
rāśi-∗.

ni-√han. To multiply.

nī. Abbr. of nīlaka. Symbol for the third unknown number.

nī. Abbr. of nīla or indra-nīla (sapphire).

nīpībhā. Abbr. of nīlaka-pītaka-bhāvita.

nīlaka. Blue. Word for the third unknown number; its initial letter, nī, is used as a symbol for it. See BG 7, 68p1.
∗-unmāna,
∗-unmiti,
∗-pakṣa,
∗-māna,
∗-varga,
∗-varga-ghana,
∗-varga-varga,
kālaka-∗-māna.

nīva. Abbr. of nīlaka-varga.

nīvakābhā. Abbr. of nīlaka-varga-kālaka-bhāvita.

nīvagha. Abbr. of nīlaka-varga-ghana.

nīvava. Abbr. of nīlaka-varga-varga.

nyas (ni-√as). To put down, set down (numbers or figures on the calculating board).

nyasta. Put, set (on the calculating board).

nyāsa. Setting down. Tabular presentation of the numerical data.

nyūna. Smaller.

p

pakṣa. Wing, one of a pair of things such as the sides of an equation, a multiplicand and a multiplier, etc. Option.
∗-antara,
∗-śeṣa,
adhika-∗,
avyakta-∗,
avyakta-∗-mūla-abhāva,
ādya-∗-pada-sāmya,

ādya-∗-mūla,
uparitana-∗,
ūrdhva-∗,
kālaka-∗-mūla,
dvitīya-∗,
dvitīya-∗-pada,
nīlaka-∗-mūla,
para-∗,
pūrva-∗-mūla,
prathama-∗,
prathama-∗-pada/mūla,
prāk-∗-mūla,
vyakta-∗,
vyakta-∗-mūla-rūpa,
vyakta-∗-rūpa.

pañca-kṣepa-pada. Root for the additive five of varga-prakṛti.

pada. Root (square and cube)
∗-ānayana,
ādya-pakṣa-∗-sāmya,
ṛṇa-kṣepa-∗,
kaniṣṭha-∗,
kalpita-∗,
ghana-∗,
jyeṣṭha-∗,
dvitīya-pakṣa-∗,
pañca-kṣepa-∗,
pūrva-∗-kṣepa,
prathama-pakṣa-∗,
yoga-∗,
rūpa-∗,
rūpa-kṣepa-∗,
rūpa-kṣepa-∗-uttha,
rūpa-śuddhi-∗,
hrasva-jyeṣṭha-∗,
hrasva-∗.

pada-prada. Giving the square root, a square number.

paraspara-bhajana. Mutual division (the so-called Euclidean algorithm) of the dividend and the divisor in kuṭṭaka.

parikarman. Fundamental operations, six in the BG and eight in the L.

pari-$\sqrt{}$kḷp. To assume.

paribhāṣā. Meta-rule.

paribhāṣita. Stated as a meta-rule.

pari-$\sqrt{}$vṛt. Caus. to rotate (geometric figure).

parimāṇa. Value (of unknown number).

pariśiṣṭa. Remainder.

pāṭalaka. Pink. One of the words for unknown numbers; its initial letter, pā, is used as a symbol. See BG 68p1.

pāṭī. Procedure, algorithm.

pāṭī-gaṇita. Mathematics by algorithms.

piṅgalaka. Brown. One of the words for unknown numbers; its initial letter, pi, is used as a symbol. See BG 68p1.

pī. Abbr. of pītaka. Symbol for the fourth unknown number.

pītaka (or pīta). Yellow. Word for the fourth unknown number; its initial letter, pī, is used as a symbol for it. See BG 7, 68p1.
∗-unmiti,
∗-māna,
∗-varga.

pīva. Abbr. of pītaka-varga.

pṛcchaka. Questioner.

pṛthak-sthiti. Separate standing (of numbers or of unknown numbers).

pṛṣṭa. Questioned.

pra. Abbr. of prakṛti.

prakalpita. Assumed.

prakalpya. To be assumed.

prakāra. Manner, way, method.
ukta-∗,
jñāna-∗,
vilomaka-utthāpana-∗,
sa-upapatti-∗.

prakṛti. Nature, natural form. Coefficient p of the indeterminate equation, $px^2 + t = y^2$. Cf. varga-prakṛti.
∗-mūla,
∗-varṇa,
∗-varṇa-māna/miti,
∗-sama-kṣepa,
kṛti-∗,
kṣaya-ga-∗,
varga-∗.

pra-√kḷp. To assume.

pra-√kṣip. To add.

prakṣipta. Added.

prakṣepa. Additive.

pracaya. Common difference (of an arithmetical progression).

pracyuta. Subtracted.

pra-√jan. To be produced, to become.

pratīti. Conviction, apprehension (about negative quantity).

prathama-bīja. First seed, i.e., eka-varṇa-samīkaraṇa.
∗-kriyā,

-prada. Giving (square root).
pada-∗,
mūla-∗,
varga-mūla-∗.

prapañca. Manifestation, application (of mathematical rules).

pramāṇa. Measure. Standard, esp. the first term of trairāśika. Cf. icchā, pramāṇa-phala, phala.
ali-∗,
ali-kula-∗,
āvāddhā-∗,
nala-∗,
phala-∗,
yūtha-∗,
labdhi-∗.

pramāṇa-phala. Fruit of the standard, the second term of trairāśika. Cf. icchā, pramāṇa.

-pramita. Of such and such measure.

pra-√yam. To give (exact parts when divided, i.e., to be divisible).

pra-√vṛt. To progress (the subject is computation).

praśna. Problem.

praṣṭṛ. Questioner.

pra-√sādh. Caus. to establish, obtain.

prasādhya. To be accomplished, obtained.

pra-√sṛ. To advance (the subject is computation). Caus. to stretch (threads).

projjh (pra-√ujjh). To subtract.

ph

phala. Fruit, result, esp. the second (pramāṇa-phala) and the fourth terms (icchā-phala) of trairāśika. Area. Sum of a series.
∗-aikya,
∗-pramāṇa,
∗-viśeṣa-abhāva,
kṣetra-∗,
guṇaka-ja-∗,
guṇana-∗,
pramāṇa-∗,
śreḍhī-∗.

b

bahiḥ-koṇa-stha. Lying outside the corner.

bahiḥ-kṣetra. External figure.

bahu. Many.
∗-tva,
∗-dhā.

bāhu. 'Arm,' indicating a side of a trilateral. Usually, like bhuja, this word also means a side of any polygon but the two figures of the BG where this word is used are trilaterals.

bindu. Dot (used as a sign of negative quantity). See BG E1p.

bīja. 'Seed,' meaning a method for solving algebraic problems by means of equations. There are four 'seeds.' See bīja-catuṣṭaya.
∗-upayogin,
∗-jña,
∗-vid,
∗-vit-tama,
padmanābha-∗,
pūrva-∗,
prathama-∗,
brahma-āhvaya-śrīdhara-padmanābha-∗.

bīja-kriyā. Operations with the four seeds or with one of them. See bīja-catuṣṭaya.

bīja-gaṇita. Mathematics by seeds, that is, algebra. Also means the mathematics as a seed which generates the rules of pāṭī-gaṇita. See BG 2.
∗-adhyāya,
∗-āhvaya-tā,
∗-jña,
∗-saṃjña.

bīja-catuṣṭaya. Quartet of seeds, that is, eka-varṇa-samīkaraṇa, madhyama-āharaṇa, aneka-varṇa-samīkaraṇa, and bhāvita. See BG 58p1.

buddhi = mati. Intellect, regarded by Bhāskara as the most essential element of the bīja-gaṇita. See BG E43p2, 61p2, E88p2, 73p3, Q15p0. Cf. dhī.
∗-mat,
ātma-∗,
su-∗,
stoka-∗,
sva-∗.

bṛhat. Large.
∗-kṣetra.

bh

bhakta. Divided.

bhaṅga. Resolution (of bhāvita).
bhāvita-∗,

√bhaj. To divide.

bhajana. Division.
paraspara-∗.

bhajita. Divided.

bhā. Abbr. of bhājya.

bhā. Abbr. of bhāvita. See yākābhā, yānībhā, yāvakābhā, kānībhā, kāvayābhā, nīpībhā, nīvakābhā.

bhāga. Part. Division.
∗-labdha,
∗-śeṣa,
aṣṭa-∗,
eka-∗,
navama-∗,
māna-∗,
sapta-∗.

bhāga-āhāra/-hāra. Division.

bhājaka. Divisor.
∗-varṇa-unmiti,
∗-varṇa-māna,
ṛṇa-∗,
dṛḍha-∗-bhājya.

bhājita. Divided.

bhājya. To be divided, dividend.
∗-gata,
∗-rāśi,
∗-varṇa,
∗-varṇa-māna,
∗-stha,
ṛṇa-∗,
dṛḍha-∗-hāra,
dhana-∗.

bhāvanā. Generative method of varga-prakṛti, which is a particular algorithm for obtaining a new pair of roots when two pairs of roots are known. See BG 40–43. Cf. antara-bhāvanā, samāsa-bhāvanā, tulya-bhāvanā.
∗-artha,
∗-tas,
∗-vyatireka,
tulya-∗,
tulya-∗-artha,
rūpa-kṣepa-artha-∗,
rūpa-kṣepa-∗,
samāsa-antara-∗.

bhāvita. Product of different unknown numbers or the solution procedure for algebraic problems by means of equations involving it. The fourth item of bīja-catuṣṭaya.
∗-aṅka,
∗-unmiti,
∗-upapatti,
∗-jña,
sa-∗.

bhāvita-kṣetra. A rectangle whose length and width are measured by two unknown numbers. See BG 93p3.

bhāvita-bhaṅga. Resolution of bhāvita,

bhinna. Fraction.

bhuja. 'Arm,' indicating a side of a geometric figure in general and one of the two sides that contain the right corner of a right-angled triangle in particular, the other being koṭi. For a definition of bhuja and koṭi see L 135.
∗-āśrita-āvādhā,
∗-koṭi-māna,
∗-koṭi-vadha,
∗-māna,
koṭi-∗-antara,
kṣetra-∗,
catur-∗,
tri-∗.

bhū. Base of a geometric figure.
∗-māna,
sama-∗.

bhūmi = bhū.
∗-kalpanā.

bheda. Variety (of assumption, equations).
kalpanā-∗,
madhyama-āharaṇa-∗.

m

mati = buddhi. Intellect, regarded by Bhāskara as the most essential element of the bīja-gaṇita. See BG Q2, Q11, 73a, 73p3, Q15. Cf. dhī.
∗-mat,
∗-vṛddhi,
amala-∗,
niścala-∗,
su-∗.

madhya. Middle. Center.

madhyama. Middle term.

madhyama-āharaṇa. Elimination of the middle term of a quadratic equation, meaning the perfection of square, or the solution procedure for algebraic problems by means of it. The second item of bīja-catuṣṭaya.
aneka-varṇa-∗,
ekavarṇa-∗.

mahat. Large.

mā. Abbr. of māṇikya (ruby).

māna. Measure, size. dimension, value.
∗-saṃjñā,
avyakta-∗,
uḍḍīna-∗,
karṇa-∗,
kalikā-∗,
kālaka-∗,
kālaka-nīlaka-∗,
nīlaka-∗,
pītaka-∗,
bhuja-∗,
bhū-∗,
yāvattāvat-kālaka-∗,
yāvattāvat-kālaka-bhuja-koṭi-∗-ātmaka-kṣetra,
yāvattāvan-∗,
lamba-∗,
varga-aikya-∗,
varṇa-∗,
sama-rāśi-∗,
haritaka-∗.

-mita. Of such and such measure.

miti. Value (of unknown numbers). Number (of a certain commodity).
avyakta-∗,
ādya-∗,
māṇikya-amala-nīla-maukti-ka-∗,
varṇa-∗.

mithas. Mutually.

milita. Added up.

miśra. Accompanied by, increased by.

mu. Abbr. of muktā-phala (pearl).

√muc. To exclude.

muhus. Repeatedly.

mūla. Root (square and cube).
∗-abhāva,
∗-artha,
∗-ānayana,
∗-aikya,
∗-karaṇa,
∗-karaṇī,
∗-dhana,
ananta-∗,
avyakta-∗,
āsanna-∗-karaṇa,
kaniṣṭha-∗,
karaṇī-gata-∗-abhāva,
kṛti-∗,
kṣetra-∗-antarbhūta,
guṇa-∗,
ghana-∗,
catuḥ-kṣepa-∗,
jyeṣṭha-∗,
trayodaśa-kṣepa-∗,
trayodaśa-ṛṇa-kṣepa-∗,
dvi-kṣepa-∗,
pakṣa-∗,
prakṛti-∗,
yoga-∗,
rāśi-∗,
rūpa-kṣepa-∗,
rūpa-śuddhi-∗,
vadha-∗,
varga-antara-∗,
varga-aikya-∗,
varga-∗,
varga-∗-prada,

y

varga-antara-∗,
varga-∗,
sama-∗,
sama-∗-viyoga.

yojita. Added.

r

rahita. Deprived of, decreased by.

rāśi. Quantity, number.
∗-antara,
∗-kṣepa,
∗-gata,
∗-ghāta,
∗-nihati,
∗-mūla,
∗-yoga,
∗-yoga-kṛti,
∗-vadha,
∗-varga,
∗-śeṣa,
ananto ∗(ḥ),
avyakta-∗,
avyakta-varga-∗,
kalpita-∗,
pūrva-∗,
bhājya-∗,
yāvattāvad-∗,
varga-∗,
sama-∗.

-rāśika. See trairāśika, pañcarāśika.

rāśi-gata-upapatti. Proof based on quantities. See BG 93p3–p4.

rū. Abbr. of rūpa.

rūpa(ka). Unity. Collectively, a set of unity, i.e., an integer.
∗-ūna,
∗-kṣepa,
∗-kṣepa-artha-bhāvanā,
∗-kṣepa-pada,
∗-kṣepa-pada-artha,
∗-kṣepa-pada-ānayana,
∗-kṣepa-pada-uttha,
∗-kṣepa-bhāvanā,
∗-kṣepa-mūla,
∗-pada,
∗-vat,
∗-vidhāna-hetu,
∗-viśodhana,
∗-śuddhi,
∗-śuddhi-pada,
∗-śuddhi-mūla,
∗-śeṣa,
a-∗,
avyakta-varga-∗,
āhati-∗-aikya,
ṛṇa-ga-∗-tas,
ṛṇa-∗,
kṣaya-∗,
dhana-∗,
varga-∗,
vi-∗,
vyakta-pakṣa-∗,
vyakta-pakṣa-mūla-∗,
vyakta-∗,
vyeka-∗,
sa-ayyakta-∗,
sa-tri-∗,
sa-dvi-∗,
sa-pañca-∗,
sa-∗,
hāra-taṣṭa-∗.

l

laghu. Small.
∗-kṣetra.

labdha. Obtained in general, quotient in particular.
∗-aikya-pramāṇa,
bhāga-∗.

labdhi. Quotient.
∗-pramāṇa,
∗-vaiṣamya,

dhana-∗,
yoga-ja-∗.

√labh. To obtain (a result by means of calculations).

lamba. Perpendicular.
∗-māna.

lava. Part.
tri-∗.

lāghava. Easiness (of calculation).
∗-artha,
kriyā-∗-artha.

lābha. Quotient.
kṣepa-takṣaṇa-∗,
takṣaṇa-∗.

lekhya. To be written down.

lo. Abbr. of lohitaka. Symbol for the fifth unknown number.

loka. People, who do not have conviction in negative known quantities. See BG E69p.

lohitaka (rarely lohita). Red. Word for the fifth unknown number; its initial letter, lo, is used as a symbol for it. See BG 7, 68p1.

v

va. Abbr. of vajra (diamond).

va. Abbr. of varga. See yāva, kāva, nīva, pīva.

vajra-abhyāsa. Cross multiplication for varga-prakṛti.

vadha. Product.
∗-kṣepa,
∗-mūla,
bhuja-koṭi-∗,
rāśi-∗.

varga. Square.
∗-antara,
∗-antara-kṣepaka,
∗-antara-mūla,
∗-antara-yoga,
∗-artha,
∗-aikya,
∗-aikya-māna,
∗-aikya-mūla,
∗-tva,
∗-yuti,
∗-yoga,
∗-rāśi,
∗-rūpa,
antara-∗,
avyakta-∗,
avyakta-∗-ādisamīkaraṇa,
avyakta-∗-rāśi,
avyakta-∗-rūpa,
kaniṣṭha-∗,
kālaka-∗,
ghana-∗,
ghana-∗-yuti,
ghana-∗-yoga,
navātmaka-∗,
nīlaka-∗,
nīlaka-∗-ghana,
pītaka-∗,
yāvattāvad-∗,
yāvattāvad-∗-∗,
rāśi-∗,
varṇa-∗,
sama-∗-gama.

varga-ādi-gata. Raised to the powers beginning with the square.

varga-kuṭṭaka. Square pulverizer: method for solving the equation $y = \frac{ax^2+c}{b}$.

varga-kṛti = varga-varga.

varga-gata. Raised to the square power.

varga-ghana. Cube of square, the sixth power.

varga-prakṛti. Square nature or natural form of square: method for solving the quadratic indeter-

minate equation, $px^2 + t = y^2$, where p is called prakṛti.

varga-mūla. Square root.

varga-mūla-prada. Giving a square root, a square number.

varga-varga. Square of square, the fourth power.

vargita. Squared.

varjita. Deprived of, decreased by.

varṇa. Color (for expressing unknown number).
∗-akṣara,
∗-aṅka,
∗-aṅka-āhati,
∗-ātmaka,
∗-kṛti,
∗-māna,
∗-varga,
aneka-∗,
aneka-∗-madhyama-āharaṇa,
aneka-∗-samī-karaṇa,
antya-∗,
antya-∗-māna,
anya-∗,
anya-∗-unmiti,
anya-∗-kalpanā,
anya-∗-māna,
anya-∗-varga,
ādya-∗-unmiti,
ādya-∗-śeṣa,
iṣṭa-∗,
eka-∗-unmiti,
eka-∗-tva,
eka-∗-madhyama-āharaṇa,
eka-∗-samī-karaṇa,
kālaka-∗-māna,
pūrva-∗,
pūrva-∗-unmiti,
pūrva-∗-māna,
prakṛti-∗,
prakṛti-∗-māna,
prakṛti-∗-miti,
prathama-∗,
prathama-∗-miti,
bhājaka-∗-unmiti,
bhājaka-∗-māna,
bhājya-∗,
bhājya-∗-māna,
yāvattāvat-kālaka-∗,
vividha-∗,
vividha-∗-sahāyana.

vallī. 'Creeper,' indicating a column of quotients of the mutual divisions for kuṭṭaka with the additive and zero at its bottom. Cf. paraspara-bhajana.

vi-. Less by.
∗-eka,
∗-eka-rūpa,
∗-pañca-rūpa,
∗-rūpa.

vikalpa. Option.

vikāra. Change (of form).

vikraya. Selling rate (of commodity per price). Cf. kraya.

vijātīya. Of a different category.

vitta. Property.
tulya-∗.

$\sqrt{}$vid. To know (calculation, answer, etc.).

-vid. Knowing about.
bīja-∗.

vidha. Variety, kind.
aneka-∗,
evam-∗,
evam-∗-kalpanā,
dvi-∗,
ṣaḍ-∗.

vi-$\sqrt{}$dhā. To do, make (calculation, equation, etc.).

vidhāna. Making (rūpa from karaṇī).
rūpa-∗-hetu.

vidhi. Doing, making in general, mathematical operation in particular, and a procedure for it.
∗-kuṭṭaka,
∗-khaṇḍaguṇanā,
∗-dhana-bhājya,
∗-manda-avabodha,
∗-viloma,
∗-śeṣa,
∗-samīkāra.

vinā. Without, excluding.

vinighna. Multiplied.

vinyas (vi-ni-$\sqrt{}$as). To put down, set down (numbers or figures on the calculating board).

viparyas (vi-pari-$\sqrt{}$as). To reverse, interchange.

viparyaya. Inverse.

viparyāsa. Inversion, interchange.
cheda-aṃśa-∗.

vibhakta. Divided.

vi-$\sqrt{}$bhaj. To divide.

vibhājita. Divided.

vibhājya. To be divided.

vibhinna. Different.
∗-jāti.

viyuti. Difference.
kṛti-yuti-∗.

viyoga. Difference.
∗-ja,
∗-mūla,
sama-yoga-∗.

viyojita. Subtracted.

viloma(ka). Inverse.
∗-utthāpana,
∗-utthāpana-prakāra,
∗-vidhi.

vivara. Difference.

vivarjita. Deprived of, decreased by.

viśuddhi. Subtractive (number, term).

vi-$\sqrt{}$śudh = $\sqrt{}$śudh.

viśeṣa. Peculiar, special. Difference.
∗-sūtra,
phala-∗-abhāva.

viśodhana. Subtraction.
rūpa-∗.

viśodhita. Subtrcted.

viśodhya. To be subtracted.

vi-$\sqrt{}$śliṣ. Caus. To separate, decompose.

viśleṣa. Disjunction, decomposition. Difference.
∗-sūtra.

viśleṣya. To be separated, decomposed.

viṣama. Uneven, odd (number). Scalene (triangle).
∗-tryasra.

viṣaya. Object, area.
sūtra-artha-∗.

vihṛta. Divided.

vedin. Knowing about.
kuṭṭaka-∗.

vaiparītya. Inversion.

vaiṣamya. Unevenness, unequalness.
labdhi-∗.

vyakta. Visible, known (number). Cf. avyakta.
∗-aṅka,
∗-tva,
∗-pakṣa-mūla-rūpa,
∗-pakṣa-rūpa,
∗-rūpa.

vyakta-gaṇita. Mathematics with known numbers which does not employ bījas. Cf. avyakta-gaṇita.

vyakta-pakṣa. The side of known numbers of an equation, which exclusively consists of known numbers. Cf. avyakta-pakṣa.

vyatyaya. Inversion.
dhana-ṛṇa-tā-∗.

vyatyāsa. Inversion.
dhana-ṛṇa-tva-∗,
dhana-ṛṇa-∗.
vyabhicar (vi-abhi-√car). To deviate from the right course (the subject is calculation).
vyabhicāra. Error, anomaly.
vyavakalana. Subtraction.
vyavahāra. Procedure.
kṣetra-∗.
vyasta. Inverted, inverse.
∗-dhana-ṛṇa-ga.
vyāpti. Pervasion, validity of a rule or of a thesis.

ś

śavalaka. Spotted. One of the words for unknown numbers; its initial letter, śa, is used as a symbol. See BG 68p1.
śāstra. Discipline (of mathematics).
∗-vistāra-vāri-dhi,
∗-vistṛti.
√śudh. To become clean (when subtracted repeatedly), where the subject is a factor of the dividend. To become clean (when divided), where the subject is the dividend divisible by the divisor. Caus. to subtract.
śuddha. Subtracted.
śuddhi. Subtraction.
tulya-∗,
rūpa-∗-pada,
rūpa-∗-mūla,
sama-∗.
śūnya. Zero.
∗-eka-dvy-ādy-utthāpana,
∗-tas.
śeṣa(ka). Remainder.
∗-avyakta,
∗-vidhi,
adhimāsa-∗,
avama-∗,
avyakta-rāśi-∗,
avyakta-∗,
ādya-varṇa-∗,
pakṣa-∗,
bha-gaṇa-∗,
bhāga-∗,
rāśi-∗,
rūpa-∗.
śodhana. Subtraction.
∗-artha,
∗-ādi-siddha,
sama-∗,
sama-∗-artha.
śodhita. Subtracted.
śodhya. To be subtracted.
śyāmalaka. Black. One of the words for unknown numbers; its initial letter, śyā, is used as a symbol. See BG 68p1.
śravaṇa = karṇa.
śravas = karṇa.
śruti = karṇa.
śruti-pathāt. Diagonally.
śreḍhī. Mathematical series.
śreḍhī-gaṇita. 'Series computation,' meaning the sum of an arithmetical progression. See L 121.
śreḍhī-phala. The sum of a mathematical series.
śve. Abbr. of śvetaka. Symbol for the seventh unknown number.
śvetaka. White. Word for the seventh unknown number; its initial letter, śve, is used as a symbol for it. See BG 68p1.

ṣ

ṣaḍ-gata. Raised to the sixth power.
ṣaḍ-vidha. Six kinds (of arithmetical operations, which are treated in the first four chapters of the BG).

s

sa-. Accompanied by, increased by.
∗-ardha,
∗-alpa,
∗-avyakta,
∗-avyakta-rūpa,
∗-aṣṭa(ka),
∗-upapatti-prakāra,
∗-eka,
∗-ekaviṃśati,
∗-kalā-antara,
∗-kṣepa,
∗-tri-rūpa,
∗-dvi-rūpa,
∗-pañca-rūpa,
∗-phala,
∗-bhāvita,
∗-rāśi-yugala,
∗-rūpa(ka),
∗-rūpa-aṣṭaka,
∗-viśva-rūpa,
∗-sūtra-uddeśaka.
saṃkalana(or ā). Addition, summation.
saṃkalita. Added up, sum.
saṃkoca. Contraction (of calculation).
kriyā-∗.
saṃkramaṇa. Rule of concurrence. See L 56.
saṃkṣipta. Abridged.
∗-pāṭha.
saṃkhyā. Number.
ali-∗,
alikula-∗,
aśva-ādi-∗,
khaṇḍa-∗,
bāṇa-∗,
ratna-∗.
saṃkhyāna. Calculation.
saṃguṇa. Multiplied.
saṃguṇ (sam-$\sqrt{}$guṇ). To multiply.
saṃguṇita. Multiplied.
saṃjñā. Name, designation.
bīja-gaṇita-∗,
māna-∗.
saṃdheya. To be united, reconciled.
saṃpāta. Intersection.
sūtra-∗.
saṃyuj (sam-$\sqrt{}$yuj). To unite, add.
saṃyuta. Accompanied by, increased by.
saṃyuti. Sum
saṃvargita. Squared.
saṃśudh (sam-$\sqrt{}$śudh). Caus. to subtract.
saṃśliṣṭa-kuṭṭaka. Contiguous kuṭṭaka, an indeterminate system of simultaneous linear equations, $a_i x = by_i + r_i$. See BG 39.
sakala. Whole.
∗-gaṇita-sāra.
sakṛt. Only once (equation made).
sadṛśa. Same, equal.
sama. Same, equal.
∗-argha,
∗-kṣepa,
∗-gati,
∗-ccheda,
∗-cchedī-kṛta,
∗-cchedī-kṛtya,
∗-jātika,
∗-tā,
∗-tva,
∗-dhana,
∗-paṇa,
∗-yoga,

∗-yoga-viyoga,
∗-rāśi-māna,
∗-śuddhi,
kṛta-∗-ccheda,
guṇaka-khaṇḍa-∗,
prakṛti-∗-kṣepa.

sama-kriyā. Equality operation, equation procedure, operation with equations.

sama-catur-asra-kṣetra. A figure with four equal sides, a square.

sama-cchedī-karaṇa. Reduction (of fractions) to a common denominator.

sama-varga-gama. Elimination of the same square (from both sides of an equation).

sama-śodhana. Equal subtraction, subtraction of the same (from both sides of an equation).

samanvita. Accompanied by, increased by.

samapavartita. Reduced by a common factor.

sam-ā-$\sqrt{}$gam. To come near, obtain.

samāna. Same.
∗-jāti.

samāpta. Reached, obtained.

samāsa. Sum.
∗-antara-bhāvanā.

samāsa-bhāvanā. Generative method by sum. Essential part of varga-prakṛti. See bhāvanā.

samīkaraṇa. Making equal (pakṣas or 'wings'), equation.
∗-artha,
aneka-varṇa-∗,
avyakta-varga-ādi-∗,
eka-varṇa-∗.

samīkāra. Making equal (pakṣas or 'wings'), equation.
∗-vidhi.

samī-$\sqrt{}$kṛ. To equate.

samīkṛta-ccheda-gama. Elimination of the denominators of fractions after reducing them to a common denominator.

samutthā (sam-ud-$\sqrt{}$sthā). Caus. to raise. See utthā and utthāpana.

samuddhṛta. Divided.

sammita. Of such and such measure.

sarva. All, every.
∗-karaṇī-tulya,
∗-dhana.

sahāya(na). Companion.
vividha-varṇa-∗.

sahita. Added up. Accompanied by, increased by.

$\sqrt{}$sādh. Caus. to establish, obtain.

sādhanīya. To be established, obtained.

sādhita. Established, obtained.

sādhya. To be established, obtained.

sāmya-karaṇa. Making equality, equation.

sāra. Essence.
sakala-gaṇita-∗.

$\sqrt{}$sidh. To be established, settled.

siddha. Established, settled.
∗-anta,
∗-anta-śiro-maṇi.
śodhana-ādi-∗.

siddhi. Establishment, settlement.
iṣṭa-∗.

su-. Good.
∗-dhī,
∗-buddhi,
∗-mati.

sūtra. Thread.
∗-yuti,
∗-saṃpāta.

sūtra. Rule.
∗-artha-viṣaya,
∗-avatāra,
ityādi-∗,
karaṇa-∗,
para-ukta-∗,
pūrva-∗-ukta,
mūla-∗,
viśeṣa-∗,
viśleṣa-∗,
śrīdhara-ācārya-∗,
sa-∗-uddeśaka.
stoka. Small, little.
∗-buddhi.
-stha. Being at, lying at.
koṇa-∗,
dvi-∗,
bahiḥ-koṇa-∗,
bhājya-∗.
sthāna(ka). Place.
sthāpya. To be placed.
sthiti. Standing (of numbers, terms, etc.).
pṛthak-∗.
sthira-kuṭṭaka. Fixed (or constant) kuṭṭaka, where the additive is taken to be positive or negative unity: $y = \frac{ax \pm 1}{b}$. See BG 36cd–37ab.
sphuṭa. Correct.
∗-kuṭṭaka.
sva. Property, positive quantity.
∗-tva,
∗-∗-rṇa-ga.
sva-tas. Automatically (established).
svayam. Automatically (established).
sva-rūpa. True constitution.

h

ha. Abbr. of haritaka. Symbol for the sixth unknown number.
hata. Multiplied.
hati. Product.
√han. To multiply.
hara. Divisor.
∗-taṣṭa,
eka-∗-tva,
kha-∗,
kha-∗-tva.
haraṇa. Dividing, division.
haritaka. Green. Word for the sixth unknown number; its initial letter, ha, is used as a symbol for it. See BG 68p1.
∗-māna.
hā. Abbr. of hāra.
√hā. To leave, exclude.
hāra. Divisor.
∗-taṣṭa,
∗-taṣṭa-rūpa,
kha-∗,
dṛḍha-bhājya-∗,
bhāga-∗.
hīna. Less by.
√hṛ. To divide.
-hṛt. Divisor.
hṛta. Divided.
hetu. Reason, cause.
karaṇī-tva-∗,
kriyā-∗,
rūpa-vidhāna-∗.
hrasva. Small. Smaller (of the two roots).
∗-jyeṣṭha-pada,
∗-pada.

III.4 Bhūtasaṃkhyās and Weights and Measures

III.4.1 Bhūtasaṃkhyās

For rūpa meaning 'unity' and śūnya meaning 'empty' or zero see Appendix 6 (Index to Words).

0
- kha E5a, E5b, 5c, 5d, E5c, 6a, 28d, E64a, E64d, E65b, E65c, ⟨Q4a-d⟩, Q5b,
- viyat 5c,

1
- indu E77c,
- kṣiti E77b,
- bhū E77b,
- mahī E77c,

2
- netra E77c,
- yuga E59a,
- yugala E108b, Q13b
- yugma E6b, E7b, E7c, 29b, E58c, E108c,

3
- guṇa E77a,
- pāvaka E77b,
- hutāśana E17b

4
- śruti E77b,

5
- iṣu E19a,

6
- aṅga E77a,
- ṛtu E19b,

7
- muni E77b, E77c,

8
- gaja E16b,
- nāga E19b,
- maṅgala E77a,

11
- rudra E19a,

12
- ravi E98b,
- sūrya E19a,

13
- viśva E17b, E19c,

14
- indra E109c,
- manu E56b,

15
- tithi 23b, E17b, E19a, E73a,

20
- nakha E73a, E107b,

24
- siddha E16b,

27
- bha E11a,

32
- danta E16b,

III.4.2 Weights and Measures

Units of currency
- kākiṇī (= 1/4 paṇa) E48b, E48p
- dramma (= 16 paṇas) E48a, E48p, E79a
- paṇa (= 4 kākiṇīs) E88d, E88e, E88p1

Units of length
- aṅgula (= 1/12 vitasti) E70c, E70p1
- kara (= hasta) E57d, E60a
- pāṇi (= hasta) E57a

III.5 Index to Quarter Verses

For the order of the Indian letters see Appendix 3. Interword space and avagraha are ignored.

avyaktavargarūpair Q3c
avyaktavargādi yadāvaśeṣaṃ 59a
avyaktavargo 'tra kṛtiprakṛtyā 74c
avyaktānāṃ kalpitā mānasaṃjñās 7c
avyaktānāṃ dvyādikānām apīha 58a
avyaktānāṃ brūhi vargaṃ sakhe me E8f
avyaktā rāśayaḥ kalpyāḥ Q7c
aśvāḥ pañcaguṇāṅgamaṅgalamitā yeṣāṃ caturṇāṃ dhanāny E77a
aśvā daśānyasya tu tulyamaulyāḥ E36b
aṣṭādaśa hatāḥ kena E24a
aṣṭādaśāṣṭadvikasammitānāṃ E14a
aṣṭau ṣaṭpañcāśat E18a
asamānasamacchedān E52a
asti trairāśikaṃ pāṭī Q15a
asmin vikāraḥ khahare na rāśāv 6a
ācāryavaryapadavīṃ viduṣāṃ prapannaḥ 95b
ādāya tatsāram akāri nūnaṃ 96c
ādāyārpaya taṇḍulāṃśayugalaṃ mudgaikabhāgānvitaṃ E48c
āder dalaṃ tatpracayaḥ phalaṃ ca E63b
ādyaṃ varṇaṃ śodhayed anyapakṣād 65a
ādyayukto navonitaḥ E64b[2]
ādyāyukto 'thavonitaḥ E64b[3]
ādyo dhanena triguṇo 'nyato vā E37c
ārabhyate yathā laghvī 86c
ārūḍho vada te kati E69d
ālāpita eva haro 90c
ālāpo matir amalā- Q11a
āsīn maheśvara iti prathitaḥ pṛthivyām 95a
itaretaramūlāgraga- E60c
iti bahuguṇayuktaṃ sarvadoṣair vimuktaṃ 102c
iṣṭaṃ hrasvaṃ tasya vargaḥ prakṛtyā 40a
iṣṭabhakto dvidhā kṣepa 54a
iṣṭavargaprakṛtyor yad 45a
iṣṭavargahṛtaḥ kṣepaḥ 44a
iṣṭāhatasvasvahareṇa yukte 36a
iṣṭoddhṛtasyeṣṭavivarjitasya 80c
iṣṭonāḍhyo dalīkṛtaḥ 54b
uktaṃ bījopayogīdaṃ 55a

[2]Cf. 'ādyāyukto 'thavonitaḥ' and 'koṭyā yukto 'thavonitaḥ.'

[3]Variant of 'ādyayukto navonitaḥ.'

[4]Variant of 'tac cābhinnam avehi vatsa gaṇakaḥ kas tvatsamo 'sti kṣitau.'

[5]Variant of 'ādyayukto navonitaḥ.'

kṣuṇṇaḥ kṣuṇṇe tadā pade 44d
kṣuṇṇā jyeṣṭhābhyāsayug jyeṣṭhamūlaṃ 42c
kṣuṇṇā bhavanti pṛthag evam imāḥ karaṇyaḥ 18d
kṣuṇṇeṣu hṛteṣu keṣu viṃśatyā E81b
kṣuṇṇo yukto varjito vā sa yena 40b
kṣetre tithinakhais tulye E73a
kṣepaṃ viśuddhiṃ parikalpya rūpaṃ 36c
kṣepaḥ śudhyed dharoddhṛtaḥ 35b
kṣepaḥ syād iṣṭabhājite 44b
kṣepatakṣaṇalābhāḍhyā 33c
kṣepaś cet tad duṣṭam uddiṣṭam eva 26d
kṣepas tathānte kham upāntimena 28d
kṣepābhāvo 'thavā yatra 35a
kṣepo harahṛtaḥ phalam 35d
kṣepyaṃ tayor yena padapradaḥ syād 59c
khaṃ hāraś cet punas tadā rāśiḥ Q5b
khaguṇaś cintyaś ca śeṣavidhau Q4d
khaguṇo navatir bhavet E64d
khaguṇo vargito yutaḥ E65b
khaṇḍatraye 'pi saphalaṃ vada khaṇḍasaṃkhyām E46d
khaṇḍāni tatkṛtipadasya yathepsitāni 18b
khaṇḍais tribhir navatiyuk triśatī dhanaṃ tat E46b
khayoge viyoge dhanarṇaṃ tathaiva 5a
khaharaḥ syāt khaguṇaḥ khaṃ Q4c
khahāro bhavet khena bhaktaś ca rāśiḥ 5d
gacche kvāpi ca yat phalam E93b
gaṇaka pavanavegād ekadeśe sa bhagnaḥ E57b
gaṇaka brūhi tāṃ drutam E70d
gaṇaka bhaṇitiramyaṃ bālalīlāvagamyaṃ 102a
gaṇakānandakārakam 55d
gaṇayitvā kathaya yadi vetsi E99d
gaṇitaṃ gaṇakā jaguḥ 94b
gaṇitajña vadāśu tam E89d, E91d
gaṇitasyāsya kathyatām E73d
guṇaḥ prāgvat tato labdhiḥ 34c
guṇamūlahṛtaś cādyo 54c
guṇalabdhiḥ padaṃ hrasvaṃ 48c
guṇalabdhī tu pūrvavat 33b
guṇalabdhyos samaṃ grāhyaṃ 32e
guṇavarge prakṛtyone 47c
guṇāptī sto viyogaje 32b

jātaivaṃ samatā tayor yadi gatāv uḍḍīnamānaṃ kiyad E59c
jñātavye te viparyayāt 93d
jñātuṃ śakyā mandadhībhir nitāntaṃ 2c
jñeyaḥ śūnyaṃ guṇas tatra 35c
jyeṣṭhaṃ kaniṣṭhena tadā nihanyāc 76c
jyeṣṭhaṃ kṣepo 'trāpi ca kṣepaghātaḥ 43d
jyeṣṭhaṃ tataḥ pūrvavad eva śeṣam 77b
jyeṣṭhaṃ tayoḥ prathamapakṣapadena tulyaṃ 75a
jyeṣṭhaṃ dvitīyena samaṃ vidadhyāt 78d
taṃ guṇaṃ gaṇaka kīrtayāśu me E26d
taṃ guṇaṃ gaṇaka me pṛthag vada E23d
taṃ vadāśu tavālaṃ ced E104c
tac cābhinnam avehi vatsa gaṇakaḥ kas tvatsamo 'sti kṣitau E108d[6]
tajjaṃ phalaṃ syur vikalā guṇas tu 38a
tajjena bījagaṇitaṃ laghu bhāskareṇa 95d
tataḥ pakṣau vibhajya ca 92d
tato jyeṣṭham ato 'sakṛt 48d
tato jyeṣṭham ihānantyaṃ 46a
tato rūpaviśodhane 51d
tat tu kṣepahṛtaṃ kṣepo 48a
tat tu prāpyaiva vistāraṃ 100c
tattulyavitto yadi vā dvitīyaḥ E37b
tat padaṃ syād ekasaṃyutau 45d
tatpadena vibhājayet 53d
tatra kṛtau kiṃ padaṃ brūhi E20d
tatra tanmānam ānayet 84b
tatrābhyāsaḥ kṣepayoḥ kṣepakaḥ syāt 42d
tatrecchayaikāṃ prakṛtiṃ prakalpya 79b
tatsaṅkhyānaṃ kartum ācāryavaryaiḥ 7d
tathā prakṛtitaś cyute 47b
tathā yathā praṣṭur abhīpsitāḥ syuḥ 17d
tathā sudhībhir bahudhā vicintyam 72d
tadanyavarṇonmitayaḥ prasādhyāḥ 66b
tadartham atra kathyate 81d
tadā guṇaikyaṃ parikalpya bhājyam 39b
tadānyavarṇasya kṛteḥ samaṃ tam 71d, 77d
tad eva triguṇaṃ kasminn E93c
tadbhāvitaṃ cāsamajātighāte 9b
tadratnatrayamaulyasaṃyutimitis tryūnaṃ śatārdhaṃ priye E40c

[6]Cf. 'kṛtvābhinnam avehi vatsa gaṇakaḥ kas tvatsamo 'sti kṣitau.'

tyaktvā varṇau sarūpakau 92b
tyajen muhuḥ syād iti rāśiyugmam 29b
trayastriṃśadyutaḥ kṛtiḥ E33d
trayād dvayaṃ svāt svam ṛṇād ṛṇaṃ ca E2a
trayodaśaguṇo vargaḥ E34a
trayodaśaguṇo vargo E30a
trayodaśa tathā pañca E50a
trayodaśayuto vā syād E34c
trayodaśa vadāvalambakaṃ tatra E56d
trayodaśavibhājitaḥ E87b
trayodaśa sakhe jātaṃ E72c
trayoviṃśatisaṃyutāḥ E25b
triṃśaj jātaṃ vadāśu tam E87d
triṃśadūno 'thavā kaḥ syād E103c
trikāgraḥ pañcabhir bhaktas E82c
trikādidvyuttaraśreḍhyāṃ E93a
trinighnam ādyaṃ vada tat kiyad dhanam E47d
tripañcaguṇarāśibhyāṃ E110a
tribhiḥ pārāvatāḥ pañca E78a
triyuktaḥ ṣoḍaśoddhṛtaḥ E105b
triśatyā vā kṛtir bhavet E31d
trisaptamityoś ca ciraṃ vicintya E11c
trisaptamityor vada me karaṇyor E14c
trairāśikam iti bīje Q11c
tryabhyastaṃ kṛtir ekayuk E101d
tryasrakṣetrasya yasya syāt E53a
tvaccetasi pravada tāta tatā latāvat E29d
tvattas tayor vada dhane mama kiṃpramāṇe E39d
tvatto bhavāmi hi sakhe dviguṇas tato 'nyaḥ E39b
dakṣo 'si gaṇite yadi E54d, E105d
dattaṃ daśakaśatena E42c
dadau daśaivaṃ nagaratraye 'bhavat E47c
dantaiḥ siddhair gajair mitā vidvan E16b
dalena tulyaṃ hi tad eva kāryam 80d
daśapañcakaraṇyantaram E51a
daśasu catasṛṇāṃ tithiṣu ca pañcānām 23b
daśāḍhyā vā daśonitāḥ E24b
daśāhataḥ syād vihṛtas triṣaṣṭyā E27c
daśendrāhatarāśyaikyaṃ E109c
dustaraḥ stokabuddhīnāṃ 99a
dūtāhūta itas tato bhramati khe bhṛṅgo 'lisaṃkhyāṃ vada E41d

[7]Variant of 'dvividhotpadyate mitiḥ.'

[8]Cf. 'dvidhā mānaṃ kvacid bhavet.'

dviśatītulyāḥ karaṇyaś cet E20b
dviṣaṣṭipramito jātas E110c
dvyagraṃ tryuddhṛtam antaraṃ navahṛtā pañcāgrā syād yutiḥ E83b
dvyagras trisamuddhṛtaḥ kaḥ syāt E80d
dvyūnaṣaṣṭivivarjitam E109d
dhanaṃ dhanenarṇam ṛṇena nighnaṃ E2c
dhanaṃ dhanenarṇam ṛṇena bhaktam E3b
dhanabhājyavidhir bhavet Q0b
dhanabhājyodbhave tadvad 32c, Q1a
dhanarṇatāvyatyayam īpsitāyāś 16a
dhanarṇayoḥ saṃkalanām avaiṣi E1d
dhanarṇayor antaram eva yogaḥ 3b
dhanasya rūpatritayasya vargaṃ E4a
dhanātmakānām adhanātmakānāṃ E4c
dhanātmikāṃ tāṃ parikalpya sādhye 21b
dhanāvyaktayugmaṃ virūpāṣṭakaṃ ca E6b
dhanāvyaktayugmād ṛṇāvyaktaṣaṭkaṃ E7c
dhanāvyaktavargatrayaṃ satrirūpaṃ E7a
dhātrī manusammitā sakhe bāhū E56b
dhīmatā takṣaṇe phalam 32f
na ced evaṃ viśeṣo 'sti 94c
na tatra yojayet tāṃ tu Q10c
na nirvahaś ced ghanavargavargeṣv 60c
na pāṭībījayor yataḥ 94d
na bījāni pṛthak pṛthak Q2b
na mūlaṃ kṣayasyāsti tasyākṛtitvāt 4d
na yadi padaṃ rūpāṇāṃ 89a
navabhiḥ saptabhiḥ kṣuṇṇaḥ E84a
navabhir barhiṇāṃ trayam E78d
na hy udāharaṇānto 'sti 98c
nāgartavo yatra kṛtau karaṇyaḥ E19b
nikhilanavamabhāgāś cālinī bhṛṅgam ekaṃ E61b
niyatādhārikāpi vā Q10b (aniyatā-)
niragrakaṃ syādvada me guṇaṃ taṃ E22c
niragrāḥ syuḥ sa ko guṇaḥ E25d
nirādhārā kriyā yatrā- Q10a
nirekaḥ kaḥ kṛtir bhavet E30b
nireko mūlado vada E30d
nirvahec ca yathā tathā 86d
niśi parimalalubdhaṃ padmamadhye niruddhaṃ E61c
nīlakavarṇās tripañcasaptadhanam E9b

rūpāṇi tu śodhanādisiddhāni 90d
rūpāṇy anyasyetarasmāc ca pakṣāt 57b
rūpāṣṭakaṃ rūpacatuṣṭayena E3a
rūpeṇāḍhyā dviguṇitamitais te tu tair eva nighnāḥ E10b
rūpaiḥ pakṣadvayaṃ guṇayet Q3b
rūpaiḥ ṣaḍbhir varjitānāṃ caturṇām E8e
rūpair daśabhir upetaṃ E18c
rūpair daśabhir upetāḥ E16c
rūpottarāṇi śeṣāṇy E81c
rūponaṃ vada taṃ rāśiṃ E67e
rūponā lambam ācakṣva E51d
laghvor ghāto yaḥ prakṛtyā vinighnaḥ 43b
laghvyā hṛtāyās tu padaṃ mahatyāḥ 14a
labdhaṃ kiṃ mūlam ācakṣva E45d
labdhāḥ karaṇyo yadi yogajāḥ syuḥ 17b
labdhiḥ śuddhau tu varjitā 33d
labdhvāvabodhakalikāṃ tata eva cakre 95c
liptāgram asmāc ca kalā lavāgram 38b
vajrābhyāsau jyeṣṭhalaghvos tadaikyaṃ 42a
vada taṃ bījamadhye 'si E100c
vadhaṃ pracakṣvāśu vipañcarūpe E12c
vadhādau viyat khasya khaṃ khena ghāte 5c
vadhe tu tadvargaghanādayaḥ syus 9a
vanāntarāle plavagāṣṭabhāgaḥ E68a
vamāgrakābhyāṃ divasā ravīndvoḥ 38d (avamā-)
varga eva nigadyatām E34d
vargaḥ saikaḥ kṛtiḥ sakhe E28d
vargaḥ syād vada ced vetsi E35c
vargacchinne guṇe hrasvaṃ 53c
vargaprakṛtyāparapakṣamūlaṃ 71a
vargaprakṛtyā viṣayo na cet syāt 71c
vargaprakṛtyā viṣayo yathā syāt 72c
vargaprakṛtyoktavad eva mūle 78b
vargayogasamaḥ sa syād 62c
vargayogasya yad rāśyor 63a
vargayogo guṇo na cet 50d
vargayogo yayor ghanaḥ E92b
vargavargo 'yutaṃ bhavet E67d
vargāder yo haras tena 87a
⟨vargādau khaṃ khabhājito rāśiḥ/⟩ Q4b
vargādyaṃ cet tulyaśuddhau kṛtāyāṃ 70a

veṇvor ajñātamadhyabhūmikayoḥ E60b
vetsi bījakriyāṃ yadi E67f
vyaktaṃ mānaṃ jāyate 'vyaktarāśeḥ 57d
vyaktapakṣasya cen mūlam Q6a
vyaktasya kṛtsnasya tad ekabījam 1c
vyaktasya pakṣasya padaṃ yadi syāt 61b
vyaktasya mūlasya samakriyaivam 60a
vyaktānāṃ kalpanā samīkaraṇam Q11b (avyaktānāṃ)
vyakte yad uktaṃ gaṇite tad atra 9d
vyaktoktakhaṇḍaguṇanāvidhir evam atra 10d
vyastaṃ ca saṃśodhya vadāśu śeṣam E2b
vyastaṃ syād ṛṇabhājake Q0d
vyastaṃ svarṇaṃ kalpayitvā ca vidvan E8d
vyastaḥ prakṛtitaś cyute 48b
vyāptiṃ darśayituṃ kvacit 97d
vyekasya gacchasya dalaṃ kilādir E63a
śataṃ hataṃ yena yutaṃ navatyā E22a
śatena śatam ānaya E79b
śalyaṃ ṣaḍbhir atheṣubhis tribhir api chatraṃ dhvajaṃ kārmukaṃ E62c
śāstravistāravāridhiḥ 99b
śuddhaṃ bhāgaṃ prayacchanti E24c
śuddhim eti guṇakaṃ vadāśu tam E21d
śuddhim eti tam ācakṣva E105c
śudhyati so 'pi dvirūpapadaguṇitaḥ 88b
śūnyasya vargaṃ vada me padaṃ ca E5d
śūnye guṇake jāte Q5a
śeṣaṃ tataḥ kṣepakam uktavac ca 79c
śeṣavidhinā na yadi tāḥ 25c
śeṣas tayoḥ syād apavartanaṃ saḥ 27b
śeṣasya rūpāṇi yutonitāni 19d
śeṣāḥ karaṇyo yadi santi varge 20d
śeṣāt tyajed rūpapadaṃ gṛhītvā 12c
śeṣāvyaktenoddhared rūpaśeṣaṃ 57c
ṣaṭkapañcakayor iva E102d
ṣaṭpañcakatridvikasammitānāṃ E13c
ṣaṭpañcāśad vadhas tathā E76b
ṣaṭśatī saptabhiḥ kṣuṇṇā E76c
ṣaḍaṣṭaśatakāḥ E88a
ṣaḍbhaktaḥ pañcāgraḥ E80a
ṣaḍbhir ūno ghanaḥ kasya E104a
ṣaṣṭiḥ karaṇītrayaṃ kṛtau yatra E18b

III.6 Index to Words

In this index, compounds are listed under each member. The word order in a compound is indicated by hyphens. Thus, a compound 'a-b' is listed twice: item a with sub-item -b and item b with sub-item a-; a compound 'a-b-c' is listed three times: item a with sub-item -b and sub-sub-item -c (item a with sub-item -bc if the compound 'a-b' does not occur), item b with sub-item a- and sub-sub-item -c (or item b with sub-item -c and sub-sub-item a- if b is more strongly connected with c than with a), and item c with sub-item b- and sub-sub-item a- (or item c with sub-item ab- if the combination 'b-c' exclusively makes a compound with a in the BG). When the compound has a fourth member (d), it is coupled with a or c as the case might be or, otherwise, it is indicated immediately after the reference number (n): 'n(d-)' for 'd-a-b-c' and 'n(-d)' for 'a-b-c-d.' It should be noted that a concept in Sanskrit texts is sometimes expressed by a compound but sometimes by the separated members of that compound. For example, 'the sum of two squares' can be expressed either as *varga-yogaḥ* or as *vargayor yogaḥ*. In the former case, the compound is listed under both *varga* and *yoga*, while in the latter case simply each word is indexed. Those compounds which mean arithmetical operations involving particular numbers such as *rūpa-yuta* ('increased by unity'), *dvy-ūna* ('decreased by two'), *tri-guṇita* ('multiplied by three'), *catur-hṛta* ('divided by four'), *pañca-agraka* ('having the remainder five'), etc. are excluded: in these cases, each member is listed individually. So also are simple *dvandva* compounds. Conjugated forms of verbs are listed under their root forms. For the order of the Indian letters see Appendix 3.

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III.7 Concordance of Verse Numbers

For the abbreviations, A, M, G, T, P, J, F, and C and the notation, see I.1, I.2, and I.3.

Addition to the notation:

n.n. = the verse occurs but no serial number is given to it.

The following abbreviations are used for the names of the meters.

Anu = Anuṣṭubh
Ārya = Āryā
Indr = Indravajrā
Udg = Udgīti
Upag = Upagīti
Upaj = Upajātikā
Gīt = Gīti
Drut = Drutavilambita
Bhuj = Bhujaṅgaprayāta
Mand = Mandākrāntā
Māl = Mālinī
Rath = Rathoddhatā
Vaṃś = Vaṃśastha(-vila)
Vas = Vasantatilakā
Śār = Śārdūlavikrīḍita (also called Siṃhoddhatā or Siṃhonnatā)
Śāl = Śālinī
Siṃh = Siṃhoddhatā/Siṃhonnatā

BG	Meter	A	M	G	T	P	J	F	C	Notes
1. dhanarṇa-ṣaḍvidha										
1	Upaj	1	1	1	1	1	1	1	1	
2	Śāl	2	2	2	2	2	2	2	2	
3ab	Upaj 1/2	⟨1⟩	⟨1⟩	⟨3⟩	⟨3⟩	3	3ab	3	3	
E1	Upaj	1	1	1	1	4	3cd–4ab	4	4	
E1p′	prose				n.n.	5	(n.n.)	(n.n.)		Opening passage of E1p cited by Kṛṣṇa (in TP) and by Sūryadāsa (fragmentarily in JF).
E1p″	prose				n.n.	6	∅	∅		Last sentence of E1p cited by Kṛṣṇa (in TP).
3cd	Upaj 1/2	1	1	3	3	7	4cd	5	5	
E2ab	Upaj 1/2	⟨2⟩	⟨1⟩	⟨2⟩	⟨2⟩	8	5ab	6	6	
4a	Bhuj 1/4	⟨2⟩	⟨2⟩	⟨4⟩	⟨4⟩	9	5c	7	7	
E2cd	Upaj 1/2	2	1	2	2	10	6ab	8	8	
4b	Bhuj 1/4	⟨2⟩	⟨2⟩	⟨4⟩	⟨4⟩	11	5d	7	7	Displayed together with 4a in AMJF.
E3	Upaj	3	1	3	3	12	6cd–7ab	9	9	
4cd	Bhuj 1/2	2	2	4	4	13	7cd	10	10	
E4ab	Upaj 1/2	⟨4⟩	⟨1⟩	4	4	14	8ab	11ab	11	
E4cd	Upaj 1/2	4	⟨1⟩	4	4	15	8cd	11cd	11	
2. kha-ṣaḍvidha										
5ab	Bhuj 1/2	⟨3⟩	⟨3⟩	⟨5⟩	⟨5⟩	16	9ab	12	12	
E5ab	Indr 1/2	⟨5⟩	⟨1⟩	⟨5⟩	⟨5⟩	17	9cd	13	13	
5cd	Bhuj 1/2	3	3	5	5	18	10ab	14	14	
E5cd	Indr 1/2	5	⟨1⟩	5	5	19	10cd	15	15	
6	Upaj	4	4	6	6	20	11	16	16	Numbered as an example in T and as a rule in AMG.

BG	Meter	A	M	G	T	P	J	F	C	Notes
3. avyakta-ṣaḍvidha										
3.1. avyakta-ṣaḍvidha										
7	Śāl	5	5	7	6	21	12	17	17	
8ab	Upaj 1/2	⟨6⟩	⟨6⟩	⟨8⟩	⟨7⟩	22	13ab	18	18	
E6	Bhuj	6	1	7	7	23	13cd–14ab	19	19	
E7ab	Bhuj 1/2	⟨7⟩	⟨2⟩	⟨8⟩	8	24	14cd	20	20	
E7cd	Bhuj 1/2	7	2	8	8	25	15ab	20	20	
8cd	Upaj 1/2	6	6	8	7	26	15cd	21	21	
9	Upaj	7	7	9	8	26	16	21	21	
10	Vas	8	8	10	9	27	17	22–23	22	
E8	Śāl	8	1	9	9	28	18	24	23	
11	Śāl	9	9	11	10	29	19	25	24	
E8ef	Śāl 1/2	⟨9⟩	⟨1⟩	9	n.n.	30	20ab	26	25	
12	Upaj	10	10	12	11	31	20cd–21ab	27	26	
3.2. anekavarṇa-ṣaḍvidha										
E9	Āry	$10\frac{1}{2}$	1	10	10	32	21cd–22ab	28	27	
E10	Mand	11	1	11	11	33	22cd–23ab	29	28	
4. karaṇī-ṣaḍvidha										
13	Indr	11	11	13	12	34	23cd–24ab	30	29	
14	Upaj	12	⟨12⟩	14	13	34	24cd–25ab	31	30	
E11	Upaj	12	⟨1⟩	12	12	35	25cd–26ab	32	31	
E12	Upaj	13	⟨2⟩	13	13	36	26cd–27ab	33	32	
15	Upaj	13	13	15	14	37	27cd–28ab	34	33	

BG	Meter	A	M	G	T	P	J	F	C	Notes
16	Upaj	14	14	16	15	38	28cd–29ab	35	34	
17	Upaj	15	15	17	16	38	29cd–30ab	36	35	
18	Vas	16	16	18	17	39	30cd–31ab	37	36	
E13	Upaj	14	⟨1⟩	14	18	40	31cd–32ab	38	37	
E14ab	Upaj 1/2	$14\frac{1}{2}$	⟨2⟩	⟨15⟩	n.n.	40	32cd	38	38	
19	Upaj	17	17	19	19	41	33	39	39	
20	Upaj	18	18	20	20	41	34	40	40	
21	Upaj	19	19	21	21	42	35	41	41	
E14cd	Upaj 1/2	15	⟨1⟩	15	22	43	36ab	42	42	
E15	Upaj	16	⟨2⟩	16	23	43	36cd–37ab	43	43	
22	Gīt	20	20	22	21	44	37cd–38ab	44	44	
23	Gīt	21	21	23	22	44	38cd–39ab	45	45	
24	Ārya	22	22	24	23	44	39cd–40ab	46	46	
25	Ārya	23	23	25	24	44	40cd–41ab	47	47	
E16	Ārya	17	1	17	18	45	41cd–42ab	48	48	
E17	Ārya	18	2	18	29	46	42cd–43ab	49	49	
E18	Ārya	19	3	19	19	47	43cd–44ab	50	50	
E19	Upaj	20	4	20	20	48	44cd–45ab	51	51	
E20	Upag	21	5	21	21	49	45cd–46ab	52	52	
5. kuṭṭaka										
26	Śāl	1	1	26	25	50	46cd–47ab	53	53	= L 242
27	Upaj	2	2	27	26	51	47cd–48b	54	54	= L 243
28	Upaj	3	3	28	27	51	48cd–49ab	55	55	= L 244
29	Upaj	4	4	29	28	51	49cd–50ab	56	56	= L 245

30	Upaj	5	5	30	29	52	50cd–51ab	57	57	= L 246
31	Drut	6	6	31	30	53	51cd–52ab	58	58	= L 248
32ab	Anu 1/2	7	7	32	31	54	53cd	60	59	= L 250
32cd	Anu 1/2	7	7	32	31	54	54ab	60	59	
32ef	Anu 1/2	8	8	32	31	55	52cd	59	60	= L 252
33ab	Anu 1/2	8	8	33	32	56	53ab	61	61	= L 252
33cd	Anu 1/2	9	9	33	32	56	54cd	61	61	= L 252
34ab	Anu 1/2	9	9	⟨34⟩	33	57	55ab	62	62	
34cd	Anu 1/2	10	10	⟨34⟩	33	57	55cd	62	62	
35ab	Anu 1/2	10	10	35	34	58	56ab	63	63	= L 254
35cd	Anu 1/2	11	11	35	34	58	56cd	63	63	= L 254
36ab	Upaj 1/2	11	11	36	35	59	57ab	64	64	= L 256
E21	Rath	1	1	22	22	60	57cd–58ab	65	65	= L 247
E22	Upaj	2	2	23	23	61	58cd–59ab	66	66	= L 249
E23	Rath	3	3	2⟨4⟩	24	62	59cd–60ab	67	67	≈ L 251
Q0	Anu	n.n.	n.n.	n.n.	∅	∅	∅	∅	∅	
Q1	Anu 1/2	n.n.	n.n.	n.n.	n.n.	n.n.	n.n.	n.n.	n.n.	= BG 32cd. ‘mandāvabodhārthaṃ mayoktam.’
E24	Anu	10	10	25	25	63	60cd–61ab	68	68	
E25	Anu	11	11	26	26	64	61cd–62ab	69	69	= L 253
E26	Rath	12	12”	26•	27	65	62cd–63ab	70	70	= L 255
36cd	Upaj 1/2	13	10	36	35	66	63cd	71	71	= L 257
37ab	Upaj 1/2	14	11	37	35	66	64ab	71	71	= L 257
37cd	Upaj 1/2	14	11	37	36	67	64cd	72	72	= L 258
38	Upaj	15	12	38	37	67	65	72	72	= L 258
39	Upaj	16	13	39	38	68	66	73	73	= L 259
E27	Upaj	13	1	27	28	69	67	74	74	= L 260. J and F are available up to this verse.

BG	Meter	A	M	G	T	P	J	F	C	Notes
6. varga-prakṛti										
6.1. varga-prakṛti										
40	Śāl	1	1	40	39	70			75	
41	Śāl	2	2	41	40	71			76	
42	Śāl	3	3	42	41	71			77	
43	Śāl	4	4	43	42	71			78	
44	Anu	5	5	44	43	72			79	
45	Anu	6	6	45	44	73			80	
46ab	Anu 1/2	6	6	46	45	73			81	
E28	Anu	1	1	28	26	74			82	
6.2. cakravāla										
46cd	Anu 1/2	1	1	46	45	75			83	
47ab	Anu 1/2	1	1	47	46	75			83	
47cd	Anu 1/2	2	2	47	46	75			84	
48ab	Anu 1/2	2	2	48	47	75			84	
48cd	Anu 1/2	3	3	48	47	75			85	
49ab	Anu 1/2	3	3	49	48	75			85	
49cd	Anu 1/2	4	4	49	48	75			86	
50ab	Anu 1/2	4	4	50	49	75			86	
E29	Vas	1	1	29	30	76			87	
50cd	Anu 1/2	5	5	50	49	77			88	
51ab	Anu 1/2	5	5	51	50	78			88	
51cd	Anu 1/2	6	6	51	50	78			89	
52ab	Anu 1/2	6	6	52	51	78			89	

BG	Meter	A	M	G	T	P	J	F	C	Notes
E30	Anu	2	2	30	31	79			90	
E31	Anu	3	3	⟨31⟩	32	80			91	
52cd	Anu 1/2	7	7	52	51	81			92	
53ab	Anu 1/2	7	7	⟨53⟩	51	81			92	
53cd	Anu 1/2	8	7	⟨53⟩	52	82			93	
E32	Anu 1/2	4	4	n.n.	⟨33⟩	83			94	
54ab	Anu 1/2	8	8	54	53	84			95	
54cd	Anu 1/2	⟨9⟩	8	54	53	84			95	
E33ab	Anu 1/2	4	4	32	34	85			96	
E33cd	Anu 1/2	5	4	32	34	85			96	
E34ab	Anu 1/2	5	5	33	35	86			97	
E34cd	Anu 1/2	6	5	33	35	86			97	
E35ab	Anu 1/2	6	⟨6⟩	34	36	87			98	
E35cd	Anu 1/2	⟨7⟩	⟨6⟩	34	36	87			98	
55	Anu	⟨10⟩	⟨9⟩	55	54	88			99	
7. ekavarṇa-samīkaraṇa										
56	Śāl	1	⟨1⟩	56	55	89			100	
57	Śāl	2	2	57	56	89			101	
58	Śāl	3	3	58	57	89			102	
E36	Upaj	1	1	35	37	90			103	
E37	Upaj	2	2	36	38	91			104	
E38	Śār	3	3	37	39	92			105	
E39	Śār	4	4	38	40	93			106	
E40	Śār	5	5	39	41	94			107	

BG	Meter	A	M	G	T	P	J	F	C	Notes
E41	Śār	6	6	40	42	95			108	= L 55
E42	Āry	7	7	n.n.	43	96			109	‘anyoktam udāharaṇam.’
E43	Āry	8	8	41	44	97			110	
Q2	Anu	n.n.	n.n.	n.n.	∅	∅			n.n.	= GA, praśna 5
E44	Śār	9	9	42	45	98			111	= L 102
E45	Āry	10	10	43	46	99			112	
E46	Vas	11	11	44	47	100			113	
E47	Vaṃś	12	12	45	48	101			114	
E48	Śār	13	13	46	49	102			115	= L 99
E49	Anu	14	14	⟨47⟩	50	103			116	
E50	Anu	15	15	48	59	104			117	L 166 cited in E50p.
E51	Āry	16	16	49	52	105			118	
E52	Anu	17	17	50	53	106			119	
E53	Anu	18	18	51	54	107			120	
E54	Anu	19	19	⟨52⟩	55	108			121	
E55	Anu	20	20	53	56	109			122	
E56	Gīt	21	21	54	57	110			123	
E57	Māl	22	22	55	58	111			124	= L 150
E58	Mand	23	23	⟨56⟩	59	112			125	= L 155
E59	Śār	24	24	57	60	113			126	= L 157
E60	Gīt	25	25	58	61	114			127	= L 162
8. ekavarṇa-madhyamāharaṇa										
59	Indr	1	1	59	58	115			128	
60	Upaj	2	2	60	59	115			129	

BG	Meter	A	M	G	T	P	J	F	C	Notes
61	Upaj	3	3	61	60	115			130	
Q3	Upag/Udg	n.n.	n.n.	n.n.	n.n.	116			131	‘śrīdharācāryasūtram.’
E61	Māl	1	1	62	62	117			132	= L 71
E62	Śār	2	2	⟨63⟩	63	118			133	= L 70
E63	Upaj	3	3	64	64	119			134	L121 cited in E63p.
E64	Anu	4	4	65	65	120			135	L 46ab cited in E64p1.
E65	Anu	5	5	66	66	121			136	
Q4	Āry 1/2	n.n.	n.n.	n.n.	∅	∅			∅	= L 45cd
Q5	Āry	n.n.	n.n.	n.n.	∅	∅			∅	= L 46
E66	Āry	6	6	67	67	122			137	
E67ab	Anu 1/2	7	7	68	68	123			138	
E67cdef	Anu	7	7	69	68	123			138	
E68	Upaj	8	8	70	69	124			139	
E69	Anu	9	9	71	70	125			140	
E70	Anu	10	10	72	71	125			141	
Q6	Anu	n.n.	n.n.	n.n.	∅	∅			142	‘padmanābhabīje.’
E71	Anu	11	11	73	72	126			143	
E72	Anu	12	12	74	73	126			144	
Q7	Anu	n.n.	n.n.	n.n.	n.n.	127			145	‘ādyaparibhāṣā.’
E73	Anu	13	13	75	74	128			146	
62	Anu	14	14	64	61	129			147	
E74	Anu	15	15	76	75	130			148	L 56a cited in E74p.
63	Anu	16	16	65	62	131			149	
64	Anu	17	17	66	63	131			150	
E75	Anu	18	18	77	76	132			151	L 56a cited in E75p.

BG	Meter	A	M	G	T	P	J	F	C	Notes
E76	Anu	19	19	78	77	133			152	L 56a cited in E76p1.
9. anekavarṇa-samīkaraṇa										
65	Śāl	1	1	68	64	134			153	
66	Upaj	2	2	69	65	134			154	
67	Upaj	3	3	70	66	134			155	
68	Śāl 1/2	n.n.	n.n.	n.n.	n.n.	134			156	
Q8	Śār	1	1	n.n.	n.n.	135			n.n.	= BG E38 (only part of the 1st pāda is quoted)
Q9	Śār	2	2	n.n.	n.n.	136			n.n.	= BG E39 (only part of the 1st pāda is quoted)
E77	Śār	3	3	76	78	137			157	
E78	Anu	4	4	n.n.	79	138			158	
E79	Anu	5	5	n.n.	80	138			159	
E80	Āry	6	6	80	81	139			160	
E81	Āry	7	7	81	82	140			161	
E82	Anu	8	8	82	83	141			162	
E83	Śār	9	9	⟨83⟩	84	142			163	
E84	Anu	10	10	⟨84⟩	85	143			164	
E85	Anu	11	11	85	86	144			165	
E86	Anu	12	12	86	87	145			166	
69	Anu	n.n.	n.n.	n.n.	1	146			167	
E87	Anu	13	13	n.n.	88	147			168	
Q10	Anu	n.n.	n.n.	n.n.	∅	∅			169	‘tathā coktam.’
E88	Anu 3/2	14	14	n.n.	89	148			170	‘ādyodāharaṇam.’
Q11	Āry	∅	n.n.	n.n.	∅	∅			n.n.	‘tathā coktam.’

BG	Meter	A	M	G	T	P	J	F	C	Notes
10. anekavarṇa-madhyamāharaṇa										
70	Śāl 1/2	1	1	68	67	149			171	
71ab	Upaj 1/2	1	1	69	68	149			172	
71cd	Upaj 1/2	2	2	69	68	149			172	
72ab	Upaj 1/2	2	2	70	69	149			173	
72cd	Upaj 1/2	3	3	70	69	149			173	
73	Vas	3	3	71	70	150			174	
74	Upaj	4	4	72	71	151			175	
75	Siṃh	5	5	73	72	151			176	
E89	Anu	1	1	88	70	152			177	
E90	Anu	2	2	n.n.	71	153			178	‘ādyodāharaṇam.’
76	Upaj	6	6	74	73	154			179	
77ab	Upaj 1/2	⟨7⟩	⟨7⟩	⟨75⟩	⟨74⟩	154			180	
E91	Anu	1	1	89	72	155			181	
E92	Anu	2	2	90	73	156			182	
77cd	Upaj 1/2	7	⟨7⟩	75	74	157			183	
78	Upaj	8	8	76	75	157			183	
E93	Anu	1	1	91	74	158			184	
79	Upaj	9	9	77	75	159			185	
80	Upaj	10	10	78	77	162			186	
E94	Anu	1	1	92	75	160			187	
E95	Anu	2	2	90	76	161			188	
E96	Anu	3	3	91	97	163			189	
E97	Śār	5	5	n.n.	98	164			190	‘kasyāpy udāharaṇam.’
81	Anu	n.n.	n.n.	70	78	165			n.n.	

BG	Meter	A	M	G	T	P	J	F	C	Notes
82	Upaj	11	11	83	79	166			191	
83	Indr	12	12	84	80	166			192	
E98	Śār	6	6	95	99	167			193	
E99	Ār̄y	4	4*	n.n.	100	168			194	‘ādyodāharaṇam.’ L 58a cited in E99p3.
84	Anu	13	13	n.n.	81	169			195	
85	Anu	14	14	83	82	169			196	
E100	Anu	1	1	96	101	170			197	
E101	Anu	2	2	n.n.	102	171			198	‘ādyodāharaṇam.’
E102	Anu	3	3	97	103	172			199	
86	Anu	n.n.	n.n.	84	83	173			200	
87	Anu	15	15	85	84	174			201	
87ef	Anu 1/2	n.n.	n.n.	n.n.	n.n.	174			201	
E103	Anu	1	1	⟨98⟩	104	175			202	
88	Ār̄y	16	16	n.n.	85	176			203	‘pūrvair upāyaḥ paṭhitaḥ.’
89	Gīt	17	17	n.n.	86	177			204	cont.
90	Gīt	18	18	n.n.	87	178			205	cont.
E104	Anu	2	2	99	105	179			206	
E105	Anu	3	3	100	106	180			207	
11. bhāvita										
91	Upaj	1	1	86	88	181			208	
E106	Anu	1	1	⟨101⟩	107	182			209	
E107	Anu	2	2	⟨102⟩	108	183			210	
E108	Śār	4	4	103	109	184			211	
92ab	Anu 1/2	2	2	88	89	185			212	

BG	Meter	A	M	G	T	P	J	F	C	Notes
92cd	Anu 1/2	2	2	88	89	185			213	
92ef	Anu 1/2	3	3	88	90	185			213	
93ab	Anu 1/2	3	3	89	90	185			214	
93cd	Anu 1/2	n.n.	n.n.	89	91	185			214	
Q12	Anu	n.n.	n.n.	n.n.	n.n.	n.n.			n.n.	= BG E106. T(K) and P(K) cite E106a.
94	Anu	n.n.	n.n.	90	∅	∅			n.n.	
E109	Anu	1	1	n.n.	110	186			215	
E110	Anu	2	2	n.n.	111	187			216	
Q13	Śār 1/2	n.n.	n.n.	n.n.	n.n.	n.n.			n.n.	= BG E108ab. T(K) and P(K) cite part of E108a.
Q14	Śār 1/4	n.n.	n.n.	n.n.	∅	∅			n.n.	= BG E108c
12. grantha-samāpti										
95	Vas	n.n.	n.n.	91	92	1			217	
96	Indr	n.n.	n.n.	92	93	2			218	
97ab	Anu 1/2	n.n.	n.n.	93	94	3			219	
97cd	Anu 1/2	n.n.	n.n.	93	94	4			219	
98ab	Anu 1/2	n.n.	n.n.	⟨94⟩	95	4			220	
98cd	Anu 1/2	n.n.	n.n.	⟨94⟩	95	5			220	
99	Anu	n.n.	n.n.	⟨95⟩	96	6			221	
100	Anu	n.n.	n.n.	96	97	7			222	
101	Anu	n.n.	n.n.	⟨97⟩	98	8			223	= CV 14.5
Q15	Anu	n.n.	n.n.	∅	∅	∅			224	= GA, praśna 3
102	Māl	n.n.	n.n.	98	99	9			225	

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