Glossary of my translation of Bhâskara's commentary to the AaryabhaTiiya

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Chapter 1

Glossary

The words are given in the Sanskrit order. Double quotes indicate the technical translation chosen, as opposed to the literal translation of a word or expression. Are noted as synonyms, those that are given as such by Bhāskara[1].

A

Akṣa is the latitude.

> *Akṣajyā* is the Rsine of the latitude.

Akṣepa Non-additive. Said of two *karaṇīs* that cannot be summed.

Agra remainder. In one instance of far-fetched interpretation (BAB.2.32-33), Bhāskara understands this word used in Āryabhaṭa's verse as meaning "a number".

Adhikāgrabhāgahāra or adhikāgraccheda Technical term of the *kuṭṭakāra* procedure.

> It is "the divisor of the greater remainder" in a pulveriser with remainder (*sāgrakuṭṭakāra*) procedure. It is "the divisor which is a large number" in the pulveriser without remainder (*niragrakuṭṭaka*) procedure.

Anuloma Same direction. Direct.

> *Anulomagati* is a direct motion, as opposed to *vilomagati*, a retrograde motion. *Anulomacārin* has the same meaning. *Anulomavivara* is the distance of ⟨two bodies moving in⟩ the same direction.

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[1] Please see in the section "Conventions of translations" in *Introducing the Translation*, the paragraph on synonyms, for a short discussion of this topic.

Anta Last term of a series.

Antara distance, difference.

> *Deśāntara*, lit. difference of spots, is the "longitude". *Sthānāntara* is a different place. In common sanskrit it means particular, as in *upāyāntara* (a particular method) or different, as in *ābhādhāntara*: the different sections (of the base).

Antarāla Space between. An interval.

Antya Last.

Apacaya Decrease; subtractive (quantity), subtrahend.

Apanayed One should subtract.

Apavartita, apavartya reduced (by a common factor).

Aparvartana Division. reducer (as one who does the action described as *apavartita*).

> Given as a synonym of *bhāga* (division, part) in BAB.2.4.

apa-VṚT to reduce (by a common factor), to divide.

Abhyasta Multiplied.

Abhyāsa Product. The product *of* two or more quantities, as opposed to the multiplication of a quantity *by* another.

Aṃśa part. numerator of a fraction. A fraction. When a fractional number is stated, the denominator is marked with *aṃśa*. Also used as a substitute for *bhāga* with the meaning of "degree".

Ardha Half. Increase in commercial problems.
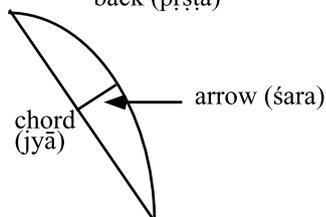
Ardhita Halved.

Avagāhya, avagāha Penetration. Lit. "having plunged". Segment of the diameter of a circle. Also used for the arrow (*śara*), of a bow-field (illustrated in Figure 1.1)

Avayava part.

Avarga See *varga*.

Figure 1.1: A bow-field

Avalambaka perpendicular. Plumb-line. Rsine of the colatitude.

> The Rsine of the colatitude is proportional, on an equinoctial day, to the perpendicular formed by the body of a gnomon.

Avasāna distance. Literally it means a boundary. Only used in BAB.2.16. to refer to the distance between a gnomon and a source of light.

Aśeṣagaṇita mathematics as a whole, i.e. mathematics seen as a global subject.

Aśra or Aśri side, edge. Used in the names of planes and solids.

> A *caturaśrakṣetra* is a quadrilateral field, and a *dvādaśāśri* "a twelve edged ⟨solid⟩", which is one of the names, here, for a cube. However in BAB.2.14. a *caturaśra* is used to qualify a solid- this may be another name for a cube, or that of a prism.

> A *tryaśrakṣetra* is a "trilateral field" and a *ṣaḍaśri* is "a six-edged solid" , which is the name, here, of an equilateral pyramid with a triangular base. However in BAB.2.14, a *tryaśra* is used to qualify a solid, maybe a pyramid with a triangular base.

Asata Incorrect ⟨value⟩. Companion term of *sata* (correct ⟨value⟩).

Ahargaṇa lit. group of days, is the number of days elapsed since a given epoch, usually the *Kaliyuga*.

Ā

Ācārya Teacher, learned one. It is often attached, as an honorific suffix, to the name of a person. We have left it untranslated in the last case, since even in India today a person, referred to in English, may be called "*ācārya*".

Ādi the first term of a series.

Ānayana To compute, computation.

> Mostly used in the introductive sentence, preceding the quotation of a verse of the *Āryabhaṭīya* about to be commented, which gives the aim of the procedure which will be treated.

Ābhādhā Technical term naming a segment of the base delimited by a perpendicular.

Āyata Elongated. length. *Āyatacaturaśrakṣetra*, lit. elongated quadrilateral field is always a rectangular field.

Āyāma length.

> In a trapezium, it is one of the names of the height. length in a rectangle as opposed to *vistāra* which then means width.

Ārya This is the meter in which the three last quarters of the *Āryabhaṭīya*, including the *gaṇitapāda*, are written.

Ālekhya Lit. written, painted. A "drawing".

Āsanna Approximate, approximation. Lit. close to. Companion term of *sūkṣma*, accurate.

> However, *sūkṣmasya āsanna* is the approximation of an accurate ⟨value⟩. *Vyāvahārikasya āsanna* is the approximation of a practical value. The first being of better quality then the latter.

Āhniko bhogaḥ Daily passing. This is the name of the sum of the daily motions of two planets.

I

Icchā Desire.

> *Icchārāśi* is the "desire quantity" in a Rule of Three. *Icchāphala* is the "fruit of the desire" in a Rule of Three.

Iṣṭa Desired. Sometimes close to the meaning of optional. In computation with series, *iṣṭa* is the desired number of terms.

U

Ucchrāya height. Used when relating the geometrical cube to the square it is derived from, and when defining a triangular based pyramid.

Figure 1.2: A tusk-field
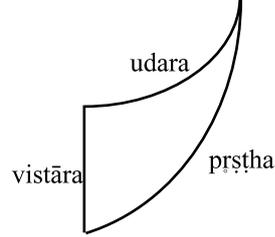
Utkramajyā is the R-versed sine, i.e R-Rsin. See the Annex to BAB.2.12.

Uttara The common difference in arithmetical series. Increase.

Udara Belly. Used to characterize one of the sides of a tusk-field, see Figure œ1.2.

Uddeśaka example.

Uddeśana example.

Udvartanā Multiplication. Given as a synonym of *saṃvarga* in BAB.2.3ab.

Upacaya Increase. Additive (quantity).

Upaciti Lit. accumulation. Is the name of the series of (the progressive sum of) natural numbers.

Upapatti proof.

Opposed to tradition (*āgama*) in BAB.2.10.

Uparirāśi See *rāśi*.
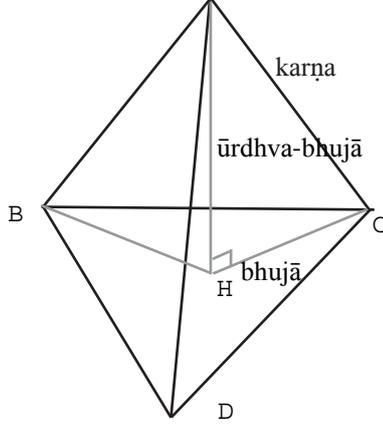
Upalakṣita characterized.

Upāya method.

Ū

Ūṇa Decreased. Subtractive ⟨quantity⟩.

Ūnāgraccheda or ūnāgrabhāgahāra is "the divisor for the smaller remainder" in a pulveriser with remainder and "the divisor which is a small number" in a pulveriser without remainder procedure.

Figure 1.3: Right-angled triangle in a *śṛṅgāta* field.

Ūrdhvabhujā Upward side. Used for the perpendicular issued from one vertex on to the triangular base in a *śṛṅgātaka* field, as illustrated in Figure œ1.3.

Ṛ

Ṛkṣa sign. 1/12th of the circumference of a circle.

Ṛju Vertical.

> *Ṛjuta* is verticality. *Ṛjusthiti* is a steady vertical.

Ṛṇa Debt. When opposed to *dhana* (wealth) it is a "subtractive ⟨quantity⟩".

E

Ekatra kṛtvā summed. lit. having made in one place; this may refer to the fact that the two summed quantities were erased from the working surface, and replaced by one quantity, their sum, that occupied thereafter only "one place" on the working surface.

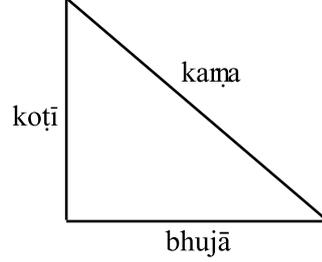**Ekī bhavā, ekī kṛtya** sum. lit. the state of becoming one, having made into one; this may refer to the fact that the two summed quantities where erased from the working surface, and replaced by one quantity, their sum. See *ekatrakṛtvā*.

Ka

Kakṣyā orbit of a planet.

Figure 1.4: Right-angled triangle

Karaṇa procedure. Name given to the part of an example which exposes its resolution.

Pratilomakaraṇa is a reversed procedure.

Karaṇika Which belongs to *karaṇīs* which measures the *karaṇī* (of a given quantity).

Karaṇika is derived from the word *karaṇī*, to which the suffix *-ka* is added, followed by a diminution of the long *ī*.

Karaṇī Usually considered as a "surd", the expression "the *karaṇīs* of a" may be translated as meaning : "that whose square is a", or $\sqrt{a}$. However, it seems to be a geometrical concept. It may be a specific way of considering the square of the measure of a geometrical object synonym of *varga* in BAB.2.3ab.

karaṇīparikarman the geometrical operation of constructing the square having the hypotenuse for side: its area is equal to the sum of the two other sides of a right-angle triangle, as well as the numerical squaring of the length of the hypotenuse as the sum of the squares of the two other sides.

Karidantakṣetra A (two dimensional) tusk-field. see Figure œ1.2.

Karkaṭa, karkaṭaka Lit., a crab; it is the name of " a pair of compasses".

Karṇa hypotenuse. diagonal. In customary sanskrit it is an "ear". *Karṇa* is used in the traditional enumeration of the sides of a right-angle triangle: *karṇabhujākoṭi*. See Figure 1.4.

We will use the literal translation when it is used to describe the side of a field or a solid, where no right-angle triangle is immediately involved. But usually it names a segment of a geometrical figure, in which Ab.2.17

(i.e. the so called "Pythagorean Theorem") may be applied; when this is the case, it becomes then the hypotenuse of a right-angle triangle, and we have translated it accordingly. See for instance Figure 1.3.

In any triangle, the sides for a given base are also called *karṇa*, which means "ears". These may also be named by synonyms of this term as *śravaṇa* and so forth.

Karman computation, operation.

gaṇitakarman is a mathematical operation. *viparīta-, pratiloma-* and *vilomakarman* mean a reversed operation.

Kārikā A verse.

Kāla time. *Kālakrīyā,* " time reckoning" is the third chapter of the *Āryabhaṭīya*.

yogakāla is the meeting time (of two moving bodies).Ť

Kāṣṭha A unit arc. This is a terminology particular to Bhāskara. It glosses Āryabhaṭa's use of *capa* in Ab.2.11. but can be found in the *Mahābhāskarīya* as well[2].

Kuṭṭākāra or Kuṭṭaka Pulveriser. Name of the procedure described in verses 32-33 of the Chapter on mathematics of the *Āryabhaṭīya*.

Sāgrakuṭṭākāra is a pulveriser with remainder. *Niragrakuṭṭāka* is a pulveriser without remainder.

Velākuṭṭākāra is the time pulveriser.

Kṛti Square. Given as a synonym of *varga* in BAB.2.3ab.

Kendra Center.

Koṭī or koṭi The upright-side.

It is usually one of the sides of a right-angle triangle, the other one is called *bhujā*, and the hypotenuse *karṇa*. See Figure 1.4. This word is also used to name the vertical edge of a gnomon.

Krama method.

Kriyyā method.

Kṣaya Decrease.

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[2]See Shukla's remark in [Shukla 1976; Intro, p.xlii].

Kṣetra A field, and by extension a geometrical figure.

> It sometimes refers to the *surface* delimited by a number of sides or a line. It sometimes refers only to the *set of lines and inner segments* that draw the field, and not to the delimited surface.

> *Kṣetragaṇita* is the mathematics of fields or computations with fields.

Kṣepa Additive ⟨quantity⟩

Ga

Gaccha The number of terms in a series. In one instance, BAB.2.20, it is also interpreted as a term of the series. This would be rather Āryabhaṭa's understanding of the word, rather than Bhāskara's. In BAB.2.29. it is a term of a set: *pada* and *paryavasāna* are given as synonyms of this word.

Gaṇaka Mathematician? A literal translation would be computer (in the sense of someone who computes), we have translated it by "calculator".

gaṇita mathematics. computation. By extension *gaṇita* sometimes names the result of any computation, and therefore means sometimes: area, sum, quantity.

> *Aśeṣagaṇita* lit. mathematics without remainder, is "mathematics as a whole" which englobes both *samānyagaṇita*, general mathematics, and its counterpart, *viśeṣagaṇita*, "specific mathematics".

> *gaṇitakarman* is a mathematical operation.

> *Średdhīgaṇita* is the sum of a series.

> *Laukikagaṇita* is wordly computations.

Gata lit. gone, "exponention"; i.e. the raising to any power of a quantity. The word with this technical meaning is only used in BAB.2.introduction.

> A *dvigata*, a double-*gata*, is a square (*varga*); a *trigata* is a cube (*ghana*). By the same token, *gatasya mūla* or *gatamūla*, lit. the root of a *gata*, is a root extraction from any power.

Gāthā Synonym of *ārya* as a name of a verse-meter.

Guṇa A multiplier. Occasionally translated as "times".

Guṇakāra Multiplier.

Guṇanā Multiplication (of two different quantities, counterpart of the term *gata*); however it is given as a synonym of *saṃvarga* in BAB.2.3ab.

Guṇita Multiplied. This word is given as synonym of *hata* in BAB.2.7.ab.

Guṇya Multiplicand.

Gulikā bead. Name of the coefficient of the unknown quantity in first order equations.

Gūha sign. 1/12th of the circumference of a circle.

Gola, golaka sphere.

> *Golapāda* is the name of the fourth chapter of the *Āryabhaṭīya*. *Ghanagola* is a circular solid.

Graha A planet. *Grahacāra* is the "motion of planets". *Grahagaṇita* is the "mathematics of planets/planetary computations".

Grāsa Lit. mouthful. Segment of the diameter of two intersecting circles. Name of the part of the sun eclipsed by the moon, or of the part of the moon eclipsed by the shadow of the earth (i.e. the part of the moon eaten by *Rāhu*).

Gha

Ghana cube. solid. A cube ⟨place⟩, i.e. in the decimal place-value notation it is a place whose power of ten is a cube. Conversely, a non-cube ⟨place⟩ is a place whose power of ten is not a cube.

> *Ghanaphala* is the volume. *Ghanamūla* is the cube-root.

> *Ghanagola* is a circular solid.

> *Citighana* is a solid ⟨made of⟩ a pile. This is the name used by Āryabaṭa for the series of the progressive sums of natural numbers (i.e. the sum of $1, 1 + 2, 1 + 2 + 3, \ldots, 1 + 2 + 3 + \ldots + i, \ldots$).
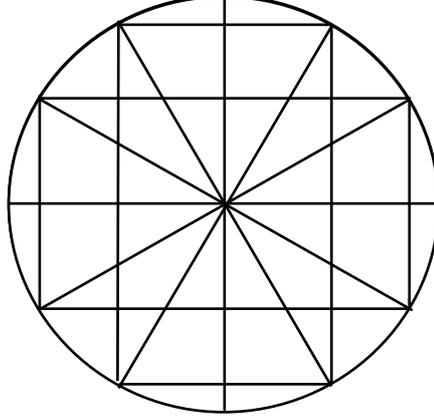
Ghāta Multiplication. Given as a synonym of *saṃvarga* in BAB.2.3ab.

Ghna Multiplier.

Ca

Cakra A revolution. In customary sanskrit it is a circle.

Figure 1.5: The diagram in BAB.2.11

Caturaśrakṣetra Quadrilateral field. Sometimes the term field (*kṣetra*) is omitted in which case we translate the compound as 'quadrilateral'. means literally: " a field with four sides".

Cāpa A unit arc.

Citi pile. Used in the geometrical description of series.

Cha

Chāya shadow. Rsine of the zenith distance.

It is the name of a specific field of mathematics, related to computations using the data given by a gnomon. It is the length of the midday shadow cast by a gnomon. It is proportionate to the Rsine of zenith distance which thus sometimes bears the same name.

Chindyāt One should divide.

Cheda part. denominator of a fraction. divisor. In BAB.2.12. once used as meaning "partial (half-chord)".

Adhikāgraccheda is the divisor of the greater remainder. *Ūnāgraccheda* is the divisor of the smaller remainder.

Chedyaka A diagram. In this commentary the word is only used in reference to a specific diagram, whose construction is described in BAB.2.11., with which the measure of half-chords (*ardhajyā*) or Rsinuses (R times the sinus) is derived. See Figure œ1.5.

Ja

Jīvā A chord.

Jyā chord.

Ardhajyā is a half-chord. Half the chord subtending the arc 2α $(\frac{crd(2\alpha)}{2})$ is called the half-chord of α. This is what we call $Rsin\alpha$, see Figure œ1.6 and the Annex to BAB.2.11.

By extension $jy\bar{a}$ is sometimes the half-chord.

Jyotpatti is a production of ⟨half⟩-chords.

Jyāvibhāga is a partition of chords. In BAB.2.11, this refers to the subdivision of the perimeter of the cercle into equal arcs and to the interior fields drawn inside the circle, as illustrated in Figure œ1.5. In BAB.2.12., this refers, along with other expressions as "*khaṇḍitaṃ . . . ardhaṃ*" (the expression used by Āryabhaṭa in Ab.2.12) and "*chinnaṃ . . . ardhaṃ*" (the expression used by Bhāskara), both meaning "sectioned half⟨-chord⟩", to the difference of two successive half-chords. The difference of two half-chords appears as a segment of the biggest half-chord. See Figure 1.7.

Akṣajyā is the Rsine of the latitude. *Natajyā* is the Rsine of the zenith distance.

Ta

Tatparās Seconds.

Tithi Lunar day.

Tulya Equal.

Trairāśika A Rule of Three.

Da

Dalita Halved.

Dairghya length. Given as a synonym of $\bar{a}y\bar{a}ma$ in BAB.2.8.

Dik (Cardinal) dirrection. Also used in a figurative sense.
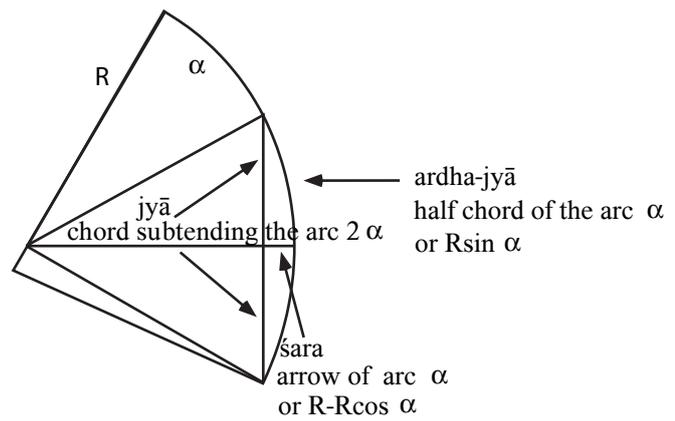
Figure 1.6: chord and Half-chord

Figure 1.7: The difference of two half-chords
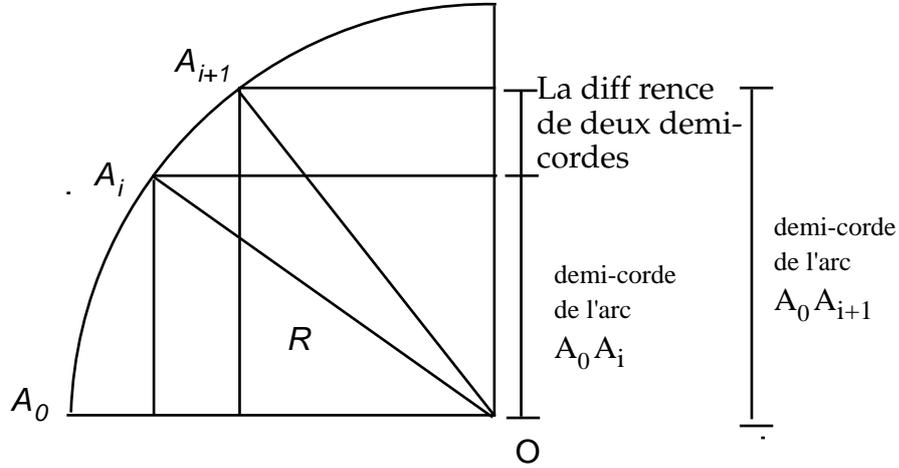
Dina A day.

> *Dinarāśi*, lit. the amount of days, is the number of days elapsed in the *Kaliyuga. Dinagana*, lit. the group of days, has the same meaning.

Divicara A planet. lit. roaming the sky.

Dravya object. sum.

Dvicchedāgra ⟨A quantity that has such⟩ remainders for two divisors. Technical term denoting the number to be found in a "pulveriser with remainder" process.

Dha

Dhatrī lit. earth, the "base" of a triangle, or the "earth" in a trapezium (the "earth" here is the base of the trapezium, but we have kept the literal translation here in order to distinguish it from its segments which can be the "base" of a triangle).

Dhana Lit. wealth. value, especially the value of the term of a series, i.e. the sum of the terms of a finit sequence. Amount. With the meaning of wealth as opposed to the word *ṛṇa* (debt) it is an additive quantity.

> *Madhyadhana* is the mean value, i.e. the mean sum of the terms of the sequence. *Sarvadhana* is the whole value, i.e. the sum of all the terms of a sequence. *Padadhana* is the value of the terms, which ambiguiously may refer to the terms of the sequence or to its corresponding series.

Dhanuḥkṣetra A bow-field. It is made of an arc of a circle (called "the back" *pṛṣṭha*), the chord that subtends it (*jyā*) and an arrow (*śara*). It is illustrated in Figure 1.1.

Na

Nata is the zenith distance.

Natajyā is the Rsine of the zenith distance.

Nāḍī time unit equal to half a *muhūrta*, or 24 minutes.

Nirapavartita reduced. See *apavartita*.

Niravaśeṣa Without remainder; without exception.

Niravaśeṣagaṇita is "mathematics as a whole", which englobes both *samānyagaṇita* (general mathematics), and its counterpart, *viśeṣagaṇita*, (special(ised)/specific mathematics).

Nīyamāna Computing.

Nyāya rule. method. Logic?

Pa

Pada term of a sequence, a series or of a set. Given as a synonym of *gaccha* in BAB.2.29. In Āryabhaṭa's understanding it would be the number of terms of a sequence. For Bhāskara however, its meaning is restricted to the meanings given as entries. Name given to the successive remainders that are placed, in the mutual division of the pulveriser (*kuṭṭākāra*) procedure.

padapramāṇa is the number of terms in a series.

Paṇavakṣetra A drum-field. See illustrations in BAB.2.9.ab.

Parikarman operation.

Parikalpaniyā calculation.

Pariṇāha circumference. Given in BAB.2.9.cd. as a synonym of *paridhi*.

Paridhi circumference, given in BAB.2.7ab and BAB.2.10. as a synonym of *pariṇāha*.

Parilekha The out-line ⟨of a circle⟩, i.e. the line that draws the circumference.

Parihāra refutation.

Paryavasānam is the term of a set. Given as a synonym of *gaccha* in BAB.2.29.

Pārśva lit. a flank, it has the technical meaning of "side". In Āryabhaṭa's understanding it may be any side. In Bhāskara's understanding it may be restricted to orthognal sides. It is however given by Bhāskara as a synonym of *bhujā* in BAB.2.6.ab.

Pārśvatā is "sideness", maybe an expression meaning orthogonality.

Piṇḍita Added. This term is used by Āryabhaṭa rather than by Bhāskara.

Pṛṣṭha Back. Name of one of the sides of a tusk-field, see Figure œ1.2 and of the arc of a bow-field, see Figure 1.1. This may be a general term for anything curved.

Prakriyā calculation. In grammatical sanskrit it means a derivation, i.e. what is done step by step.

Prakṣepa sum. In commercial problems as the original sum invested by each member in a commercial transaction, so that it is sometimes translated as "investment".

Pratiloma Reversed.

Pratilomakaraṇa is a reversed procedure. *pratilomakarman* is a reversed operation.

Pratyayakaraṇa lit. a conviction-procedure, a "verification" .

Pramāṇa size, amount.

Pramāṇarāśi is the "measure-quantity" in a Rule of Three.

Pha

Phala Fruit; result. Thus the "interest" in commercial problems.

Kṣetraphala is the area. *Ghanaphala* is the volume. By extension, in a geometrical context, *phala* alone has sometimes been translated by area or volume. In a specific part of BAB.2.3cd *phala* is used as meaning

'surface', although this understanding can generally be attributed to the word *kṣetra* (field).

Phalarāśi is the " fruit quantity" in a Rule of Three.

Mūlaphala is the interest on the capital.

Ba

Bāhu Its usual meaning is arm or forearm, as a synonym of *bhuja* (given as such in BAB.2.6.ab), it is translated as "side".

Bīja seed.

Brahma A pair of compasses. terminology used by Āryabhaṭa.

Bha

Bhakta Divided.

Bhagaṇa revolution.

Bhavana Zodiacal sign.

Bhāga part; division. Degree, the 60th part of a circle or revolution in an astronomical context.

>This word is derived from the verbal root *Bhaj-*, to share, distribute, which has the technical meaning "to divide". *Bhāgahṛtvā*, lit. when one has removed a part, means "when one has divided". *Bhāgalabdha* is what is obtained from the division or "the quotient of the division".

>When expressing in words the fraction $\frac{a}{b}$, *bhāga* may be affixed to the denominator (b), thus meaning a out of b parts. It may also be affixed to the numerator (a), thus meaning a parts of b.

>*Śuddhaṃ bhāgaṃ*, lit. a pure division is "an exact division" that is it has no remainder.

>*Bhāgaśeṣa* is "the residue of degrees" , i.e the non integer part of the number of degrees crossed by a planet since the beginning of the *Kaliyuga*.

Bhāgahāra divisor. lit. removing a part.

>*Adhikāgrabhāgahāra* is the divisor of the greater remainder. A technical term of the *kuṭṭakāra* operation/procedure.

Bhajana Division. Given as a synonym of *bhāga* in BAB.2.4.

Bhāṣya commentary. *Āryabhaṭīyabhāṣya* is the name of Bhāskara's commentary on Āryabhaṭa's work.

Bhinna fraction, an integer increased or decreased by a fractional part, part.

Bhukti Daily motion.

Bhujā side. In customary sanskrit it is the corporeal arm. *Bhujā* can be any side of a field.

When considered in a *bahuvrīhi* compound, modified by *kṣetra*, it looses its *ā*: *tribhujakṣetra* is a trilateral field. Sometimes the word field (*kṣetra*) is omitted, the compound is then translated as 'trilateral'. *Caturbhujakṣetra* is a quadrilateral field.

Sometimes the meaning of *bhujā* is restricted to that of the base of a trilateral. *Bhujā* is one of the sides of the right-angle in a right-angle triangle, the other side is called *koṭī* and the hypotenuse *karṇa*. See Figure 1.4.

Bhujā in astronomy is the name for the mean arcual distance of a planet at a given time, to its apogee. *Bhujāphala* "the correction of the *bhujā*" is a segment, which approximates the true position of a planet to its mean position at the same time. Please refer to the astronomical Appendix.

Bhū lit. earth; the "base" of a triangle or the "earth" of a trapezium. In the case of the trapezium, to distinguish it from its segments which maybe the base of interior triangles, we have translated it as "earth". It is the companion term, in a trapezium, of *mukha* or *vadana*. See Figure œ1.8

Bhūmi lit. earth; the "base" of a triangle or the "earth" of a trapezium.

Bheda A part. Sometimes used figuratively, but also as the (fractional) part of a number.

Ma

Maṇḍala A circle. A revolution.

Maṇḍalaśeṣa is "the residue of revolutions", that is the non integer part of the number of revolutions performed by a planet since the begining of the *Kaliyuga*. This is illustrated in Figure 1.9.

Figure 1.8: An isoceles trapezium

face (mukha, vadana, etc)

flanks, ears
(pārśva, karṇa)

lines on their own falling
(svapātalekha)

diagonals, internal ear
(karṇa, antaḥkarṇa)

base
(bhujā)

earth
(bhū, bhūmi, etc.)

perpendicular, height
(avalambaka, āyāma)
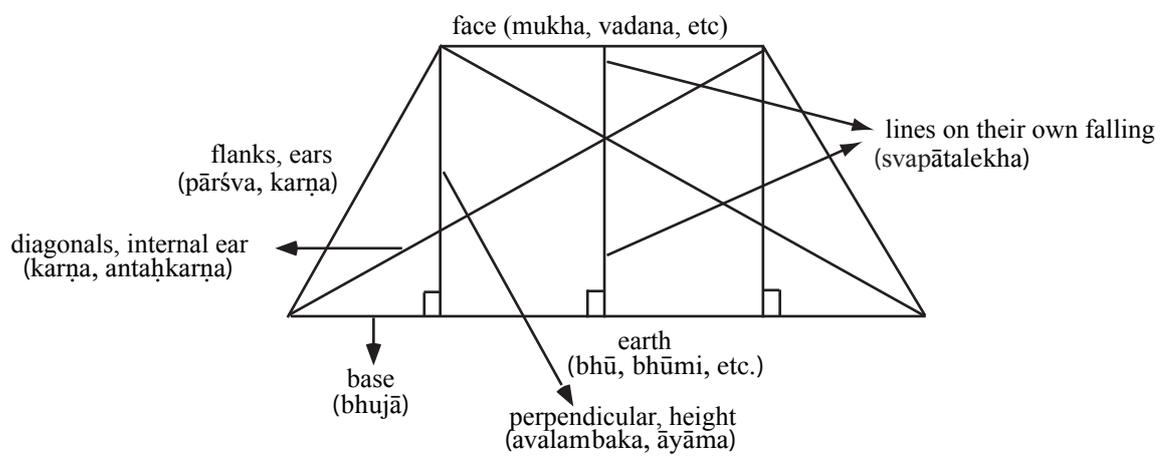
Figure 1.9: Residue of revolutions and Residue of signs

Residue of revolutions:
the non interger part of a revolution
performed by G

Residue of signs

G
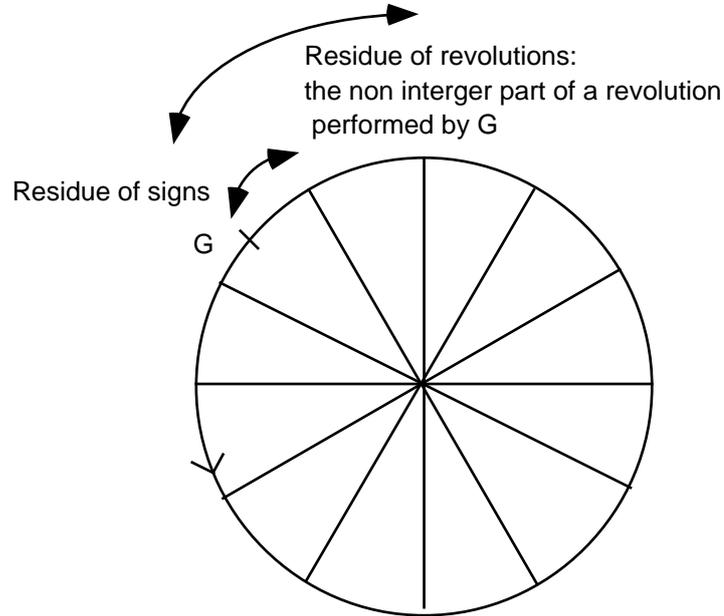
Madhya Middle. zenith. mean.

>   *Madhyadhanam* is the mean value, i.e. the mean value of the sum of
>   the terms of an arithmetical series.

Mahī lit. earth, the "base" of a trilateral.

Miśrata lit. mixture, "increased".

Mukha The face or mouth. Name of the side opposite to the earth in a
    trapezium. See Fig œ1.8.

>   It is also the name of the oppening of a pair of compasses.

>   The first term of a series.

Muhūrta Period of time equal to 48 minutes.

Mūla root (in the common and mathematical sense). The "capital" in com-
    mercial problems.

>   *Vargamūla* is a square root. *Ghanamūla* is a cube root. *Gatamūla* is
>   the root of an exponention, the fact of extracting a root. The latter
>   compound is only used in BAB.2.introduction.

In BAB.2.14. the word *mūla* is used to qualify the lower base of a gnomon.

mūlaphala is the interest on the capital.

Maurika Minute (as a unit used in longitudes).

Ya

Yāma Unit of time equal to 1/8th of a day or 3 hours.

Yāvakaraṇa Square. Given as a synonym of *varga* in BAB.2.3ab.

Yāvattāvat Lit. "as much as". Name of the the coefficient of the unknown quantity in first order equations. Used only by Bhāskara.

Yāvattāvatpramāṇa is the "value of the *yāvattāvat*, which what is unknown.

Yukta Increased. summed.

Yuktyā Adverb meaning "cleverly". The word *yukti*, with the meaning "reasoning", has an important posterity in sanskrit mathematical texts.

Yuga A period of 4320000 years. There are traditionally four *yugas*, the last one being the *Kaliyuga* (which corresponds to our time) after which the earth is destroyed, and the cycle starts again.

Yuta Increased. summed.

Yoga sum. Meeting point (of two moving bodies).

yogakāla is the meeting time (of two moving bodies).

Ra

rāśi A quantity. traditionally, the 12th part of the ecliptic. It is the 12th part of a circle or 30 degrees.

rāśigaṇita is lit. the mathematics of quantities or computations with quantities, we have translated it as "arithmetic" or "arithmetical computations".

rāśirūpa is the integer ⟨part⟩ of the quantity. This expression is solely used in BAB.2.26-27.ab.

Uparirāśi is the "higher quantity", i.e. the integer in a fraction increased or decreased by a part; the disposion $\begin{smallmatrix} a \\ b \\ c \end{smallmatrix}$ corresponding to $a + \frac{b}{c}$.

Bhāskara uses in BAB.2.9.cd the expression *rāśidvayakṣetra*, a two-*rāśi* field, which would be the name of an arc measuring 60 degrees.

rāśiśeṣa is "the residue of signs" that is the non integer part of the number of signs crossed by a planet since the beginning of the *Kaliyuga* (measured in degress and minutes). This is illustrated in Figure 1.9.

rūpa A unit. A digit (i.e numbers from 1 to 9). A whole number.

rāśirūpa is the integer ⟨part⟩ of a fractionnary quantity.

Rekha A line. Used in the drawing of a diagram.

La

Lakṣaṇasūtra A rule which is a characterization. A way of expressing an abstract or general rule.

Labdha What is obtained, the result, the quotient when connected with division (*bhāga*).

Lava Degree. 1/30th of the circumference of a circle.

Liptā or Liptika Minutes, the 60th part of a degree.

Liptāśeṣa is the "residue of minutes", that is the non-interger part of the number of minutes crossed by a certain planet since the beginning of the *Kaliyuga*.

Lekha A line. Used in the drawing of a diagram.

Parilekha is the out-line of a circle, i.e. the line that draws its circumference.

Laukikagaṇita Wordly computation.

Va

Vadana The face, the side opposite to the earth in a trapezium. See Figure 1.8.

Varga Square. The geometrical square as well as the square of a number, according to Āryabhaṭa. Practicaly, Bhāskara uses it for the square of a quantity. The square-place, i.e. a place in the decimal place-value notation whose power of ten is pair.

Vargakarmaṇ, square-operation, may be the squaring of the length of a diagonal in a quadrilateral or the hypothenuse of a right-angle triangle (*karṇa*). See the discussion in the Annex of BAB.2.3.ab.

Vargagaṇita, a square computation. The squaring of a digit in the procedure of extraction of a square-root.

Vargamūla is a square root.

Avarga is a non-square place. In the decimal place-value notation, it is a place whose power of ten is odd.

Vargaṇā Square. Given as a synonym of *varga* in BAB.2.3ab.

Vasudhā earth, in a trapezium, that is the side opposite to the face. See Figure œ1.8.

Vastu Subject, substance, object. Used to indicate the subjects of the treatise.

Vikalā A second, a unit used in giving longitudes.

Vigaṇaya, vigaṇayya Having computed.

Vi Decreased. Lit. "is removed".

Vidhi operation. method.

Vidhāna method.

Vinādika time unit equal to 1/60th of a *nāḍī*.

Viparītakarma is the reversed operation.

Vibhāga A partition.

Jyāvibhāga is "a partition of chords", see *jyā*.

Vibhājed One should divide.

Virahita Decreased.

Viloma Reversed. Opposite directions. Retrograde.

> *Vilomakarman* is a reversed operation. *Vilomagati* is a retrograde motion. *Vilomavivara* is the distance of ⟨two bodies moving in⟩ opposite directions.

Vivara distance. See *viloma*.

Viśeṣa difference.

Viśodhayed One should subtract.

Viṣama uneven. Odd. This word is also used with a different meaning in BAB.1.1, where it is the name given to equations with several unknowns

> *Viṣamacaturbhuja* is "an uneven quadrilateral", i.e. in Bhāskara's commentary a non-isoceles trapezium. However Bhāskara notes in BAB.2.8. that in other treatises this could refer to any quadrilateral.

Viṣkambha diameter.

> *Viṣkambhaardha* is the semi-diameter or radius.

Vistara width. Bhāskara in BAB.2.8. interpretes the word as meaning literally a kind of spreading.

Vistāra width. Given as a synonym of *āyāma* (length) in BAB.2.8, however in rectangles it is opposed to this very term.

Vṛtta A circle, circular.

> *Vṛttakṣetra* is a circular field. Given in BAB.2.9.cd. as a synonym of *paridhi*, it then would mean circumference, although it is not used with this meaning in the commentary on the *gaṇitapāda*. *Samavṛttaparidhi* is interpreted by Prabhākara as a *bahuvrīhi*, meaning literally: an evenly-circular circumferenced ⟨field⟩; Bhāskara precises that this interpretation understands the compound as refering to a disk. The same compound is analysed as a *karmadhāraya* by Bhāskara meaning literally: a circumference which is evenly circular.

> In Āryabhaṭa's verses, in the Chapter on the sphere (*golapāda*), *vṛtta* is used to characterise the sphericity of three dimensional objects. In BAB.2.7cd *gola* is paraphrased by *vṛtta* in the compound *ghanagolaphala*. In this compound *ghanagola* is a sub-*kamadhāraya* therefore *gola* and with it *vṛtta* means rather "a *circular* solid", rather than "a *sphere/circle* which is a solid".

Svavṛtta is one's own circle. It is the circle having for center the tip of the shadow of a gnomon, whose radius extends to the tip of the gnomon.

Vṛddhi Increase. Common difference in an arithemtical series. Interest in commercial problems. This is word soly used by Bhāskara.

Velā time.

Velākuṭṭākāra is the time-pulveriser.

Vyavahāra Name of a set of eight subjects that form mathematics understood as a global subject (only part of which is presented in the *Āryabhaṭīya*.

Lokavyavahāra is "wordly practice", the particular case where a rule is applied, or the common use of a rule.

Vyāvahāragaṇita Practical computation. Companion term of *sūkṣmagaṇita*, an accurate computation.

Vyākhyāna Explanation. commentary. Used by Bhāskara to characterize his own work in the introductory verse of the chapter on mathematics.

Vyāsa diameter (literaly the seperating ⟨line⟩), *vyāsārdha* is the semi-diameter. This word is given as a synonym of *viṣkambha* in BAB.2.7.ab.

Śa

Śara arrow. One of the segments of a bow-field, illustrated in Figure 1.1.

Śaṅku gnomon, by extension ⟨the height of⟩ a gnomon; the Rsine of the altitude. For the relation between the size of the gnomon and the Rsine of altitude see the Annex to BAB.2.14.

Śāstra Science, treatise.

Śeṣa remainder (of a subtraction). Residue.

Maṇḍalaśeṣa is "the residue of revolutions", that is the non integer part of the number of revolutions performed by a planet since the beginning of the *Kaliyuga* (measured in signs, degrees and minutes).

rāśiśeṣa is "the residue of signs" that is the non integer part of the number of signs crossed by a planet since the beginning of the *Kaliyuga* (measured in degress and minutes).

Bhāgaśeṣa is "the residue of degrees" that is the non integer part of the number of degrees crossed by a planet since the beginning of the *Kaliyuga* (measured in minutes).

Śṛṅgāṭaka Probably an equilateral, triangular based pyramid, *with* the perpendicular issued from one of its tops onto the triangular base. It is illustrated in Fig œ1.3.

Śravaṇa ear, side of a geometrical field.

Średhī series.

Sa

Saṅkalanā summation.

Saṅkalanāsaṅkalanā is the "summation of a summation", this is the name given by Bhāskara to the sum of the series of progressive sums of natural numbers (i.e. the sum of the series 1, 1+2, 1+2+3, ...,1+2+...+i, ...).

Saṅkhyā number, amount, value. calculation.

Saṅkhyāsthānāḥ is "the places of numbers", the places in which digits are written in the decimal place-value notation.

Sata Correct ⟨value⟩. Companion term of *asata* (incorrect ⟨value⟩).

Sadṛṣa Same kind. Equal.

Used with the first meaning for the result of the transformation of an integer increased or decreased by a fractional part into a fraction with only a numerator and a denominator. Also used to characterise the type of quantity which enters the multiplication when squaring and cubing.

Sama Same. Equal. even. Pair. This word does not seem to have exactly the same meaning for Āryabhaṭa and for Bhāskara. For the first, it would have had the meaning "even", in the sense of "uniform"; the meanings understood by the commentator are those given as entries.

Dvisamatryaśrakṣetra, is lit. a three sided field with two equal sides, we have translated it as an "isoceles trilateral".

samacaturaśrakṣetra, an equi-quadrilateral field, *samacaturaśratā*, lit. the quality of being an equi-quadrilateral; we have translated this expression by "equi-quadrilateralness", *samacaturaśratvā*, the state of being an equi-quadrilateral.

dvisamacaturbhuja, lit. a field with four sides two ⟨of which⟩ are equal, is "an isoceles quadrilateral" i.e. an isoceles trapezium.

Samakaraṇa Lit. making equal. An equation.

Samadalakoṭi perpendicular. According to Bhāskara, other scholars interpretate this word as a *karmadhāraya* meaning a mediator.

Samapariṇāha An even circumference.

This compound, is analysed by Bhāakara as a *karmadhāraya*, meaning literally: that field which is and evenly circular and a circumference (an evenly circular circumference). According to our commentator other scholars interpreted it as a *bahuvrīhi* meaning lit.: that field which has an even circumference (i.e. a disk).

Samavṛttaparidhi See *Vṛtta*.

Samasta sum. Lit, mingled.

Samāsa A sum. Lit, joining.

Saṃkramaṇa Name of the rule given in Ab.2.24.

Samparka sum. Vocabulary used by Āryabhaṭa in Ab.2.23. rather than by Bhāskara.

Sampāta The ⟨line whose top is⟩ the intersection. It is a substitute word for *svapātalekha*.

Pāta means "falling", *sampāta*, "falling together"; this is a substantivated adjective.

In astronomy, this word means "meeting": it is the momment where a planet eclipses another, or the momment of the greatest span of the eclipse.

Saṃyoga, saṃyojamāna Addition.

Saṃvarga Product.

Sahita Increased.

Sūkṣma Accurate. Exact. Companion term of *vyāvahāra* (practical) and of *āsanna* (approximate). Sharp (as the tip of a gnomon), precise.

Sūkṣmagaṇita is an accurate computation.

Sūtra A thread or string. It is used in the construction of geometrical figures (as trilaterals and quadrilaterals) and of three dimensional objects (as a gnomon).

A technical rule given in the form of an aphoristic verse. We have translated when it is used with the latter meaning as "rule". It can be contrasted with *ārya* and *kārikā* both refering to the verse, in its metrical dimension.

Sthāna A place (for a digit or number).

Sthānāntaram is a different place. The next place, to the right or to the left, according to the context, when considering the places in the decimal place-value notation. Maybe in the procedure for extracting the square root, an allusion to a different space where the successive digits of the partial square-root extracted are placed.

Sthāpana Placement. Disposition. Used as an alternative for *nyāsa* "setting-down", which precises how a quantity or a geometrical field is represented on a working surface.

Sthūlatā The state of being rough.

atyantasthūlatā is the state of being exceedingly rough (said of an approximate value).

Sphuṭa Correct, true.

Used as a substitute for *sūkṣma* in BAB.2.10.

Svapātalekhā A literal translation would be: "the line on its own falling". This expression names any of the two segments of a perpendicular in a trapezium, as illustrated in Figure œ1.8. These two segments of the perpendicular (or lines, *lekhā*) are defined from the point of intersection of the diagonals to the middle of the earth and the mouth (the names of the parallel segment in a trapezium). The middle points of the parallel sides being each considered as the "falling" (*pāta*) of the line. However such "lines" are segments of the mediator in isoceles trapeziums but not in uneven trapeziums.

Ha

Hata Multiplied.

Hati Multiplication. Given as a synonym of *saṃvarga* in BAB.2.3ab.

Hīna Decreased.

Hṛta Divided.

Hṛti Division. Given as a synonym of *bhāga* in BAB.2.4.

Hrāsa Subtraction, diminution.

1.1 Peculiar and metaphoric expressions to name numbers

The reference in parentheses indicates the first occurrence of the expression.

zero *kha*, void; *śūnya* (BAB.2.32-33, ex. 14), *viyad*, void (idem, ex. 18), *ākāśa*, idem (idem, ex. 22); *gagana*, the sky (idem, ex. 26).

One *indu*, the moon (BAB.2.5, ex. 1); *śaśāṅka*, lit. "marked with a rabbit", the moon (BAB.2.32-33; ex. 14); *uḍupa*, the moon (idem, ex. 19); *śītāṃśu*, "with cold rays" i.e. the moon (idem, ex. 20); *śītakiraṇa*, idem (idem, ex. 23); *niśākara*, "the maker of the night", i.e. the moon (idem, ex. 24) .

Two *yama*, a pair (BAB.2.4, ex. 1); *aśvin*, name of the twin sons of the sun (BAB.2.5, ex. 1); *netra* the eyes (BAB.2.32-33, ex. 23); *dasra*, another name of the *aśvins* (idem, ex. 26).

Three *Rāma*, there are three famous Rāmas: the hero of the *Rāmayaṇa*, Balarāma (Kṛṣṇa's brother) and Parasurāma (BAB.2.10, example 2). *Dahana*, fire as there are three sacrificial fires (BAB.2.11, ex. 1); *hutāśana*, idem; *guṇa* as the three qualities of all created things (truth/goodness for gods (*sattva*), matter/passions for men (*rajas*), darkness/ignorance for demons (*tamas*) (BAB.2.32-33, ex. 19); *śikhin*, fire (idem, ex. 23); *bhuvana* world, as the three worlds of god, men and demons (idem, ex. 24); *puṣkara*, a lake, there are three sacred lakes (idem).

Three and a half *Ardhacaturthā* the fourth ⟨unit⟩ is a half.

Four *kṛta*, the best of the four casts in a vedic dice game (BAB.2.5, ex.2); *abdhi*, ocean, it is considered that there are four oceans (BAB.2.5, ex.2); *sāgara*, ocean (BAB.2.32-33, ex. 14); *udadhi* idem (idem, ex. 24).

Five *śara*, as the five arrows of Kāma, the god of love (BAB.2.4; ex.1); *viṣaya*, lit. the objects of the senses (BAB.2.32-33, ex. 13); *bhūta*, the five elements (earth, air, fire, water and stone) (idem, ex.20); *iṣu*, arrow (idem, ex. 24); *artha*, as objects of the senses (idem, ex. 26).

Six *rasa*, perfume, taste. There are six tastes: *kaṭu* (acrid), *amla* (sour, acid), *madhura* (sweet), *lavaṇa* (saline), *tikta* (bitter) and *kaṣāya* (astringent, fragant); *aṅga*, as the six *Vedāṅgas* (BAB.2.32-33, ex. 23); *ṛtu* a season, there are six seasons (idem).

Seven *muni*, a sage, there are seven great sages or seers (*ṛṣi*) or maybe the seven stars of the constellation Ursa Major (BAB.2.5, ex. 10); *naga*, "that which does not move", a mountain, there are seven chains of mountains (BAB.2.5, ex.2); *bhūdhara*, "supporting the earth" mountains, (BAB.2.32-33, ex. 14); *adri*, mountains (BAB.2.16); *kṣoṇīdhara*, idem (BAB.2.32-33, ex. 23); *kṣamābhṛt*, a mountain (idem); *adri*, mountain (idem); *svara*, the seven notes that can constitute a *rāga* (idem, ex. 26).

Eight *vasu*, a class of eight deities (BAB.2.5, ex.1); *nāga* elephant; there are eight elephants symbolising the eight cardinal directions (East, West, South, North, South-east, South-west, North-east, North-west) (BAB.2.32-33, ex. 23).

Nine *randhra*, orifice; the nine orifices of the human body are: the two eyes, the two nostrils, the mouth , the two ears, the sex, the anus (BAB.2.5, ex. 2); *chidra*, idem (BAB.2.32-33, ex. 24); *nanda* either the nine treasures of Kubera or the nine brother-kings called "Nanda" (idem).

Ten *paṅkti* a verse with ten syllables in a quarter (BAB.2.9ab, ex.1)

Eleven *Śiva*, as the head of a group of eleven gods called collectively *rudra*[3]. (BAB.2.32-33, ex. 13)

Fourteen *Manu* the fourteen successive *manus*, progenitors or sovereigns of the earth mentioned in the *Manusmṛti* 1. 63[4]. (BAB.2.9.ab. ex.1)

Sixteen *Aṣti* a meter with sixteen syllables per quarter of verse (BAB.2.9.ab, ex. 1)

Eighteen *dhṛti*, name of a meter with eighteen syllables per quarter of verse (BAB.2.32-33, ex. 14).

Nineteen *ekonaviṃśati*, twenty minus one.

Twenty-one *Trisapta*, three-(times)-seven (BAB.2.32-33, ex. 9)

Twenty-five *Śarakṛti*, the square of five.

Fifty-nine *Navapañca*, lit. nine-five (BAB.2.32-33, ex. 9).

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[3]For further information see [Doniger 1975; glossary, p.351].

[4]See also [Doniger 1975; Glossary, p.347].

1.2   Measure units

1.2.1   Units of length

Aṅgula Smallest unit of length. Literally an *aṅgula* is a finger or a thumb.

Nṛ Lit. a man. 1 *nṛ* = 96 *aṅgulas*= 4 *hastas*.

Yojana A measure of distance. 1 *yojana* = 800 *nṛ*.

Hasta Lit. a hand or forearm. 24 *aṅgulas* = 1 *hasta*.

Table 1.1: Units of length

	aṅgula	*hasta*	*nṛ*	*yojana*
aṅgula	1			
hasta	24	1		
nṛ	96	4	1	
yojana	76800	1200	800	1

1.2.2   Measures of Weight

Karṣa 4 *karṣas* = 1 *pala*.

Kuḍuva 1 *kuḍuva* = 4 *setikas*.

Guñjā 5 *guñjās* = 1 *māṣaka*. Used traditionaly by jewelers.

Pala 4 *karṣas* = 1 *pala*. 1 *bhāra* = 2000 *palas*.

Bhāra 1 *bhāra* = 2000 *palas*.

Mānaka 4 *mānakas* = 1 *setikā*.

Māṣaka 5 *guñjās* = 1 *māṣaka*.

Setikā 1 *setikā* = 4 *mānakas*. 4 *setikās* =1 *kuḍuva*.

Sauvarṇika Equal to a *karṣa*? measure of weight specific to gold.

Table 1.2: Units of weight

measures of Grain			
	māṇaka	*setikā*	*kuḍuva*
māṇaka	1		
setikā	4	1	
kuḍuva	16	4	1

measures of Gold					
	guñja	*māṣaka*	*karṣa*	*pala*	*bhāra*
guñja	1				
māṣaka	5	1			
karṣa/sauvarṇika	80	16	1		
pala	320	64	4	1	
bhāra	640 000	128 000	8 000	2 000	1

1.2.3   Coins

One name of a specific coins (*dravya*) is mentioned in the commentary, without any given value: *dīnāra*.

rūpaka Probably the ancestor of the rupee. 1 *rūpaka* = 20 *viṃśopakas*.

Viṃśopaka 20 *viṃśopakas* = 1 *rūpaka*.

1.2.4   Time Units

Ghaṭikā One sixtieth of a day, half a *muhūrtta* or twenty-four *liptās*. A *ghaṭikā* originally is the name of a clay pot, and by extension became the name of a water pot used in measuring time, and especially the *ghaṭikās* of the day.

Naḍī or nāḍika A synonym of *ghaṭikā*. Half a *muhūrtta*, or 1/60th of a day.

Muhūrtta or Muhurta 1/30th of a day, roughly 48 minutes.

Yāma 1/8th of a day or 3 hours.

Liptā Minute.

Vināḍika 1/60th of a *nāḍī*.

Table 1.3: Divisions of the day

ě	dina	yāma	muhurta	nāḍika	vināḍika
dina (a day)	1	8	30	60	3600
yāma		1	3 + 3/4	7 + 1/2	450
muhurta or muhūrtta			1	2	120
nāḍika, naḍīor ghaṭikā				1	60
vināḍika					1

1.2.5   Subdivisions of a circle

rāśi A sign. 1/12th of the circumference of the circle.

Liptā A minute. 1/3600th of the circumference.

Kalā A minute. 1/3600th of the circumference.

Bhāga A degree. 1/60th of the circumference.

1.3   Names of planets, constellations, zodiac signs

The first occurence of the name is indicated in between parenthesis.

Aśvinī Name of a *nakṣatra-* roughly, a constelation- derived from the names of the twin vedic gods *Aśvin.* Contains stars of what is called today the Taurus constellation.

Balance *tulādharanara*, litt. the man holding a balance or balance holder (BAB.2.32-33, ex. 14)

earth *Ku* (Ab.2.1).

Jupiter *Guru*, (Ab.2.1); *adhirūḍhamahendrasūrau* (BAB.2.32-33, ex. 17) .

Leo *Mṛgapati*, lord of the beasts (Ab.2.32-33, ex. 7).

Mars *Kuja*, born from the earth (Ab.2.1), *medinīhṛdayaja*, born in the heart of the earth (BAB.2.32-33, ex.16);*aṅgāraka*(BAB.2.32-33, ex. 23); *bhauma* "produced from the earth" (idem).

Mercury *Budha* (Ab.2.1).

moon *Śaśin*, lit. that which has a rabbit (Ab.2.1), *candra*, lit. that which is bright; *candramas* (BAB.2.32-33, ex.13); *niśānātha*, litt. lord of the night (idem, ex. 14).

Rāhu *tamomaya* "made of darkness" (BAB.2.18, ex. 1).

Saturn *Koṇa*, (Ab.2.1).

Sagittarius *Dhanu*, bow (BAB.2.32-33 ex. 7); *Dhanvin*, the archer (BAB.2.32-33 ex. 12)

sun *Ravi* (Ab.2.1), *Mayūkhamāla*, litt. wreathed with rays (BAB.2.1); *sahasramarīca*, "with a thousand rays" (BAB.2.16.); *Sūrya* (BAB.2.32-33),*savitṛ* (Ab.2.32-33, ex. 7); *bharttur divasasya, dinabharttur*[5] "lord of the day" (idem, ex. 9); *bhānu* (a ray of light, by extension) (idem, ex.12) *divasakara*, litt. maker of days (idem. ex.13); *arka*, vedic ray of light (idem, ex.14); *bhāsvat* "with lustre" (idem. ex. 19); *tigmāṁśu*, "with harsh rays" (idem, ex.21).

Venus *Bhṛgu* (Ab.2.1).

1.4 Days of the week

Appear in commentary to verses 32-22

Monday *somadina* (com. preceding example 12).

Wednesday (Mercury day) *jñavāra, rātreḥpātustanujadivasa*, litt. the son of the protector of the night (the moon) (ex.12), *budhadivasa* (resolution of ex. 12).

Thursday (Jupiter day) *jīvavāra* (ex.12).

Friday (Venus day) *śukravāra* (ex.12).

Saturday (Saturn day) *śanaiścarasya divasa* (ex.14)

sunday (sun day) *sūryadina* (com. preceding example 12).

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[5]In classical sanskrit the word "lord" is usually writen with one 't': *bhartur*. This may be the trace of some dialectical writting or just a scribal error.

1.5   Gods and mythological figures

They do not appear often in the text, however occasionally, in examples,
numbers' names and in the introductory verses, reference are made to some
elements of Hindu Mythology. Therefore, we will briefly give some explana-
tions on this topic.

   One thing to bear in mind is that roughly the three major gods of
Hinduism are Brahmā (the creator and grandfather), Śiva (the destroyer)
and Viṣṇu (the preserver). Viṣṇu has eleven incarnations (*avatāra*). Brahmā,
a masculin noun (in the nominative case) is the god; when a neutral noun,
brahman, it is a philosophical concept[6] . Āryabhaṭa was a worshiper of
Brahmā, a fact quite rare in India today, Bhāskara was a worshiper of Śiva,
as the first verse introducing the *gaṇitapāda* seems to indicate.

Kṛṣṇa Is the 8th *avatāra* of Viṣṇu.

Brahmā The "Lotus-Born" (*Kamalodbhava*), Brahmā is said to be born
     from a lotus growing out of Viṣṇu's navel. (BAB.introduction to Ab.2).

     The "Creator"(*vedhas*); *Svāyaṃbhū*, litt. self-existent or self-created;
     gives the name to the *Svāyaṃbhuvasidhānta*(BAB.2.1).

     Ka, lit. "who?", would have arised from the interpretation of a vedic
     verse: 'Who (*ka*) knows whence this creation was born?', later inter-
     pretated as: '⟨The god⟩ *ka* knows whence this creation was born.' [7]

Rāhu The demon of eclipses. He is thought to swallow the moon or part of
     it during an eclipse.

1.6   Cardinal directions

North *Uttara*.

South *Dakṣiṇa* (at the right).

East *pūrva*, *purastāt* (in front).

West *Apara*, *paścād* (the last).

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[6]The essence of all things, the absolute see [Biardeau 1981; p.24-28, and glossaire, p.
183].
[7]See [Doniger 1975; p. 139, note 2].