Kautilya's

Arthashastra

Translated into English by
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THE Superintendent of Weights and Measures shall have the same manufactured.

10 seeds of *másha* (*Phraseolus Radiatus*) or
5 ,, *gunja* (*Cabrus Precatorius*) = 1 *suvarna-másha*. 16 *máshas* = 1 *suvarna* or *karsha*. 4 *karshas* = 1 *pala*. 88 white mustard seeds = 1 silver-*másha*. 16 silver *mashas* or 20 *saibya* seeds = 1 *dharana*. 20 grains of rice = 1 *dharana* of a diamond.

Ardha-másha (half a *másha*), one *másha*, two *máshas*, four *máshas*, eight *máshas*, one *suvarna*, two *suvarnas*, four *suvarnas*, eight *suvarnas*, ten *suvarnas*, twenty *suvarnas*, thirty *suvarnas*, forty *suvarnas* and one hundred *suvarnas* are different units of weights.

Similar series of weights shall also be made in *dharanas*.

Weights (*pratimánáni*) shall be made of iron or of stones available in the countries of Magadha and Mekala; or of such things as will neither contract when wetted, nor expand under the influence of heat.

Beginning with a lever of six *angulas* in length and of one *pala* in the weight of its metallic mass, there shall be made ten (different) balances with levers successively increasing by one *pala* in the weight of their metallic masses, and by eight *angulas* in their length. A scale-pan shall be attached to each of them on one or both sides.

A balance called *samavrittá*, with its lever 72-angulas long and weighing 53 *palas* in its metallic mass shall also be made. A scalepan of 5 *palas* in the weight of its metallic mass being attached to its edge, the horizontal position of the lever (*samakarana*) when weighing a *karsha* shall be marked (on that

part of the lever where, held by a thread, it stands horizontal). To the left of that mark, symbols such as 1 *pala*, 12, 15 and 20 *palas* shall be marked. After that, each place of tens up to 100 shall be marked. In the place of *Akshas*, the sign of *Nándi* shall be marked.

Likewise a balance called *parimání* of twice as much metallic mass as that of *samavrittá* and of 96 *angulas* in length shall be made. On its lever, marks such as 20, 50 and 100 above its initial weight of 100 shall be carved.

20 *tulas* == 1 *bhára*.
10 *dharanas* == 1 *pala*.
100 such *palas* == 1 *áyamání* (measure of roy

Public balance (*vyávahárikà*), servants' balance (*bhájinî*), and hare

(*antahpurabhájinî*) successively decrease by five *palas* (compared with *áyamáni*). A *pala* in each of the above successively falls short of the same in *áyamáni* by half a *dharana*. The metallic mass of the levers of each of the above successively decreases in weight by two ordinary *palas* and in length by six *angulas*. Excepting flesh, metals, salt, and precious stones, an excess of five *palas* (*prayáma*) of all other commodities (shall be given to the king) when they are weighed in the two first-named balances. A

wooden balance with a lever 8 hands long,
with measuring marks and

counterpoise weights shall be erected on a pedestal like that of a peacock. Twenty-five *palas* of firewood will cook one *prastha* of rice. This is the unit (for the calculation) of any greater or less quantity (of firewood). Thus weighing balance and weights are commented upon. Then,

1 *drona* which is an *áyamána*, a measure of royal

200 *palas* in the grains of
másha 187½ ,, 1
income.

public *drona*.
175 ,, 1 *bhájaníya*, servants' measure 162½ ,, 1
antahpurabhájaníya, harem measure.

Adhaka, *prastha*, and *kudumba*, are each ¼ of the one previously mentioned.

16 *dronas* == 1 *várí*. 20 ,, == 1
kumbha. 10 *kumbhas* == 1 *vaha*.

Cubic measures shall be so made of dry and strong wood that when filled with grains, the conically heaped-up portion of the

grains standing on the mouth of the measure is equal to ¼th of the quantity of the grains (so measured); or the measures may also be so made that a quantity equal to the heaped-up portion can be contained within (the measure).

But liquids shall always be measured level to the mouth of the measure.

With regard to wine, flowers, fruits, bran, charcoal and slaked lime, twice the quantity of the heaped-up portion (*i.e.*, ¼th of the measure) shall be given in excess.

1¼ *panas* is the price of a *drona*.
¾ *pana* ,, an *ádhaka*.
6 *máshas* ,, a *prastha*.
1 *másha* ,, a *kudumba*.

The price of similar liquid-measures is double the above.

20 *panas* is the price of 6⅔ *panas* ,, of a *tulá* (balance).

a set of counter-weights.

The Superintendent shall charge 4 *máshas* for stamping weights or measures. A fine of 27¼ *panas* shall be imposed for using unstamped weights or measures.

Traders shall every day pay one *kákaní* to the Superintendent towards the charge of stamping the weights and measures.

Those who trade in clarified butter, shall give, (to purchasers) 1/32 part more as *taptavyáji* (*i.e*., compensation for decrease in the quantity of *ghi* owing to its liquid condition). Those who trade in oil shall give 1/64 part more as *taptavyáji*.

(While selling liquids, traders) shall give 1/50 part more as *mánasráva* (*i.e*., compensation for diminution in the quantity owing to its overflow or adhesion to the measuring can).

Half, one-fourth, and one-eighth parts of the measure, *kumbha*, shall also be manufactured.

84 *kudumbas* of clarified butter are held

a *wáraka* of the same;

to be equal to

64 *kudumbas* of clarified butter are held make one *wáraka* of oil (*taila*);and¼ of a *wáraka* to be equal to is called *ghatika*, either of *ghi* or of oil.

[Thus ends Chapter XIX, "Balance, Weights and Measures" in Book II, "The Duties of Government Superintendents" of the *Arthasástra* of Kautilya. End of the fortieth chapter from the beginning.]

CHAPTER XX. MEASUREMENT OF SPACE AND TIME.

THE Superintendent of lineal measure shall possess the knowledge of measuring space and time.

atoms (*paramánavah*) are

1 particle thrown off by the wheel of a chariot.

equal to
8 particles are equal to 1 *likshá*.
8 *likshás* are equal to the middle of a *yúka* (louse) or a *yúka* of medium size.
8 *yúkas* are equal to 1 *yava* (barley) of middle size.

1 *angula* (¾ of an English inch) or the middlemost joint 8 *yavas* are equal to of the middle finger of a man of medium size may be

taken to be equal to an *angula*. 4 *angulas* are equal to 1 *dhanurgraha*. 8 *angulas* are equal to 1 *dhanurmushti*. 12 *angulas* are equal to 1 *vitasti*, or 1 *chháyápaurusha*. 14 *angulas* are equal to 1 *sama*, *sala*, *pariraya*, or *pada*. 2 *vitastis* are equal to 1 *aratni* or 1 *prájápatya hasta* 2 *vitastis plus* 1 *dhanurgraha* are1 *hasta* used in measuring balances and cubic measures, equal to and pasture lands. 2 *vitastis plus* 1 *dhanurmusti* 1 *kishku* or 1 *kamsa*.

1 *kishku* according to sawyers and blacksmiths and used 42 *angulas* are equal to in measuring the grounds for the encampment of the

army, for forts and palaces. 54 *angulas* are equal to 1 *hasta* used in measuring timber forests.

84

1 *vyáma*, used in measuring ropes and the depth of *angulas* are equal to

digging, in terms of a man's height. 4 *aratnis* are equal to 1 *danda*, 1 *dhanus*, 1 *nálika* and 1 *paurusha*. 108 *angulas* are equal to 1 *garhapatya dhanus* (*i.e*., a measure used by carpenters

called *grihapati*). This measure is used in measuring

roads and fort-walls.

The same (108 *angulas*) are
1 *paurusha*, a measure used in building sacrificial altars.

equal to
6 *kamsas* or 192 *angulas* are1 *danda*, used in measuring such lands as are gifted to
equal to *Bráhmans*.
10 *dandas* are equal to 1 *rajju*.
2 *rajjus* are equal to 1 *paridesa* (square measure).
3 *rajjus* are equal to 1 *nivartana* (square measure).
The same (3 *rajjus*) *plus* 2
dandas on one side only are 1 *báhu* (arm).
equal to
1000 *dhanus* are equal to 1 *goruta* (sound of a cow).
4 *gorutas* are equal to 1 *yojana*.

Thus are the lineal and square measures dealt with.

Then with regard to the measures of time:---

(The divisions of time are) a *truti*, *lava*, *nimesha*, *káshthá*, *kalá*, *náliká*, *muhúrta*, forenoon, afternoon, day, night, *paksha*, month, *ritu* (season), *ayana* (solstice); *samvatsara* (year), and *yuga*.

2 *trutis* are
equal to 1
lava. 2
lavas are
equal to 1
nimesha. 5

nimeshas are equal to 1 *káshthá*. 30 *káshthás* are equal to 1 *kalá*. 1 *náliká*, or the time during which one *ádhaka* of water passes 40 *kalás* are equal to out of a pot through an aperture of the same diameter as that of a wire of 4 *angulas* in length and made of 4 *máshas* of gold. 2 *nálikas* are equal to 1 *muhúrta*. 15 *muhúrtas* are equal to 1 day or 1 night.

Such a day and night happen in the months of *Chaitra* and *Asvayuja*. Then after the period of six months it increases or diminishes by three *muhúrtas*.

When the length of shadow is eight *paurushas* (96 *angulas*), it is 1/18th part of the day.

When it is 6 *paurushas* (72 *angulas*), it is 1/14th part of the day; when 4 *paurushas*, 1/8th part; when 2 *paurushas*, 1/6th part; when 1 *paurusha*, ¼th part; when it is 8 *angulas*, 3/10th part (*trayodasabhágah*); when 4 *angulas*, 3/8th part; and when no shadow is cast, it is to be considered midday.

Likewise when the day declines, the same process in reverse order shall be observed.

It is in the month of *Ashádha* that no shadow is cast in midday. After *Ashádha*, during the six months from *Srávana*

upwards, the length of shadow successively increases by two *angulas* and during the next six months from *Mágha* upwards, it successively decreases by two *angulas*.

Fifteen days and nights together make up one *paksha*. That *paksha* during which the moon waxes is white (*sukla*) and that *paksha* during which the moon wanes is *bahula*.

Two *pakshas* make one month (*másа*). Thirty days and nights together make one work-a-month (*prakarmamásah*). The same (30 days and nights) with an additional half a day makes one solar month (*saura*).

The same (30) less by half a day makes one lunar month (*chandramása*). Twenty-seven (days and nights) make a sidereal month (*nakshatramása*). Once in thirty-two months there comes one *malamása* profane month, *i.e*., an extra month added to lunar year to harmonise it with the solar. Once in thirty-five months there comes a *malamása* for *Asvaváhas*.

Once in forty months there comes a *malamása* for *hastiváhas*.

Two months make one *ritu* (season). *Srávana* and *proshthapada* make the rainy season (*varshá*). *Asvayuja* and

Kárthíka make the autumn (*sarad*). *Márgasírsha* and *Phausha* make the winter (*hemanta*). *Mágha* and *Phalguna* make the dewy season (*sisira*). *Chaitra* and *Vaisákha* make the spring (*vasanta*). *Jyeshthámúlíya* and *Ashádha* make the summer (*grishma*). Seasons from *sisira* and upwards are the summer-solstice (*uttaráyana*), and (those) from *varshá* and upwards are the winter solstice (*dakshináyana*). Two solstices (*ayanas*) make one year (*samvatsara*). Five years make one *yuga*. The sun carries off (*harati*) 1/60th of a whole day every day and thus makes one complete day in every two months (*ritau*). Likewise the moon (falls behind by 1/60th of a whole day every day and falls behind one day in every two months). Thus in the middle of every third year, they (the sun and the moon) make one *adhimása*, additional month, first in the summer season and second at the end of five years.

[Thus ends Chapter XX, "Measurement of Space and Time" in Book II, "The Duties of Government Superintendents" of the *Arthasástra* of Kautilya. End of the forty-first chapter from the beginning.]