Coinage

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ABSTRACT

The intent of this paper is to give some salient features of pre-basic and basic concepts of coinage in Vedic Mathematics specially in Ganiita Tilaka.

I. INTRODUCTION

In ancient days, life of people was very simple having less needs. People used to overcome these needs either by producing or manufacturing the desired goods. The people used to fulfill their requirements by exchanging the items by another item. This system of purchasing one item by the exchange of another item was known as barter system.

In Vedic time there was a practice of selling and purchasing of the articles under barter system. This was the simplest and oldest system of business. This type of system still exists in the Indian villages. As the times passed, life of people become more difficult and their needs increased day by day. The people of that time felt that there should be a system of business by which selling and purchasing of articles can be done easily.

In the times of Rig-Veda, cow was used to purchase the different items. Also, the priests, guests and teachers were honoured by offering payment in terms of cows (see [7], and [8]). It is stated that the cost of statue of God Indra was ten cows and the purchase of plant Soma could also be done in the exchange of cow.

Later on, the use of cow in the form of coin become very difficult as trade and business between the people of that time increased. Then the people were in search of system which could be more effective. In this search, they came to know about metals. Very soon, they started using metals for the trade purpose. During that time silver was not found in abundance but gold was easily available. So the people made the gold as their first natural medium of trade. By the fourth century A.D., however, the whole civilized world used money to purchase/sale items and each state was having its own proper coinage. This is being still continued in practice now days. Today, we are in the age, when paper currency is gradually replacing the metal currency.

The existing decimal system of coinage was introduced in India on April 1, 1957 see [16, p-8].

We now illustrate some of the coins of ancient origin. The references of these coins come in Rig-Veda, Atharvaaveda, and Satapatha Brahmana etc.

II. DESCRIPTION OF VARIOUS COINS

2.1 NISKA

The study of Rig-Veda reveals that niska was used as a unit of barter system in that period (see [8], and [9]). This word has been mentioned in many verses of Rig-Veda but the people differ in their opinion on the reality of niska. The following verses reveal different uses of niska in Rig-Veda (see [9]):

(i) आ प्रवैणेष्यं जनवो छुमवं वर्यं कृष्टयां 
निष्कग्रिवो बृहदुक्ख एवा मथ्या न वाजयुः

Which means :

Living men with collars of gold (niskagriva), earnest in praise, desirous of food, augment by this laudation the vigour of the abiding in the white firmament.

(ii) अहः विनविष्की दायकानि धन्याहूँ निष्क यज्ञं विश्वरूपम्

Which means:

Gift of men, who are adorned with the praiseworthy self, with auspicious gifts, and with noble-minded desires, with the cattle, and with the oblations of this sacrifice, the whole universe.
Which means:
Worthy (of reference), thou bearest arrows and a bow; worthy (of praise), thou wearest an adorable and omniform niska.

(iii) निष्कं वा घा कृपाणवे स्रजं वा बुधितिविचः ।
प्रति तुष्यन्यं सर्वमाप्येपरि तदस्यनेहसो व उत्तय: सु ऊतयो व ऊतयः ॥

Which means:
Daughter of heaven, whatever ill-omened dream threatens Trita Aptya, we transfer it to the worker of niska (gold ornaments) or to the maker of garlands.

From the above, it seems that niska was used as an ornament (necklace). But, at some other places, it appears that niska was not only used as ornaments but was also used as currency, which is clear form the following verse of Rig-Veda.

(i) शतं राजस्तो नाधमानस्य निष्कास्य छतमश्वान् प्रयत्तान् तद्व आदम् ।
शतं कक्षीवा अपूर्व्य गोना दिवि श्रवोजजरमा ततात् ॥

Which means:
From which generous prince, soliciting (my acceptance) I, Kaksivat, unhesitatingly accepted a hundred niska, a hundred vigorous steeds, and a hundred bulls, whereby he has spread his imperishable fame through heaven.

It seems that niska was used as an ornament in the beginning but later on it was utilized in the form of a coin. Dr. Barker, in his book, “Theory of Money”, writes that, the metals used for coins was the same as of ornaments. Golden niska were also used to form necklace. These type of necklaces can be traced in the country side of India even today. One can be find a necklace even these days in which the silver rupee or and half-a-silver rupee coins are used. The use of niska is quite frequent in Atharva-Veda also. The following verses reveal this fact see [12]:

(i) नास्य क्षता निष्कर्ष्यां: सूचानामेत्य्यद्र: ।
यमस्मन् राजेन नियुक्ते भ्राजायाचितया ॥

Which means:
No steward golden-necked goes before the men and women of power and prosperity in the kingdom where in the wife of Brahmana is detained through want of sense.

(ii) रिष्यत्सङ्ग परिशासं परिकृत्य परिं त्वः ।
कृत्यां कृत्याकृते देवा निष्किमिव प्रतिं मुक्तत ॥

Which means:
O ye men of learning ! remove certainly the trouble-creating infliction of the disease driving away its effect from the skin and throw away the violence of the violent person like the dirt.

(iii) शतमाक्षा हिरण्ययाः: । शतं रथया हिरण्ययाः: ।
शतं कृष्या हिरण्ययाः: । शतं निष्का हिरण्ययाः ॥

Which means:
A man should posses hundred brilliant house, hundred golden chariots, hundred golden covers of elephant and hundred golden coins.
Which means:

This king has given hundred gold coin, ten garlands, three hundred horses and ten thousand cows to this industrious man.

2.2 PANA

The first reference of word pana takes place in Kautilya Arthashastra (400 B.C.) see [13]. It was a copper coin of 80 rati seeds in weight (144 grains) and 80 cowres in value see [8, p-55].

2.3 DRAMMA

It appears that the word dramma was found at first in Baksali Manuscript (200 A.D.) see [3]. It was a silver coin weighing about 65 grains. Its lower denominations were known as one quarter, two quarter, and three quarter. The Siyadoni inscription mentions specially the Adivaraha and Vigrahapatiya drammas see [8p, 493].

2.4 KARSA

The word karsa was being used from the time of Mahaviracarya (850 A.D.) see [10]. It was a silver coin and was also known as purna see [8, p 51].

2.5 KAKINI

It appears that the word kakini was found at first in katyayana sulba sutra see [6]. Kakini and ardha-kakini were copper coins. It stands for a coin of the smallest denomination, possibly it means a cowrie.

In the Dakinapatha, Kakini was means of exchange either a coin or a cowrie see [8, p-294].

In Satapatha Brahmana (c. 2000 B.C.), it is given that in exchange of many articles, namely, gold, she goat (aja), cloth, skin and milch cow, Soma could be purchased see [7, p-241]. Soma as a plant is mysterious in the sense that it in is no longer in common use now and perhaps it has not been even identified with certainly see [7]. Monier-Williams described Soma (Sacostema viminalis or Asclepias acid) as a creeping plant see [15]. The stalks of the plant Soma used to be pressed between stones (adri) by priests, and then sprinkled with water, and purified in a strainer (pavitra) and then add juice trinkled into jars (kalasa). After that it was mixed with clarified butter, flours etc, and then it was used to worship the gods. This corresponds with Iranjan Avesta. Soma was collected during moonlight on certain mountains such as Mujavat Soma is identified with moon also as the receptacle of the other beverage of the gods called amrita or as the lord of plants. It is also called rajan and appears among the eight Vasus and eight Lokapala.

Soma was also used to be one of the drinks as conjectured by the Brahmanas. It’s exhilarating effect was prized both by men and the gods.

Also in ancient India, gold, was also used as one of the unit from Soma could be purchased. In the verse of Yajur-Veda see [10], it is mentioned that gold is brilliant and pure. It is mentioned that the plural of candra (gold) is given as candrani which is translated as gold pieces. Gold used for purchased / sale of some of item was standard size and weight. It appears that there were gold coins with some recognized evaluation. Most likely the equivalent of a cow is one gold piece and even the fractions 1/2, 1/4 and 1/8 one gold piece was used for dealings see [8]. Also the word pada was used for one quarter, the word Safa for 1/8 and the word kala was used for 1/16. The relation between the different units mentioned above of cows and gold pieces see [8, p-242] are as follows:

<table>
<thead>
<tr>
<th>One Cow</th>
<th>One gold piece</th>
<th>= 1 candra</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gold piece</td>
<td>4 padas</td>
<td>= 8 safas</td>
</tr>
<tr>
<td></td>
<td>= 16 kalas</td>
<td></td>
</tr>
<tr>
<td>100 Gold units</td>
<td>= Satamana (one gold coin)</td>
<td></td>
</tr>
</tbody>
</table>

Here we shall quote a few passages from Satapatha Brahmana indicating daksina or honorarium or fee given to priests in terms of gold see [7] and [8, p-243].

(i) उदलको हारूणिः। उदिच्छान्नुतो धाववायश्चकार तस्य निष्क उपाहित आसेतत्तद स्म वै तत्पूर्वेषां वृत्तान्न्यावयतमेकधनमुपाहितम्भवत्वत्वत्त्वाय बिभ्यतात्तान्नोदीच्छानं ब्रह्माणान्भीविवेद --

Which means:
Uddalka Aruni was driving about, as a chosen (offering priest), amongst the people of the Northern Country. By him a gold coin (niska = niska is a term with a very old usage for coins) was offered for in the time of our for-fathers a prize (ekadhanam) used to be offered by chosen (priest) when driving for the sake of calling our the timid to a disputation.

(ii) अब सतमं पदं पर्युपविशति । स हिरण्यं पदे निधाय जुहोति ।

Which means:
They now sit down round the seventh foot-print; and having laid down the piece of gold (hiranya), i.e. gold coin, in the foot-print, he offers.

(iii) तस्य हिरण्यं दक्षिणा । आप्नेयो चाह एष यज्ञो भवत्येविनिहित्यं हिरण्यं तस्माद् द्विरण्यं दक्षिणा ।
Which means:
The priest’s fee for it gold; for this is a sacrifice to Agni, and gold is Agni’s seed, therefore the priest’s fee is gold.

(iv) हिरण्यं दक्षिणा सुवर्णं शतमायं तस्मयेन ब्राह्मणम् ।
Which means:
The priest’s fee is gold weighing (or valuing) a hundred (Suvarnam Satamanam).

The currency in Kautilya’s Arthastra (c. 400 B.C.) was used in terms of pana see [2], [13] & [14], as the following verse reveals:

(i) सपातपणं धर्मं मासवृद्धं । पणातपणं व्यावहारिकैं । दशपणं कानारकाणामु । विश्वालिपणं सामुदाराणाम् ।
Which means see [2, p-218] :
An interest of a pana and a quarter per month percent is just. Five panas per month percent is commercial interest. Ten panas per month percent prevails in forests. Twenty panas per month percent prevails among sea traders.

During the Kautilya period, the coin that was in practice was pana. Kautilya described the techniques of casting these coins in his Arthastra by the following verse:

(i) लक्षणाब्यक्तचतुर्भागतां प्रत्यमुपरिश्रेष्ठशनां शतमां मासबीजयुक्तं कार्येत् । पणामर्गणं पादमपथविभागिताः ।
Which means:
The superintendent of mint (laksanadhyaksah) shall carry on the manufacture of silver coins (rupya-rupa) made up of four parts of copper and one-sixteenth part (masa) of any one of the metals, tiksa, trapu, sisa and anjana (tin, lead or anti-money). These shall be a pana, half a pana, a quarter and one-eighth. Copper coins (tamra rupa) made up of four parts of an alloy (padajivam) shall be masaka, half-a-masaka, kakani, and half-a-kakani.
Mathematically it may be written as:
It is important to note that surface and sometimes the interior of a coin becomes heterogeneous. Kautilya, the greatest Economics of India was familiar with the concept of corrosion; therefore he mixed the minerals for a coin in standard ratios to maintain homogeneousness of the coins. The examiner of coins (rupadarsaka) shall regulate currency both as a medium of exchange (vyavaharikam) and as legal tender admissible into the treasury (kosapravesyam). The premia levied on coins (into the treasury shall be) eight percent known as rupika. In the Baksali Manuscript (c. 200 A.D.) the following examples explains the system of coinage see [8, p-299]:

**Example (i):** - A earns 3 ½ dramas in 2 days and B earns 2 ½ in 3 days, A gives B 7 drammas and this makes their possessions equal. How long had they been earning?

**Example (ii):** - The rates of purchase are one, two, three, four and six article for one dramma. What will be the cost of twelve of each? and what are the numbers of articles?

**Example (iii):** - A gave 2 ½ dinaras in 1 ½ days, B gave 3 ½ in 1 ½ days C gave 4 ½ in 1 ½ days. In what time would they have given 500 dinaras?

Aryabhata in his book *Aryabhatiya* (c. 499 A.D.) explains the currency in the following verse:

(i) गुलिकालेण विभजते, द्वयोः: पुरुषोऽयस्तु रूपकविशेषस्य।
   लब्ध गुलिकापूल्वं वद्यर्थकृतं भवति तुल्यम्॥

Which means see [11, P-72]:
Divide the difference between the rupakas with two persons by the difference between their gulikas. The quotient is the value of one gulika, if the possessions of the two persons are of equal value.

The term *gulika* stands for ‘a thing of unknown value’. “By the term *gulika*,“ writes Bhaskara I (629 A.D.), “is expressed a thing of unknown value”. *Gulika* and *yavattavat* (commonly used in Hindu algebra for an unknown) are used as synonyms. Bhaskara I writes; “These very *gulikas* of unknown value are called *yavattavat*”.

The term *rupaka* means a coin. “The *rupaka*,“ write Bhaskara I, “is dinara (a coin) etc”.

(i) कल्याणकनकनवते: कियति नववर्णकानि कनकानि॥
   साप्तांशकदशवर्णकसुज्ञहेम्नाशतस्यायि॥

(ii) दीनारपञ्चकाविविल्लगुण धनमजैलनरः: कर्षितश्॥
   प्राविद्धवदन्तगरी: कति जातस्य दीनारः॥

(iii) हेमानां सार्थानेमात्सर्मशेश वृद्धिर्धियाः॥
   सत्रचलुर्धिनवत्या: कित्यति पादोनप्यासे॥

(iv) चरणादलविश पञ्चमभागः: कनकस्य किं शेषसः॥
Sridharacharya was a saivite Hindu and lived sometimes between Mahavira (850 A.D.) and Aryabhata II (c. 950 A.D.) see [8, p-317], the most important of his works is the Patiganita. He described the money-measure by the following verse:

(i) योडङ्गशणणे: युगणे: पण्यो भवेत् काकिणी चतुष्क्रेण ।
    पञ्चावहृतैश्चतुप्रिष्ठवट्टके: काकिणी चैका ॥

Which means see [8, p-318]:
A purana is equivalent to sixteen panas; a pana is equivalent to four kakinis; and a kakini is equivalent to twenty varatakas (cowries).

Mathematically:

1 purana = 16 panas
1 pana = 4 kakinis
1 kakini = 20 varatakas
Sripati (1039 A.D.) mentioned the following system of currency in his treatise *Ganitatilaka* by the following verses:

\[(i)\] स्वतः काकिनी पञ्चगुणश्रृंखलाय-वराटकै: 20 काकिनिकाचतुक्षंकम्।
पञ्च भण्णिः व्यवहारतज्ज, द्रम्मशते: योक्षाभिः प्रसिद्ध:॥

Which means see [8, p-318]:
*Kakini* should be made by five times four (*i.e.* twenty) *varatakas*. Those who are skilled in this *vyavahara* call on aggregate of four *kakinis* a *pana*. The well *dramma* is made by sixteen of these *panas*.

Mathematically:

\[
\begin{align*}
20 \text{ varatakas (kapardikas)} &= 1 \text{ kakini} \\
4 \text{ kakini} &= 1 \text{ pana} \\
16 \text{ panas} &= 1 \text{ dramma}
\end{align*}
\]

\[(ii)\] येवेन्तु नियोगमुण्यन्ति षड्भिः-रघुमित्रे-पिंड्वर्गः प्रविष्टम्।
गद्यांकं तहितयेन नन, व्यावर्णायन्तीह सुवर्णवद्धशः॥

Which means see [5, p-114]:
*A nispava* is equivalent to six *yavas*. A “dharana” is specified by eight of these *nispavas*. A *gadyanaka* is surely made by two these *dharanas*.

Mathematically:

\[
\begin{align*}
6 \text{ yavas} &= 1 \text{ nispava} \\
8 \text{ nispavas} &= 1 \text{ dharana} \\
2 \text{ dharanas} &= 1 \text{ gadyanaka}
\end{align*}
\]

*Bhaskaracarya* (c. 1150 A.D.) described the relation of currency in his book *Lilavati* by the following verse:

\[(i)\] वराटकानां दशकृत्त्वा यत्सा कारिणी तान्त्रिक पणश्च:।
ते योड्धा द्रम्म इहावगाम्यो त्रम्मेस्तथा योड्धाभिषेच्निष्क:॥

Mathematically it may be written as:

\[
\begin{align*}
20 \text{ varatakas (kodi)} &= 1 \text{ kakini} \\
4 \text{ kakinis} &= 1 \text{ pana} \\
16 \text{ panas} &= 1 \text{ dramma} \\
16 \text{ drammas} &= 1 \text{niska}
\end{align*}
\]

*Nirayana Pandit* (1356 A.D.) mentioned the following system of coinage in his book *Ganitakaumidi* by the following verse see [4]:

\[(i)\] नियमितकपरिकिप्।
काकिणिका चतुस्मिकस्य व्यापारस्मिः॥

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Which means:

| 12 panas  | =  | 1 dramma |
| 36 dramma | =  | 1 niska  |

### III. CONCLUSION

On comparing the currency from different time it appears that until up to 600 year (850 A.D. -1350 A.D.) currency was same except dramma was used in place of purana which is clear from the following table:

<table>
<thead>
<tr>
<th>NAME</th>
<th>COIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sridhara</td>
<td>1 Pana = 4 Kakinis</td>
</tr>
<tr>
<td></td>
<td>16 Panas = 1 Purana</td>
</tr>
<tr>
<td>(850 A.D.-</td>
<td>(950 A.D.)</td>
</tr>
<tr>
<td>Sripati</td>
<td>1 Pana = 4 Kakinis</td>
</tr>
<tr>
<td></td>
<td>16 Panas = 1 dramma</td>
</tr>
<tr>
<td>(1039 A.D.)</td>
<td></td>
</tr>
<tr>
<td>Bhaskara</td>
<td>1 Pana = 4 Kakinis</td>
</tr>
<tr>
<td></td>
<td>16 Panas = 1 dramma</td>
</tr>
<tr>
<td>(1150 A.D.)</td>
<td></td>
</tr>
<tr>
<td>Narayana</td>
<td>12 Panas = 1 dramma</td>
</tr>
<tr>
<td>(1350 A.D.)</td>
<td></td>
</tr>
</tbody>
</table>

It seems that during this period value of the coin was stable and gives the idea that cost of living was the same.

It is concluded that from time of Narayana Pandit, currency was changed from 1 dramma = 12 panas instead of 16 panas. This might be either due to rise in prices of the ingredients of coins of living.

The present value of 1 pana (silver coin) = 700 Rs. Approx. and 1 niska (gold coin) = Rs. 34500 approx. This clearly indicates that in Vedic times, India was prosperous in every respect of life and that is the reason that we have given the name “सोन को चिड़िया” to our nation.

### REFERENCES


[13] उदयवीर शास्त्री (अनुवादक), कौटिल्य अर्थशास्त्र भाग 1, महेरचंद लक्षमनदास दिल्ली, 1969।
[14] उदयवीर शास्त्री (अनुवादक), कौटिल्य अर्थशास्त्र भाग 2, महेरचंद लक्षमनदास दिल्ली, 1969।