

# Measuring in Maldivian Society

by

Aishath Shehenaz Adam

Measuring is associated with quantifying, ordering and comparing and is a means of finding size, capacity or quantity. It is a human activity and since all cultures or societies value things differently, the precision and the types of units and methods used to measure will depend on cultural contexts. This paper, based on research done for my masters thesis, reports on mathematical ideas related to measuring that are found in Maldivian society and are related to traditional and cultural contexts.

## 1. INTRODUCTION

This study is based on the belief that all mathematical thinking is related to the culture of the knower (Barton, 1996; Ernest, 1991) and an analysis of the mathematics of the Maldivian culture can be carried out from an ethnomathematical (culture in which the mathematics arises) perspective.

The research question addressed in this paper is:

- What is the nature and scope of mathematical thinking in Maldives, with respect to measuring?

Specifically the following areas are addressed:

- Five calendar systems.
- Measurement strategies in Maldivian society.
- Cultural contexts where measuring is used, using four examples – boat building, building and construction, mat weaving, and rope making.

With reference to influences of other cultures on Maldivian mathematics, where applicable.

## 2. FIVE CALENDAR SYSTEMS

Five calendar systems have been used in Maldives. They are the Gregorian (English) calendar, Hijri (Islamic) calendar, an Indian solar calendar, an Arabic solar calendar and a nakshatra calendar (Maloney, 1980). The solar calendars are referred to as iru (sun) mas (month) while the Hijri calendar is called handhu (moon) mas in Dhivehi (Maldivian language). The Gregorian calendar and the Hijri calendar are most commonly used, and are the official calendars of the Maldives. The Gregorian calendar is used as a link with the international world while the Hijri calendar is used as the basis to mark Islamic festivals and link with the Muslim world. The Hijri calendar, beginning with the hijra (flight from Mecca to Medina) of Prophet Mohammed, is a lunar calendar which is about ten days shorter than the solar year or the Gregorian calendar (Boyer & Merzbach, 1991). Most Maldivians, especially old people and people living in the rural areas use the Hijri calendar to compute time and dates, while the young generation and people who live in the urban areas

commonly use Gregorian calendar to compute time. The Gregorian calendar is an influence of the West while the Hijri calendar is an influence of the Arab world.

The Arabic solar calendar is hardly used now. The New Year of the Arabic solar calendar begins on the day of vernal equinox - March 21st. Arabs developed this calendar in the late eighth century. Maldivian navigators used to base their calculations on this solar calendar (Maloney, 1980).

According to Maloney (1980), the Indian solar calendar called Meesa Raahi was borrowed from Sri Lanka. There is evidence that this system came from Buddhism because even though poya (Sinhalese) days are not observed in Maldives, those days in lunar cycle are called foi in Dhivehi (Maloney, 1980), which is a term commonly used by Maldivians to refer to a fortnight.

The calendar derived from the Naksatra system of India is called nakaiy in Dhivehi and is a very important calendar for Maldivians. This was originally not a calendar but a system used for astrology. Nakaiy refers to the twenty-eight seasonal divisions of the stars and each division is named after a particular star. However, instead of 28 nakaiy, Maldivians use 27 nakaiy because the star that represents this nakaiy is said to be not visible in Maldives. The Dhivehi names of the nakaiy are closely related to Sanskrit so it is evident that this system came to Maldives from India (Amin, Willets & Marshall, 1992; Maloney, 1980). The names of the nakaiy in Dhivehi and Sanskrit are given in Table A (Maloney, 1980).

Table A: Names of Nakaiy in Dhivehi and Sanskrit

DHIVEHI

SANSKRIT

Assidha

Asvini

Burunu

Bharani

Kethi

Krttika

Roanu

Rohini

Miyaheli

Mrga-siras

Adha

Ardra

Funoas

Punar-vasu

Fus

Pusya

Ahuliha

Aslesa

Maa

Magha

Fura

Purva-phalguni

Uthura

Uttara-phalguni

Atha

Hasta

Hitha

Citra

Hei

Svati

Vihaa

Visabha

Nora

Anuradha

Dhosha

Jyeshtha

Mula

Mula

Furahalha

Purva-asadha

Uthurahalha

Uttara

Huvan

Sravana

Dhinasha

Sravishtha

Hiyavihaa

Satabhisaj

Furabadhuruva

Purva-bhadhrapada

Fasbadhuruva

Uttara-bhadhrapada

Reyva

Revati

Each nakaiy has 13 or 14 days and is fixed with the solar year. There are only two distinct seasons or monsoons in Maldives. Hulhangu (the rainy or wet season) which has 18 nakaiy and Iruvai (the dry season) which has nine nakaiy. Hulhangu monsoon is approximately from 8th April to 9th December and Iruvai monsoon is from 10th December to 7th April. The first 18 nakaiy given in Table A are nakaiy of Hulhangu and the rest are nakaiy of Iruvai monsoon. Fishing, agriculture, trading and some festivals celebrated are correlated with the nakaiy system (Amin, 1950; Amin, Willets & Marshall, 1992). For example, trading boats avoid stormy nakaiy, Nora is a good nakaiy for fishing, Furahalha for planting, and Mula for kite flying.

### 3. MEASUREMENT STRATEGIES IN MALDIVIAN SOCIETY

There is no one collective word for measurement in Dhivehi. The term used for measuring dry and liquid measures are minun, mine kirun for weighing and min elhun for linear measure.

#### Linear Measures

Body parts, specifically the arms were used traditionally, and even now, it is used in everyday life for linear measure in Maldivian society. Table B gives the commonly used units for linear measure.

#### Table B: Units Used for Linear Measure

Kaivaai or handspan

Tip of thumb to tip of index finger on the same hand stretched out

Muh or half-arm span

Tip of the elbow to tip of middle finger on the same arm

Riyan or shoulder-length

Shoulder to tip of middle finger of same arm

Bama or two-arm span

Tip of middle finger of one arm to tip of middle finger of the other arm, both stretched out

Kaivaay and Muh are commonly used to measure cloth and are mostly used by housewives. Riyan and Bama are used by boat builders and in construction work.

Similar words are found in Sinhalese and Tamil for these linear measures. In Tamil mulam means two spans which is similar to muh and in Sinhalese rinan is a similar measure to muh but the word correlates to the Dhivehi word riyan. Further, the two arm span is called bamba in Sinhalese while it is bama in Dhivehi (Maloney, 1980). This shows a strong South Asian influence in our traditional linear measurement strategies. Today, however, people use feet, inches and 'Systeme International' (SI) units for measurement which is an influence of the West.

#### Dry and Liquid Measures

Traditionally, laahi, a container made out of half of an average coconut was used for dry measure and aduba, a container made out of a big coconut was used for liquid measure. Even today, laahi and aduba are used by housewives for measuring. However, instead of coconuts they commonly use plastic cups or mugs but still they call it laahi and aduba. Four laahi make one naalhi. A naalhi is approximately equal to one kilogram and an aduba has the same capacity as that of a naalhi and hence one fourth of an aduba is also called a laahi. The system of dry measures traditionally was as follows:

4 laahi = 1 naalhi

16 laahi = 4 naalhi = 1 kotte

48 laahi = 12 naalhi = 3 kotte = 1 faraa

192 laahi = 48 naalhi = 12 kotte = 4 faraa = 1 mulhi

1200 laahi = 300 naalhi = 75 kotte = 25 faraa = 6 1/4 mulhi = 1 kandi (Ismail, 1953; Maloney, 1980).

In addition to this, it is interesting to note that both traditionally and at present, a special measurement called maaru is used to measure firewood. A maaru is made out of thick rope with

two knots indicating the length of a maaru. A maaru has a circumference of approximately two feet.

In the Maldivian weighing system, the lightest weight is called bai kulhan'dhu, which is half of a kulhan'dhu. A kulhan'du has the same weight as Maldivian 50 laari (cents) and 5 kulhan'dhu is equal to an ounce. A historian [H2] explained the traditional system of weights:

1 kulhan'dhu = 1/2 thoalaa

1 thoala = 2 kulhan'dhu

1 gau = 10 thoala

1 raatha = 4 gau

1 faula = 28 raathaa

1 handharu = 4 faula = 112 raathaa

1 tanu = 20 handharu

Today, Maldivians commonly use SI units for both dry and liquid measure, which is an influence of the West. However, there is evidence of South Asian influence as well, on our dry and liquid measures. According to Maloney (1980), in Sri Lanka laahaa, which is similar to laahi, was a measure for paddy kept in the temple and nali, which is similar to naalhi, used by Indians was a container made from a section of bamboo. The word tanu most probably came from the word English word ton and gau is the Dhivehi word for stone.

## Time

As with other cultures, the day is divided into 24 hours. An hour is called gadi in Dhivehi, ghatikaa in Sanskrit and gadikai in Tamil (Maloney, 1980). The daylight hours are divided into four parts called dhan and hence each dhan equals to approximately three hours. Hindus divide the daylight hours into four parts while Sri Lankans divide it into 3 parts (Maloney, 1980). Further, Maldivians measure time according to the five daily prayers. A lot of Maldivians approximate time when they hear the bangi (call for prayers).

## 4. CULTURAL CONTEXTS WHERE MEASURING IS USED

As with other cultures, there are cultural contexts in the Maldivian culture where measuring is applied. These include boat building, building and construction, mat weaving, and rope making.

### 4.1 Boat Building

Boat building is a remarkable skill in Maldives. The boats or dhoni are made from coconut wood. The sizes of dhoni vary for different purposes and in different parts of Maldives. Boat builders stress that the actual size of the dhoni is an estimation made by the chief carpenter or boat builder. For instance, the size of two or more fishing boats made by the same boat builder might differ. When asked how they determine the length and width of the boat, some of the responses were:

The chief boat builder estimates the length and width. Hence, the sizes of the 'dhoni' vary [BB2].

The chief boat builder conceptualises the shape of the 'dhoni' [BB3].

Traditionally, the bark (vaka) from a tree called dhigga was used as a measuring tape when boat building, and charcoal was used to make marks on the wood. At present, measuring tapes and pencils are used instead of vaka and charcoal. However, still estimation is very important in boat building where the chief boat builder estimates how wide the dhoni should be. This shows that traditionally and at present, the shape, curvature and lines of a dhoni are in the chief builder's mind. There are no plans drawn at all in boat building. The builders under the guidance of the chief builder, first lay the keel and the cross frame. These determine the length and shape of a dhoni. They will then lay the planks for dhoni sides, each plank being curved individually to fit the cross-frame.

According to Maloney (1980), Maldivians may have learned boat building techniques from several different cultures. For instance, dhoni is Dravidian (Southern Indian) but also used in Indo-Aryan languages. However, I have not found any evidence in the literature or from the discussions that Maldivian boat building skills are linked to any other culture.

#### 4.2 Building and Construction

Traditionally, coral and sand are used for building and construction. Coral and sand are taken from the sea, and the coral is broken down to smaller pieces. Sacks and square tins (dabiya) are used to measure sand while well-like containers and dhoni are used to measure coral. For cement, powdered lime stone (uva) is used. Uva is made out of wood and coral mostly.

To make 'uva', first we dig a hole and then put wood inside in a circle and then put coral on top of the wood. Then soak a piece of cloth in kerosene and put that in the hole as well. Light the cloth to burn the coral and wood. This process will be continued for a day or sometimes for two days. The residue is 'uva' [BC3].

Dig a circular hole that is approximately 3 feet in height. Put coconut palm leaves at the very bottom, then wood and then coral. There will be two doors leading to the hole, so light a leaf of the coconut palm and put it through these doors. When the wood catches fire close these doors. The burning process will go on for 2 to 3 days. When the wood and coral have finished burning, spray water. Big holes will have about 40 'kandi' of 'uva'. A 'kandi' is approximately 18 'dabiya' [BC1].

Dabiyaa is used as a measurement for the mixture of uva and sand. When asked what was the ratio of sand and uva mixture, the responses were:

1 uva : 2 sand (veli) [BC1].

1 uva : 1 ½ sand [BC3].

1 moist uva : 4 sand [BC4].

Olanbu kurun is the Dhivehi word for levelling the wall. The builders explained how they level the wall and start building.



Stick a pole into the ground and put a string on the pole take the string up as you construct the wall [BC3].

To level first we stick a pole in the ground and put a string on the pole. Then we dig the ground about 6 inches or a 'kaivaiy' below ground level and then start constructing [BC3].

Even at present levelling is done the same way. However, instead of coral, cement rectangular blocks (bricks) are used mostly and instead of uva, normal cement is used. The blocks are about one foot in length and six inches in height and width. The ratio of the mixture used for these blocks is about one cement is to four sand and the same ratio is used for mixing cement and sand for construction.

#### 4.3 Mat Weaving

Mat weaving is a craft intricately performed in the Indian sub-continent (Forbes & Ali, 1980). In the Maldives, mats are usually woven by women and girls. Mats are woven from a grass called hau and from kashikeyo (screw pine) leaves. For mats made out of hau, the hau is harvested and is allowed to dry in small bundles. Once it is dry, the hau will be dyed before mat weaving can begin. The colours used for dyes are black, brown and yellow. Main components of black dye are leaves of midhili tree and bark of uni tree while it is dried and powdered bark of uni tree for brown dye and ground turmeric for yellow dye (Forbes & Ali, 1980; Shafeeg, 1988).

When asked how kashikeyo leaf mats were made, a mat weaver [MR1] explained:

Cut 'kashikeyo' leaves, tear it into strips and put the strips out in the sun. When the strips are a bit dry scratch the outer layer of the strip and let it dry again. Then again scratch the second layer and leave it to cool a bit so that the strips become soft. When weaving we put one strip on top of the other and so on. We just use our hands to weave, nothing else.

#### 4.5 Rope Making

Rope making is also carried out usually by women and girls in Maldives. For rope making, coconut husks are submerged in water for about two to three months. Then the husks are beaten with a wooden stick or mallet to separate the strands of coir. Wisps of the fibre are then laid up into double strands and rolled between the palms (Ministry of Fisheries and Agriculture, 1960; Shafeeg, 1988).

Submerge coconut husk (not dry) on the beach. After about 2 to 3 months when the husks are soft, we take them out and beat with a wooden stick called 'muguru' to separate the strands of coir. When the strands are cleaned we roll the rope [MR2].

To make rope, firstly submerge coconut husk (not dry) on the beach. When the husks are soft, we take it out and beat with a wooden stick to separate the strands of coir. Then we clean the strands using salt water and let them dry. When it is dry, we roll the rope [MR3].

Rope bundles are made up of foali or strands of rope. The thickness of strands of rope or foali varies depending on the purpose of rope-usage. The number of foali in a rope bundle varies. A

foali is approximately equal to a riyan (approximately equal to 27 inches) and is measured from toe up to a kaivay (approximately equal to nine inches) above knee.

## 5. SUMMARY

The five calendar systems, especially the nakaiy system, play a major role in Maldivian society as it is correlated with weather and hence with travelling back and forth from islands, fishing and agriculture. In addition, Maldivians developed strategies for measuring length, liquids, dry measure, weight, time, distance, area and volume, which is evident from the practical work people do in their day-to-day lives. However, as expected, almost all our measurement strategies have been influenced by South Asians, and also by Arabs and more recently by the West.

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