

sci.archaeology: Re: What is the first table (columns,rows) that had been discovered?

## Re: What is the first table (columns,rows) that had been discovered?

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**From:** stevewhittet ([whittet\\_at\\_adelphia.net](mailto:whittet_at_adelphia.net))

**Date:** 07/24/04

Date: Fri, 23 Jul 2004 21:56:37 -0400

"Jorn Barger" <[jorn@enteract.com](mailto:jorn@enteract.com)> wrote in message  
news:16e613ec.0407231332.26800deb@posting.google.com...  
> A year ago February, [hanan\\_cohen@fastmail.fm](mailto:hanan_cohen@fastmail.fm) (Hanan Cohen)  
> wrote in msg news:<[63c08e6a.0302191152.6ab93aaf@posting.google.com](mailto:63c08e6a.0302191152.6ab93aaf@posting.google.com)>  
> > I am looking for information on the first table (rows and columns)  
> > that had been discovered.

c 2600 BC in the Jemdet Nasr in Mesopotamia you have clay envelopes  
with writing listing the tokens within which are in the form of a table  
with the rows itemized list of tokens and the columns fields of numbers

<http://it.stlawu.edu/~dmelvill/mesomath/erbiblio.html#preOB>  
<http://it.stlawu.edu/~dmelvill/mesomath/erbiblio.html#genhist>

In Egypt c 1874 BC going by that date for the earliest tables in the  
mathematical papyri  
unless you want to count architectural proportions and inscription grids as  
tables

> > Where had it been found, to when is it  
> > dated, what's written on it, who has written it?  
> > The question popped up in my mind when I read Jorn Bargers' Timeline  
> > of knowledge-representation.  
> > <http://www.robotwisdom.com/ai/timeline.html>  
>  
> The answer is in "The History of Mathematical Tables"-- 2600 BC, in  
> Mesopotamia. It was a table of areas for square fields.

I can give you the values for square fields in any number of tables

These tables are copied into many other tables but the basic measure  
is a square 60' to a side. 3600 SF, 2304 SR, 2000 SC, 1444 SD,  
1296 SDS, 1225 SRC, 900 SDF, 400 SY, 144 SP, 100 SF,81 SC

If you put all those squares in a line you get a furlong/stadion/stadium/

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unit of march/iku.

<http://users.primushost.com/~whittet/measures.htm>

I have collected more information on this than any sane person would ever want to look at but bottom line the Egyptian minute of march the Greek Stadion, the Roman stadium and the English furlong are all the same unit of 185 m as close as can be measured

First some definitions of Mesopotamian units

gána, gán: tract of land, field parcel; (flat) surface, plane; measure of surface; shape, outline; cultivation (cf., iku) (cf., Orel & Stolbova #890, \*gan- "field") [GAN2 archaic frequency: 209].

gún, gú: land, region, district (gú, 'edge' + ùña, un, 'people, population').

bùr: a square surface measure = 6.48 hectares = 18 iku = 3 area ése = 1800 sar = the amount of land that supported a family (also cf., bùru) (from Akkadian buuru IV, "hunger", but cf., bii/eeru IV, "space, distance

Lets allow standards of measure could be considered a sort of table because of the necessary equivalences. Throughout history the iku, 3kr, are, acre have been related.

Fields are generally based on squares of 10, 60 or 100 cubits to a side, subdivided into rods or cords of ten cubits and multiplied into a long list of related units

Starting with Mesopotamia since the cubit originated in Sumer The great cubit (6 hands) is 600 mm, the ordinary cubit (5 hands) is 500 mm that's based on measures of the area of fields in Old Babylon. By Assyrian times there are variants based on multiples of the remen and the side of a cube which measures half a cubic cubit. (to double a cube of side 600 you measure by a side of 1.25 remen +/- 476.25 mm)

Both the foot and the remen, defined as the diagonal of a sq foot of 300 mm or 381 mm are common to Mesopotamia and Egypt.

In Egypt The basic unit seems to have been the royal cubit or "mh" that's based on 1 palm = +/- 18.75 mm so 7 palms = +/- 525 mm.

Another unit was the double remen or the diagonal of a square having sides of 1 cubit.

The remen (+/- 381 mm = 15" ) was essentially used for land measure.

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The main subdivision was the digit or "zebo" with 28 digits in a royal cubit

The "ordinary" cubit was 6 palms of +/- 450 mm.

For those who still think in inches, 1 royal cubit = 20.62 " ;

1 remen = 14.6 " or about and 1 short cubit = 17.67 "

1 digit or sb (= 18.75 mm)

4 digits = 1 palm or shp

5 digits = 1 hand (borrowed from Mesopotamia)

12 digits = 3 palms = 1 small span

14 digits = 1 large span or 1/2 royal cubit

24 digits = 6 palms = 1 ordinary or small cubit (= 450 mm)

28 digits = 7 palms = 1 royal cubit or "meh" (= 525 mm)

100 royal cubits = 1 "khet" (= 52.5 m) (decimal so a Greek unit)

120 khet = 1 "ater" (later called a "skhoinos")

There is an exception in Assyria : the cubit is thought to have 640 mm and the foot was 1/2 cubit.

digit, "shusi" or "uban" (+/- 17.67 mm)

5 uban = 1 "qat" (= 3.18 m)

6 qat = 1 "ammāt" or "kus" (cubit of 530 mm – 20.87 ")

6 ammat = 1 "qanu"

60 qanu = 1 "sos" (= 191 m – 209 yards)

30 sos = 1 "parasang" (later unit ?) (= 5724 m – 3.6 miles)

2 parasang = 1 "kapsu"

According to findings in Khorsabad, we get another scale :

the unit seems to have 275 mm (name unknown)

1/60 gives the "susi" (= 4.58 mm or about 1/4 digit)

6 units = 1 "qanu" (= 1.65 m – fathom ?)

12 units make for a "sa" (= 3.3 m)

60 sa = 1 "us" (= 198 m – 217 yards)

and 30 us = 1 "kasbu" (= 5940 m) which is not very different from the previous parasang.

Personal interpretation : we may assume a "palm" equal to 1/7 Assyrian cubit (640 / 7 = 91.43 mm)

The nameless unit would be 3 palms, and a palm contains 20 susi or 5 digits of 18.3 mm.

In Persia we had :

the cubit or "arasni" (520 to 543 mm)

1/2 cubit, "vitasti" or "charac"

2 cubits = 1 "guz"

360 cubits = 1 stadion or "asparsa" (187 to 195 m)

30 stadions = 1 "parathanka" (or parasang) (= 5610 to 5850 m)

there is also mention of a "mansion" equal to 80 000 Assyrian feet (=

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25.6 km)

Greece

generally a foot of 309 mm (12.16 ") subdivided into 16 digits and equal to 2/3 of a (small) cubit – take or leave 4 %.

There was also an older foot of 316 mm equal to 3/5 of a big cubit – 527 mm

1 digit or "daktylos" – plural : "daktyloi" (= 19.275 mm)  
2 digits = 1 "condylos"  
4 digits = 1 "palaiste"  
8 digits = 1 "dichas"  
12 digits = 1 "spithame"  
16 digits = 1 "pous" or foot – plural "podes" (= 308.4 mm)  
20 digits = 1 "pygon"  
24 digits = 1 "pechya" or small cubit  
40 digits = 1 "bema"  
72 digits = 4.5 feet = 1 "xylon"  
6 feet = 1 "orgyia" (or fathom – 1.85 m)  
10 feet = 1 "akaina"  
100 feet = 1 "plethron"  
600 feet or 6 plethra = 1 "stadion" (+/- 185 m)  
2 stadia = 1 "diaulos"  
6 diauloi = 1 "dolichos"  
there was also a "stathmos" and "mansion"

The Persian parasang was also adopted quite soon and seems to represent the distance walked in 1 hour.

The stadion – whatever its name – was quite widespread throughout antiquity. It is similar to the English furlong and close to 100 toises (fathoms) the optimal length for a plough furrow

Roman Empire

The foot was also widely used across Italy – estimated at 295 mm (11.6 ") give or take a few percents.

It is found also in Etruria. The system absorbed several units from conquered territories.

1 digit or "digitus" = 18.5 mm  
1 inch or "uncia" = 24.66 mm (inch derives from uncia, meaning 1/12 – same root as "ounce")  
4 digits or 3 inches = 1 small palm or "minor palmus"  
12 digits or 9 inches = 1 large palm or "major palmus"  
16 digits or 12 inches = 1 foot or "pes" (= 296mm)  
24 digits or 18 inches = 1 cubit or "cubitus"  
5 feet = 1 pace or "passus" – with its half = "gradus" and its quarter = "palmites"  
10 feet or 2 paces = 1 "decempeda"  
120 feet or 24 paces = 1 "actus"

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625 feet or 125 paces = 1 "stadium" (= 185m)

1000 paces or 8 stadia = 1 "milliarium" or "mille passus" (+/- 1480m)

Milliarium was actually the name of the military stones erected every 1000 paces along the Roman highways, to ease the localisation and the maintenance.

The name is, of course, at the origin of "mile".

when the Romans started to organize Northern Gaul and Germania, they used a "Drusian" or "Belgian" foot which was 2 digits longer, or 325 to 330 mm (12.9 ") – rather close to the feet of early medieval England.

Measures in the Bible

Essentially a composite of the neighbouring regions.

Originally, the cubit was used – the same as the royal cubit in Egypt. Later, the smaller cubit took over.

the digit or "esba" (18.75 mm)

4 digits = 1 palm or "tophah"

12 digits or 3 palms = 1 "zeret"

24 digits or 6 palms = 1 small cubit or "amma" (= 450 mm or 17.72 ")

7 palms = 1 old cubit

measures borrowed from the Greeks or the Romans (fathom-like, stadium, mille, parasang, ... whatever the name used in the translation.)"

You can see there is a relation between the use of unit fractions for making calculations and the standards of measure of Egypt Mesopotamia, Greece, and Rome

The earliest evidence I have for measured fields is the values given for fields in the Sumerian language which dates c 3400 –2600 BC although the copies which survive come from libraries dated c1800 BC

<http://www.sumerian.org/sumerlex.htm>

Whats sort of interesting is that if you establish a three dimensional coordinate

system of degrees of latitude and longitude and divide the equatorial circumference

of the earth into 360 degrees then each degree is 600 stadia with 600 x 185 m

being 111 km and 360 x 111 km being 39960 km

In Greek feet each stadia is 600 stadions of 600 feet of (+/-308.4mm) or 360000 Greek feet in a degree

thats a sexagesimal system

In Egyptian royal cubits its 350 royal cubits of (+/- 524mm) to a minute of

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march

thats a septenary system

In the Roman system each stadia is 600 stadiums of 625 feet of (+/-296 mm)

or

since there are 8 stadiums to a milliare there 75 milliare or 75000 paces to a degree

Further it works out that there are twice as many seconds in a century as there are

inches in the earths equitorial circumference and 365240 feet in a degree.

Somebody tabularized all that data so it worked out that way before anyone incorporated it in a standard of measure.

[http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Babylonian\\_and\\_Egyptian.html](http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Babylonian_and_Egyptian.html)

<http://www.scholars.nus.edu.sg/writing/ccwp10/benny/mesopotamian.htm>

[http://www-gap.dcs.st-and.ac.uk/~history/HistTopics/Babylonian\\_Pythagoras.html](http://www-gap.dcs.st-and.ac.uk/~history/HistTopics/Babylonian_Pythagoras.html)

>

> *Tables for accounting became common around 1800 BC.*

>> *120 mesopotamian royal cubits of 530 mm*

<http://users.aol.com/jackproot/met/antbible.html>

1 "ammatt" or "kus" (cubit of 530 mm – 20.87 ")

=====

"At the beginning of the nineteenth century it was determined that the Egyptian

royal cubit is 525 mm. and hence it was concluded that Eratosthenes calculated

by stadia of 300 Egyptian royal cubits. Newton too had tried quite successfully to

ascertain the length of the Egyptian royal cubit from the dimensions of the Great

Pyramid, in order to interpret Eratosthenes' datum.

=====

<http://users.aol.com/jackproot/met/antbible.html>

30 sos = 1 "parasang"

=====

<http://www.geocities.com/Athens/8744/herhist.htm>

"the nations whose territories are scanty measure them by the fathom;

those whose bounds are less confined, by the furlong;

those who have an ample territory, by the parasang;

but if men have a country which is very vast,

they measure it by the schoene.

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Now the length of the parasang is thirty furlongs,  
but the schoene, which is an Egyptian measure,  
is sixty furlongs. Thus the coastline of Egypt  
would extend a length of three thousand six hundred furlongs. "

=====

iF thirty furlongs or stadions, equal 30 sos, equal 1 parasang  
and the stadion is 600 short Greek feet of 308.4mm (Athens)  
or 625 Roman feet then the stadion or stadium or furlong or sos is 185m  
60 qanu = 1 "sos" so 1 ganu = 3084 mm = 10 Greek feet of Athens  
6 ammat = 1 "qanu" so 1 ammat = 514 mm  
30 uban or 6 qat = 1 "ammatt" or "kus" (cubit of 514 mm – 20.23")  
(thirty digits or six hands = 1 cubit)  
5 uban = 1 "qat" (= 85.67 mm)  
1 uban = 17.13 mm

In the case of Herodotus we are told it is the Egyptian measure.

A. A days march (1/6 degree)Mesopotamia  
(1/7 degree)Egypt 30,000 royal cubits  
an hours march (1/36 degree)Mesopotamia  
(1/35 degree)Egypt 6,000 royal cubits

B. A Days sail (1 degree)or 21000 royal cubits  
an hours sail (1 atur or 12,000 royal cubits)  
you go twice as fast on water as on land

=====

Here is a different calculation of units with the cubit at .5 m

Smallest unit of length is the she (barleycorn), of about 1/360 meter.

6 she=1 shu–si (finger)=500/30 = 16.67mm

30 shu–si=1 kush (cubit – about 1/2 m.)

6 kush=1 gi / qanu (reed)

12 kush=1 nindan/ GAR (rod – 6 m.)

10 nindan=1 eshe (rope)

60 nindan=1 USH (360 m.)

30 USH=1 беру (10.8 km.)

=====

>> 120 great cubits of 600 mm (30 uban of 20 mm)

Mesopotamian measures would be sexagesimal.

=====

[http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Babylonian\\_and\\_Egyptian.html](http://www-groups.dcs.st-and.ac.uk/~history/HistTopics/Babylonian_and_Egyptian.html)

"Perhaps the most amazing aspect of the Babylonian's calculating skills  
was their construction of tables to aid calculation.

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The Babylonians had an advanced number system, in some ways more advanced than our present system.

It was a positional system with base 60 rather than the base 10 of our present system.

Now 10 has only two proper divisors, 2 and 5. However 60 has 10 proper divisors so many more numbers have a finite form.

The Babylonians divided the day into 24 hours, each hour into 60 minutes, each minute into 60 seconds.

This form of counting has survived for 4000 years.

To write 5h 25' 30", i.e. 5 hours, 25 minutes, 30 seconds is just to write the base 60 fraction,  $5 \frac{25}{60} \frac{30}{3600}$  or as a base 10 fraction  $5 \frac{4}{10} \frac{2}{100} \frac{5}{1000}$  which we write as 5.425 in decimal notation.

Two tablets found at Senkerah on the Euphrates in 1854 date from 2000 BC. They give squares of the numbers up to 59 and cubes of the numbers up to 32. The table gives

$$82 = 1 \ 4 \text{ which stands for } 82 = 1 \ 4 = 1.60 + 4 = 64$$

and so on up to  $592 = 58 \ 1 (= 58.60 + 1 = 3481)$ .

One major disadvantage of the Babylonian system however was their lack of a zero.

This meant that numbers did not have a unique representation but required the context to make clear whether 1 meant 1, 61, 3601, etc.

The Babylonians used the formula

$$ab = ((a + b)^2 - a^2 - b^2)/2$$

to make multiplication easier. Even better is the formula

$$ab = (a + b)^2/4 - (a - b)^2/4$$

which shows that a table of squares is all that is necessary to multiply numbers, simply taking the difference of two numbers that were looked up in the table.

Division is a harder process. The Babylonians did not have an algorithm for long division. Instead they based their method on the fact that

$$a/b = a \cdot (1/b)$$

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so what was necessary was a table of reciprocals. We still have their reciprocal tables going up to the reciprocals of numbers up to several billion. Of course the tables are in their number notation, but translating into our notation, but leaving the base as 60, the beginning of one of their tables would look like

2 30  
3 20  
4 15  
5 12  
6 10  
8 7 30  
9 6 40  
10 6  
12 5  
15 4  
16 3 45  
18 3 20  
20 3  
24 2 30  
25 2 24  
27 2 13 20

Now the table had gaps in it since 1/7, 1/11, 1/13, etc. do not have terminating base 60 fractions.

This did not mean that the Babylonians could not compute 1/13, say. They would write

$$1/13 = 7/91 = 7.(1/91) = (\text{approx}) 7.(1/90)$$

and these values were given in the tables."

=====

their cubit could be divided by fingers and hands and that five hands would be 25 fingers and six hands would be thirty fingers.

what is the value of the finger used.

In order to determine that I suggest we look at the value of the cubit in terms of the unit fractions used in several different cultures and see how many fingers, palms or hands that unit was divided into.

19.22

value 20mm 18.75mm 18.487mm 18.487mm 19.05mm

Unit Mesopotamia Egypt Greece Rome England

fingers 15 16 16 16 16

palm 4 4 4 4

hand 3

foot 300mm 300mm 308.4mm 296mm 304.8mm

17 fingers 316mm 314.1428mm

18 f (remen) 360mm

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19 fingers 365.24 mm  
cubit  $3/5 \ 2/3 \ 2/3 \ 2/3$  yard  
great cubit  $1/2 \ 4/7$  rc  $1/6$  orgia  $1/5$  passus  $1/6$  fathom

note that dividing by hands and palms results in different unit fractions

=====

<http://www.interpres.cz/metrolog/measures/stereometric.htm>

that the people of Mesopotamia conceived of units of volumes as cubes, whether they were as small as a shekel or as large as a cubic iku. When units had a size such that they could not be constructed as cubes with an edge measured in round numbers, they conceived of them as near-cubes, that is, as cubes increased or decreased in height.

=====

that rulers may have been used with unit fractions as a sort of slide rule or if you prefer a table of values.

a site which gives evidence that there was a cubit of 28 fingers in use in ancient Babylon.

=====

<http://www.fordham.edu/halsall/ancient/greek-babylon.html>

"The following is a description of the place: The city stands on a broad plain, and is an exact square, a hundred and twenty furlongs in length each way, so that the entire circuit is four hundred and eighty furlongs. While such is its size, in magnificence there is no other city that approaches to it. It is surrounded, in the first place, by a broad and deep moat, full of water, behind which rises a wall fifty royal cubits in width, and two hundred in height.

(The royal cubit is longer by three fingers' breadth than the common cubit.)"

We know the royal cubit of Egypt was longer by three fingers than the ordinary cubit of mesopotamia, but we also know the fingers that were used by these two cultures were different.

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<http://www.columbia.edu/~rcc20/ppedit.html>

you can go to this site and compare the value of different unit fractions of an area called the aroura by the Greeks in Egypt.

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=====  
Perhaps standards of measure were more widely influential than the kings that decreed them, but establishing that takes a lot of research.

First you need a reason that standards of measure would be widespread. I think that reason is trade. Rulers, rods, weights and measures needed to avoid any bronze age equivalent of the infamous hanging chads.

When you compare the standards of measures from different places and find they are even unit fractions of one another its reasonable to ask why.

<http://users.aol.com/jackproot/met/antbible.html>

Measures of length may have been derived from land measures but their subdivisions were related to if not derived from the human body.

- the digit (width of the forefinger – in Latin digitus = finger)
- the inch (width of the thumb)
- the foot
- the cubit (theoretically the distance between the elbow and the middle finger)
- the pace (or double step)
- the fathom (finger–tip to finger–tip with arms outstretched)

#### Egypt

The basic unit seems to have been the royal cubit or "meh" estimated at 524 mm.

Another unit was the double remen or the diagonal of a square having sides of 1 cubit.

The remen (+/- 371 mm) was essentially used for land measure.

The main subdivision was the digit or "zebo" with 28 digits in a cubit and about 40 in a double remen.

There was indeed another "ordinary" cubit of 450 mm.

For those who still think in inches, 1 royal cubit = 20.62 " ;  
1 remen = 14.6 " or about and 1 short cubit = 17.67 "

- 1 digit or zebo (= 18.7 mm)
- 4 digits = 1 palm or shep
- 5 digits = 1 hand
- 12 digits = 3 palms = 1 small span
- 14 digits = 1 large span or 1/2 royal cubit
- 24 digits = 6 palms = 1 ordinary or small cubit (= 450 mm)
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- 100 royal cubits = 1 "khet" (= 52.4 m)

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120 khet = 1 "ater" (later called a "skhoinos") (+/- 6288 m)

There is an exception in Assyria : the cubit is thought to have 640 mm and the foot was 1/2 cubit.

digit, "shusi" or "uban" (+/- 17.67 mm)

5 uban = 1 "qat" (= 3.18 m)

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100 feet = 1 "plethron"  
600 feet or 6 plethra = 1 "stadion" (+/- 185.4 m)  
2 stadia = 1 "diaulos"  
6 diauloi = 1 "dolichos"

there was also a "stathmos", poorly defined – estimated by some authors as 25.8 km (16 miles) – is it another name for "mansion" ?

The Persian parasang was also adopted quite soon and seems to represent the distance walked in 1 hour.

The stadion – whatever its name – was quite widespread throughout antiquity. It is similar to the English furlong and close to 100 toises (fathoms) the optimal length for a plough furrow

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625 feet or 125 paces = 1 "stadium" (= 184.4 m)  
1000 paces or 8 stadia = 1 "milliarium" or "mille passus" (+/- 1475 m)

Milliarium was actually the name of the military stones erected every 1000 paces along the Roman highways, to ease the localisation and the maintenance.

The name is, of course, at the origin of "mile".

when the Romans started to organize Northern Gaul and Germania, they used a "Drusian" or "Belgian" foot which was 2 digits longer, or 325 to 330 mm (12.9 ") – rather close to the feet of early medieval England.

#### Measures in the Bible

Re: What is the first table (columns,rows) that had been discovered?

sci.archaeology: Re: What is the first table (columns,rows) that had been discovered?

Essentially a composite of the neighbouring regions.

Originally, the cubit was used – the same as the royal cubit in Egypt. Later, the smaller cubit took over.

the digit or "esba" (18.75 mm)

4 digits = 1 palm or "tophah"

12 digits or 3 palms = 1 "zeret"

24 digits or 6 palms = 1 small cubit or "amma" (= 450 mm or 17.72 ")

7 palms = 1 old cubit

measures borrowed from the Greeks or the Romans

(fathom-like, stadium, mille, parasang, ... whatever the name used in the translation.)"

You can see there is a relation between the use of unit fractions for making calculations and the standards of measure of Egypt Mesopotamia, Greece, and Rome

If you want book cites "The World of Measurements" H. Arthur Klein is a good one.

You can start with the ancient sources, classic authors like Herodotus who mention one unit in comparison to others or work off of what modern archaeologists have measured in the way of artifacts found in their digs.

A cube with a side of 1 Greek foot. 316 mm = 12.44" = 1925 cu in contained 7 BIG. That's the foot that turns up most commonly in cubic measures. if we dispute that all we need do is run the numbers.

A cube formed on the side of a long Greek foot of 331 mm is one bushel

To derive the cubit of 530 mm from the short Greek foot once again we run the numbers. The same is true for the Mesopotamian wheat cubit of 600 mm

A field laid out with a side of 120 cubits of 530 mm is one acre

A cubit of 600 mm or 2 feet has a cube of 13181 cu in and contains 48 BIG

>There were very different Greek feet, from the Macedonian foot >measuring 27.9 centimeters

=====  
279 mm (or 11")

=====  
>to the Ionian foot measuring 34.83 centimeters.

=====

Re: What is the first table (columns,rows) that had been discovered?

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<http://www.fordham.edu/halsall/ancient/greek-babylon.html>

"The artaba is a Persian measure, and holds three choenixes more than the medimnus of the Athenians."

[http://perseus.csad.ox.ac.uk/cgi-bin/ptext?](http://perseus.csad.ox.ac.uk/cgi-bin/ptext?doc=Perseus%3Aabo%3Atlg%2C0016%2C001&query=1%3A192%3A1)

[doc=Perseus%3Aabo%3Atlg%2C0016%2C001&query=1%3A192%3A1](http://perseus.csad.ox.ac.uk/cgi-bin/ptext?doc=Perseus%3Aabo%3Atlg%2C0016%2C001&query=1%3A192%3A1)

The Attic medimnus = about 12 gallons;  
it contained 48 choenixes.

Ancient measures of volume were the cube of units of length  
(You can refer to my previous posts for the discussion of why.)

12 American gallons = 231 cu in x 12 = 2772 cu in  
If measured in american gallons the choenixes was  
 $2772/48 = 57.75$  cu inches. 1 quart = 57.749 cu in

The artaba holds 3 choenixes more  
so it is 2945.25 cu inches or 51 quarts.

This cube has as its side a measure of one remen. 14.4", 364 mm

We know that the firkin and the metrete are related  
to the British Imperial Gallon (277.42 cu in) so that  
 $9 \text{ BIG} = 1 \text{ firkin} = 2496.78 \text{ mm}$ ; its side is  $13.57" = 344.58 \text{ mm}$

This is sometimes called the bath which was a Hebrew unit of measure

regards,

steve