



	3200 BCE	3000 BCE	2400 BCE	1000 BCE
sag 'head'				
gin 'to walk'				
šu 'hand'				
še 'barley'				
ninda 'bread'				
a 'water'				
ud 'day'				
mušen 'bird'				

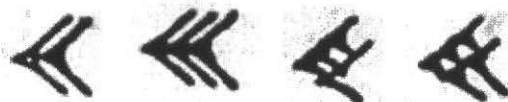
In the basic sexagesimal system used for counting most discrete objects, a single object, a sheep or cow or fish, is denoted by a small cone. Ten cones equaled one small circle, six small circles equaled one big cone, ten big cones equaled a big cone with a circle inside it, six of those was a large circle and ten large circles was given by a large circle with a small circle inside. This last unit was then worth  $10 \times 6 \times 10 \times 6 \times 10 = 36000$  base units. Note that the circle and "cone-shape" could be easily made by a stylus pressing on the clay, either vertically for the circle or at an angle for the cone.

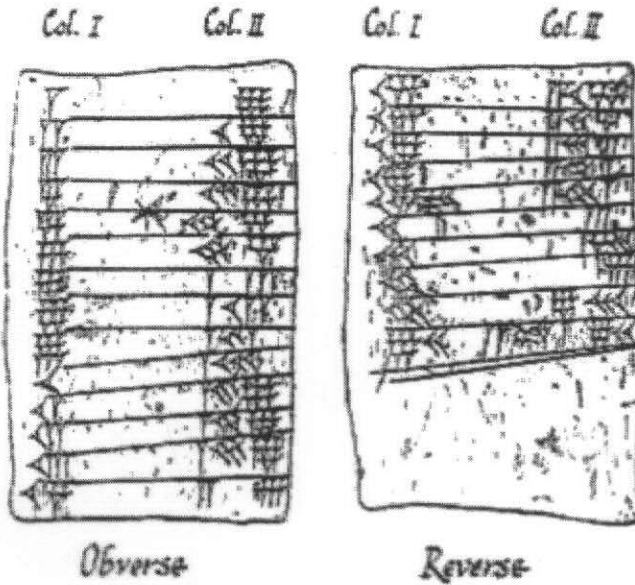


numbers 2 through 9 were written by combining multiples of a single stroke:



The number 10 was written in a single character  and the numbers 20 to 50 were written with multiples of this character:





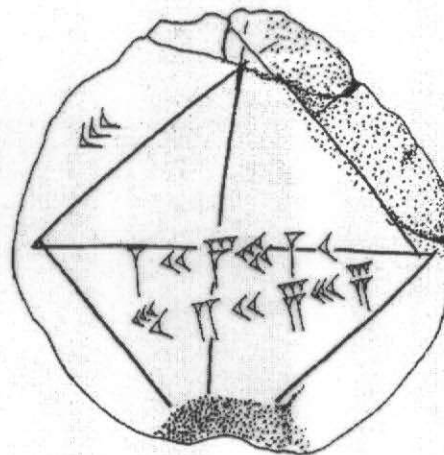
1	9
2	18
⋮	
⋮	
9	81 = 1,21
10	90 = 1,30
11	99 = 1,39
12	108 = 1,48
13	117 = 1,57
14	126 = 2,6
- - -	
20	180 = 3,0
30	270 = 4,30
40	360 = 6,0
50	450 = 7,30

## YBC 7289

The famous 'root(2)' tablet from the Yale Babylonian Collection.



Copyright: Yale Babylonian Collection



Copyright: A. Aaboe

$1,24 = 1.4 = 1 + \frac{24}{60}$   
 $1,24,51 = 1.41416$   
 $1,24,51,10 = 1.41421$   
 30 times this: 42.4264  
 or  $42 + \frac{25}{60} + \frac{35}{60^2}$

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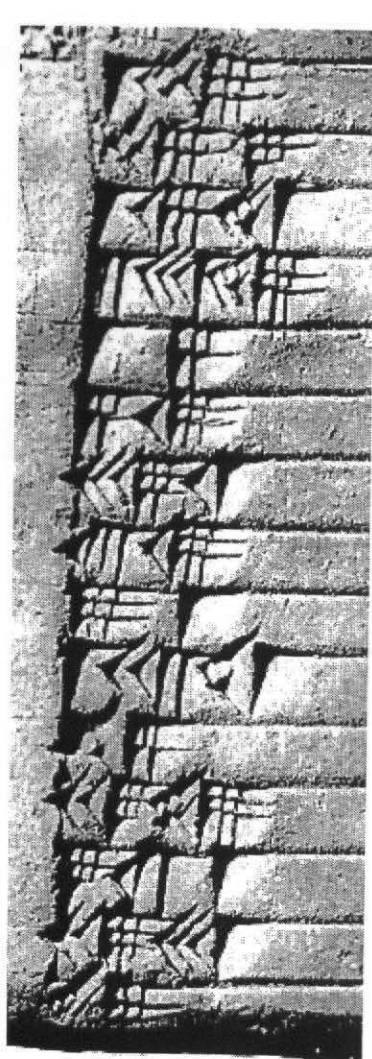
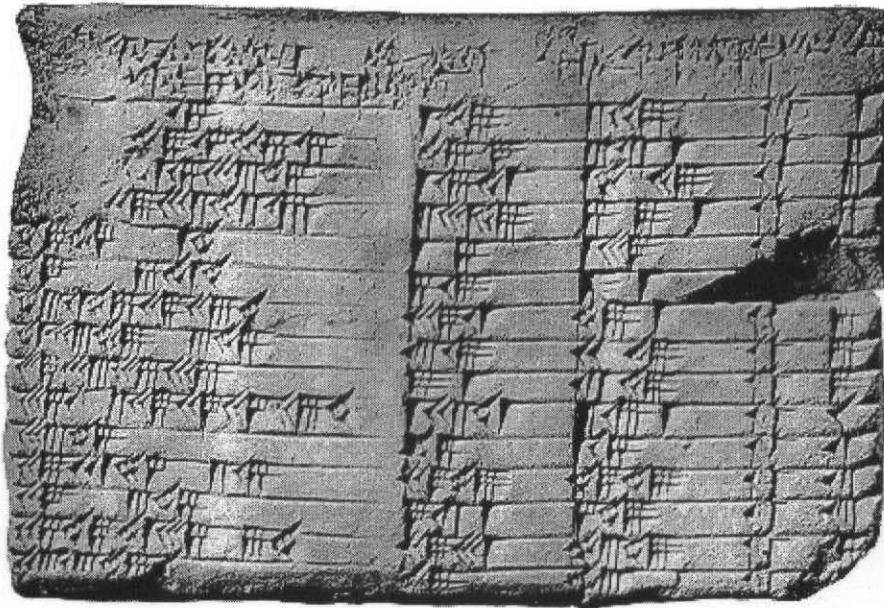
Notice that

$$\frac{1}{\sqrt{2}} = 0.707106 = 0,42,25,35$$

up to 6 decimal places

This tablet is a round school tablet of unknown provenance from the Old Babylonian period. It has a picture of a square with both diagonals drawn in. On one side of the square is written the number 30, along one of the diagonals is the number 1,24,51,10 and below it is 42,25,35.

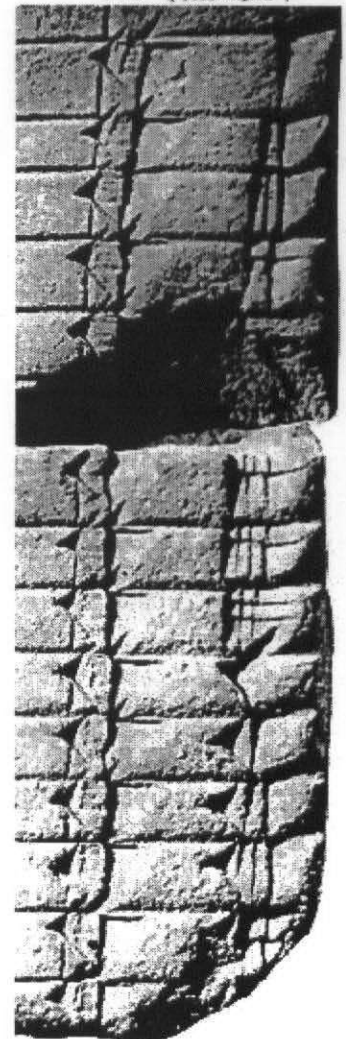
# The Babylonian tablet Plimpton 322



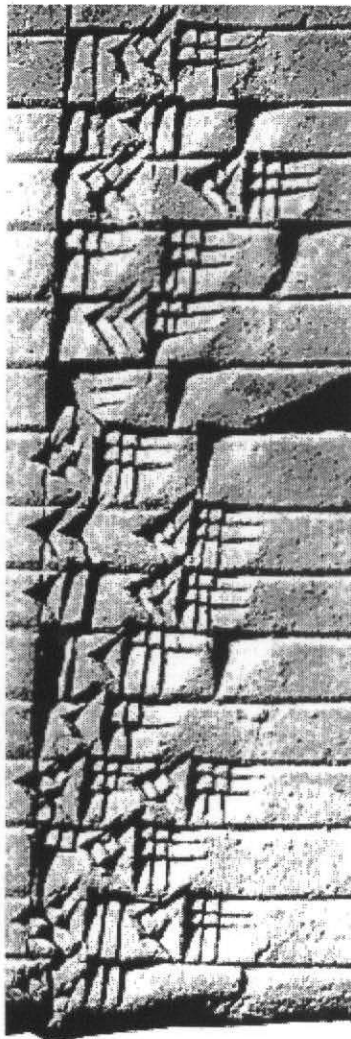
"width"

1,59	119
56,7	3367
1,16,41	4601
3,31,49	12709
1,5	65
5,19	319
38,11	2291
13,19	799
9,1 [8,1]	541[481]
1,22,41	4961
45	45
27,59	1679
7,12, 1 [2,41]	25921[161]
29,31	1771
56	56

"ki" (number)

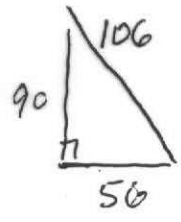
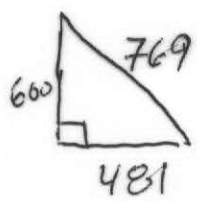
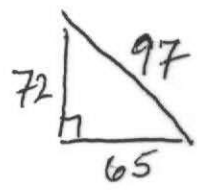
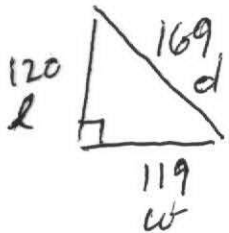


- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15



"diagonal"

2,49	169	$169^2 - 119^2 = 120^2$
3,12,1 [1,20,25]	11521 [4825]	
1,50,49	6649	
5,9,1	18541	
1,37	97	$97^2 - 65^2 = 72^2$
8,1	481	
59,1	3541	
20,49	1249	
12,49	769	$769^2 - 481^2 = 600^2$
2,16,1	8161	
1,15	75	
48,49	2929	
4,49	289	
53,49	3229	
53 [1,46]	53 [106]	$106^2 - 56^2 = 90^2$



$$\frac{d}{l} = \frac{169}{120} = 1.408$$

$$\left(\frac{169}{120}\right)^2 = 1.9834\dots$$

$$= 1,59,0,15$$

$$\left(\frac{d}{l}\right)^2 = \left(\frac{769}{600}\right)^2$$

$$= 1.6427$$

$$= 1,38,33,36,36$$

$$\left(\frac{d}{l}\right)^2 = \left(\frac{106}{90}\right)^2$$

$$= 1.38716$$

$$= 1,23,13,46,40$$

1,59,0,15	1.9834 ...
1,56,56,58,14,50,6,15	1.94916 ...
1,55,7,41,15,33,45	1.9188 ...
1,53,10,29,32,52,16	1.88625 ...
1,48,54,1,40	1.81501 ...
1,47,6,41,40	1.78519 ...
1,43,11,56,28,26,40	1.71998 ...
1,41,33,59,3,45	1.6928 ...
1,38,33,36,36	1.64267 ...
1,35,10,2,28,27,24,26	1.58612 ...
1,33,45	1.5625 ...
1,29,21,54,2,15	1.48942 ...
1,27,0,3,45	1.45002 ...
1,25,48,51,35,6,40	1.43024 ...
1,23,13,46,40	1.38716 ...

## What it means

Following perhaps the hints given by the words *diagonal* and *width*, <sup>1945</sup> Neugebauer and Sachs discovered that if  $w$  is the entry in the second column and  $d$  is the entry in the third column, then in all but a few cases  $d^2 - w^2$  turned out to be a perfect integer square  $l^2$ . In other words, assuming the exceptions to be caused by error, this table contains part of a list of Pythagorean triples, that is to say integers  $w, l, d$  with

$$w^2 + l^2 = d^2$$

which form the sides of right triangles. Here is the resulting table of calculations, in modern notation (with discrepancies in square brackets):