

Numbers in Ancient Babylon

In the distant past, as cultures advanced in the development of agriculture and trade, it became necessary to have a written language and numeration systems to help people keep accurate accounts, calculate taxes, and keep track of livestock, grain, and other goods. It took thousands of years to create writing symbols and rules for counting.

The people of Sumer and Babylon (who lived in the area now known as Iraq in the Middle East) were probably the first people to develop a written number system in 3100 BC. They recorded numbers by pressing the differently-shaped symbols into clay tablets. The Babylonian number system was fairly simple, because it only used two symbols: a pointed down wedge for 1 and a pointed to the left wedge for 10.

1  10 

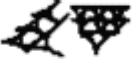
Here are Babylonian numbers from 2 to 9:

2 	6 
3 	7 
4 	8 
5 	9 

These are Babylonian numerals 10, 20, 30, 40, 50:

For example, to write numbers 13 or 47, both kinds of wedged symbols were combined in one expression:

13  47 

Babylonians did not have a symbol for "Zero," so they used an empty space to represent zero in their writing.

The Babylonians had a calendar, with the days divided into 24 hours, where each hour was divided into 60 minutes, and each minute was divided into 60 seconds. This form of counting survived for 4000 years and is still used today all over the world.

Ancient Babylonians used a what's called a sexagesimal (or base 60) number system as opposed to the base 10 system used today. In a base 60 system, all the numbers are categorized in groups of 60s. This means that whenever a unit of a number is moved to the left, its value increases by a factor of 60.

Today's Base 10 system

units are 1 - 9
tens are 10, 20, 30, ..., 90
hundreds are 100, 200, ..., 900
etc

Babylonian Base 60 system

units are 1 - 59
sixties are 60, 120 (60 x 2), 180 (60 x 3), ..., 60 x 59
(sixties) squared = 3600s are 3600, 7200, ... 360 x 59
etc

I.e. a four digit number in Base 10 system is represented by:

thousands hundreds tens units = 1000 100 10 1 = 10 x 10 x 10, 10 x10, 10. 1

For example, $3247 = 3\ 2\ 4\ 7 = 3 \times 1000 + 2 \times 100 + 4 \times 10 + 7 \times 1 = 3000 + 200 + 40 + 7$

In Babylonian system, a four digit number would be represented by

$60 \times 60 \times 60\ 60 \times 60\ 60\ 1 = 216000\ 3600\ 60\ 1$

Here is the numbers 647, 3571, and 12345 in Babylonian numerals:



To convert 647 from Base 60 to Base 10, make a chart:

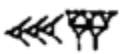
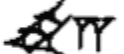
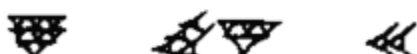
<u>60</u>	<u>1</u>	
6	47	
$6 \times 60 = 360$	$47 \times 1 = 47$	Adding these: $360 + 47 = 407$ in base 10

Similarly, converting 3571 to Base 10, we get:

<u>$60 \times 60 = 3600$</u>	<u>60</u>	<u>1</u>	
3	57	1	
$3 \times 3600 = 10800$	$57 \times 60 = 3420$	$1 \times 1 = 1$	Adding these: $10800 + 3420 + 1 = 14221$ in base 10

Exercises:

1. Complete the table below. Decipher the given Babylonian numerals and write them in standard form:

Babylonian Numerals	Written in Standard Form
	3
	35
	
	
	
	
	
	

2. Complete the table. Covert the following base 60 numbers into base10 numbers:

Base 60	Base 10
652 → 6 52	$(6 \times 60) + (52 \times 1) = 360 + 52 = 412$
1145 → 11 45	
965 → 9 6 5	
3279 → 3 27 9	
854123 → 8 5 41 23	
568 → 56 8	
5455 → 54 55	
1234567 → 12 34 56 7	