

DSA
 Alternate Base Systems
 for Cross-Curricular Fun & Engineering Applications

OVERVIEW OF WHAT BASES ARE: BABYLONIAN SEXAGESIMAL

DESCRIPTION OF THE BABYLONIAN SEXAGESIMAL BASE:

A Sexagesimal base-60 system was developed by the Babylonian people who lived near the ancient Tigris and Euphrates Rivers, in what is now Iraq. They utilized a system of writing called Cuneiform in which a specially wedge-ended stick made of reed called a stylus was poked into wet clay to make marks. Unlike our number system, the Babylonians only had two symbols. Like our system, the location of the symbols determined their value. The Babylonian base-60 notation is really a mixed- or dual-base system because decimal 10's are used repeatedly, instead of using 60 distinct symbols, one for each number. A Babylonian "ner" was 600 and a "sar" was 3600.

HISTORY OF THE BABYLONIAN BASE:

The Babylonian sexagesimal system is found on ancient clay tablets which reveal that the number system was used to record financial transactions for goods and merchandise, dates, mathematical and astronomical observations. They did not have a zero but they used a space or a (to denote where there was an empty place-value. They did not have any specific symbol to identify whether a number was greater or less than one. Today we use special symbols to represent fractions of whole numbers (ex. they did not have a . or radix to denote fractions of whole numbers ex. 3.1415).

𐎶 1	𐎶𐎶 11	𐎶𐎶𐎶 21	𐎶𐎶𐎶𐎶 31	𐎶𐎶𐎶𐎶𐎶 41	𐎶𐎶𐎶𐎶𐎶𐎶 51
𐎷 2	𐎷𐎶 12	𐎷𐎶𐎶 22	𐎷𐎶𐎶𐎶 32	𐎷𐎶𐎶𐎶𐎶 42	𐎷𐎶𐎶𐎶𐎶𐎶 52
𐎸 3	𐎸𐎶 13	𐎸𐎶𐎶 23	𐎸𐎶𐎶𐎶 33	𐎸𐎶𐎶𐎶𐎶 43	𐎸𐎶𐎶𐎶𐎶𐎶 53
𐎹 4	𐎹𐎶 14	𐎹𐎶𐎶 24	𐎹𐎶𐎶𐎶 34	𐎹𐎶𐎶𐎶𐎶 44	𐎹𐎶𐎶𐎶𐎶𐎶 54
𐎺 5	𐎺𐎶 15	𐎺𐎶𐎶 25	𐎺𐎶𐎶𐎶 35	𐎺𐎶𐎶𐎶𐎶 45	𐎺𐎶𐎶𐎶𐎶𐎶 55
𐎻 6	𐎻𐎶 16	𐎻𐎶𐎶 26	𐎻𐎶𐎶𐎶 36	𐎻𐎶𐎶𐎶𐎶 46	𐎻𐎶𐎶𐎶𐎶𐎶 56
𐎼 7	𐎼𐎶 17	𐎼𐎶𐎶 27	𐎼𐎶𐎶𐎶 37	𐎼𐎶𐎶𐎶𐎶 47	𐎼𐎶𐎶𐎶𐎶𐎶 57
𐎽 8	𐎽𐎶 18	𐎽𐎶𐎶 28	𐎽𐎶𐎶𐎶 38	𐎽𐎶𐎶𐎶𐎶 48	𐎽𐎶𐎶𐎶𐎶𐎶 58
𐎾 9	𐎾𐎶 19	𐎾𐎶𐎶 29	𐎾𐎶𐎶𐎶 39	𐎾𐎶𐎶𐎶𐎶 49	𐎾𐎶𐎶𐎶𐎶𐎶 59
𐎿 10	𐎿𐎶 20	𐎿𐎶𐎶 30	𐎿𐎶𐎶𐎶 40	𐎿𐎶𐎶𐎶𐎶 50	

USE OF THE BABYLONIAN SEXAGESIMAL BASE:

The Babylonian sexagesimal system is the basis of our culture's use of 360 degrees in a circle, our system of time (60 minutes, 60 seconds) and our system of (Degrees which are composed of 60 minutes, and minutes which are composed of 60 seconds). Today when we represent numbers in other bases we use the comma or , as a way to show place-value. See Question 2. below.

EXAMPLES:

Here is a number in base-10: 201.
 What does it mean? It means:
 two one-hundreds,
 zero tens, and
 one one.

What does this base-10 number, 201, equal in the Babylonian base-60 system?
 It is _____. What does it mean? It means
 Three sixties:
 Two tens:
 and a single one:

QUESTIONS:

1. What symbols do we use today to designate fractions of time? Fractions of degrees?
2. Can you write the following in base 10 then draw them in Babylonian sexagesimal numbers?
 $5 \times 10^3 + 8 \times 10^2 + 3 \times 10 + 4 =$ what in base 10? _____
 $5 \times 10^3 + 8 \times 10^2 + 3 \times 10 + 4 =$ what in Babylonian base-60 (use space on the back please)