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The Babylonian Number System

Essential Questions:
Why did the Babylonians use a number system based on 60 instead of 10? How did the Babylonian number system work? How was the Base 60 number system different from a Base 10 number system?

Why this topic?
As a social studies teacher, I often have to teach about the early civilizations that developed in Mesopotamia. The Sumerians and Babylonians are two of the civilizations that we have covered in class. As part of this unit, I cover the cuneiform language of these civilizations. A favorite activity of my students is to make clay tablets and to write stories in the soft clay in cuneiform using a stylus. I have always known that the Babylonians had a sexagesimal number system, but I have never fully understood how it worked. Therefore, the main reason that I have choosen this topic is to gain an understanding of how it worked, and to develop lessons on Babylonian mathematics that I can incorporate into the social studies curriculum.
Findings:
My first question as to why the Babylonians adopted a number system based upon sixty proved to be
difficult to answer. One can see how a base 10 system would originate from the fact that a human has
10 fingers, or how a base 20 system would originate from 20 fingers and toes. It is not as easy to see
the importance of the number sixty. It is clear that the Babylonians inherited this system from the
Sumerians, but why any of the ancient civilizations chose sixty as a base is a bit of a mystery. Some
historians have argued that the number sixty has many factors such as 1,2,3,4,5,12, 15, 20, 30, and 60.
Having so many factors has made sixty a number that is easy to divide into amounts. Apparently, the
system of weights and measures in the Fertile Crescent civilizations relied upon the fraction amounts
of 1/3 and 2/3. This would make the number sixty easy to manipulate when calculating amounts of
grain that the ancients used as currency for barter. Others argue that there were about 360 days in a
year and that this would account for using 60. Still others argue that using the division of each finger
into three sections could allow a person to count to sixty. Nevertheless, there is no clear explanation
why the civilizations of Mesopotamia used sixty as a base.
My next task was to gain an understanding of how a base sixty number system worked. I first
discovered that the Babylonians used only two cuneiform symbols to arrange into fifty-nine base units.
(See chart below)
The Babylonians then used a positional number system like we have today to arrange the numbers into columns. Therefore, the idea of place value is an ancient one. The first column was the unit column.
and contained any of the fifty-nine base units. This is exactly the way that we arrange numbers today, but we use ten different units for the first column – 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9 – instead of 59 different unit symbols. The next column contained multiples of 60. If one put the Babylonian symbol for one in this column, it had the value of 60, and if one put the symbol for two, it had the value of 120. This pattern would continue for all of the 59 unit symbols. The third column represented $60^2$ or 3600. Again, placing the symbol for one in this column represented 3600. Placing the symbol for two in this column represented 7200 and so on. Once I understood that the Babylonians used a positional system using powers of sixty rather than ten, I was able to easily interpret the meaning of this number system.

In looking at the differences between a base 10 and base 60 number system, I actually found more similarities than differences. Both systems rely upon different symbols to represent numeric values. Both systems are positional as where a symbol is placed in a column corresponds to its value. Also, both systems use powers of their base to increase value from column to column. The main difference would be that the Babylonians used two triangular or wedge-shaped symbols to create 59 base units where as we have 10 different symbols for base numeric values. Needless to say, calculating multiples
of sixty and multiples of 10 in the left-hand columns also is a major difference between the two systems.

Other Questions Raised:
In researching the Babylonian number system, I realized that the legacy of the base 60 number system can still be seen today. Every hour is divided into sixty minutes and every minute is divided into sixty seconds because of this system. Also, we divide a circle into 360 degrees. Because of this,
we still use this ancient number system to some degree. Also, I began to think about other number systems available today. The binary code that computer programmers use would be an example of a base two number system.

**Middle School Connections:**
I intend to use my knowledge of the Babylonian number system to teach my students how this unique system worked and how it is similar and different from our own positional system. My students will learn the different symbols for the 59 units in the Babylonian system, and students will learn to write these symbols on clay tablets in their correct positional format. I may also have
students do some basic adding and subtracting of the number to further gain an appreciation of the mathematical knowledge of ancient civilizations.
Bibliography


