The Mayan System of Counting

The Maya were a civilisation living in Central America from about 1800BC until mysteriously disappearing around 900AD. By the time their work in Mathematics was discovered, European mathematicians had discovered the use of place as well

The Mayan number system dates back to the fourth century AD and was approximately 1,000 years more advanced than the Europeans of that time. This system is unique to our current decimal system, which has a base 10, in that the Mayan's used a vigesimal system, which had a base 20. This system is believed to have been used because, since the Mayan's lived in such a warm climate and there was rarely a need to wear shoes, 20 was the total number of fingers and toes, thus making the system workable. Therefore two important markers in this system are 20, which relates to the fingers and toes, and five, which relates to the number of digits on one hand or foot.

The Mayan system used a combination of two symbols. A dot (•) was used to represent the units (one through four) and a dash (—) was used to represent five. It is thought that the Mayan's may have used an abacus because of the use of their symbols and, therefore, there may be a connection between the Japanese and certain American tribes. The Mayan's wrote their numbers vertically as opposed to horizontally with the lowest denomination on the bottom. Their system was set up so that the first five place values were based on the multiples of 20. They were 1 (20^0), 20 (20^1), 400 (20^2), 8,000 (20^3), and 160,000 (20^4). In the Arabic form we use the place values of 1, 10, 100, 1,000, and 10,000. For example, the number 241,083 would be figured out and written as follows:

Mayan Numbers	Place Value	Decimal Value
•	1 times 160,000	= 160,000
══	10 times 8,000	= 80,000
••	2 times 400	= 800
•••• ══	14 times 20	= 280
•••	3 times 1	= 3

Table 1 The Mayan place system

This number written in Arabic numerals would be 1.10.2.14.3.

The Mayan's were also the first to symbolize the concept of nothing (or zero). The most common symbol was that of a shell (⬭) but there were several other symbols (e.g. a head). It is interesting to learn that with all of the great mathematicians and scientists that were around in ancient Greece and Rome, it was the Mayan Indians who independently came up with this symbol which usually meant completion as opposed to zero or nothing.

In the next table are represented some Mayan numbers. The left column gives the decimal equivalent for each position of the Mayan number. Remember the numbers are read from bottom to top. Below each Mayan number is its decimal equivalent.

8000						•••
400			•	•	••	• —— ——
20	•	••	••	——	•• —	⬯
units	⬯	⬯	——	••• —	••• —— —	•••• ——
	20	40	445	508	953	30,414

Table 2 Representation of Several Mayan Numbers

It has been suggested that counters may have been used, such as grain or pebbles, to represent the units and a short stick or bean pod to represent the fives. Through this system the bars and dots could be easily added together as opposed to such number systems as the Romans but, unfortunately, nothing of this form of notation has remained except the number system that relates to the Mayan calendar.

As a footnote, the 360 day calendar also came from the Mayan's who actually used base 18 when dealing with the calendar. Each month contained 20 days with 18 months to a year. This left five days at the end of the year which was a month in itself that was filled with danger and bad luck. In this way, the Mayans had invented the 365 day calendar which revolved around the solar system.

There were two reasons why the Mayan's use of the place system and zero was not more prominent in our history:

1. There did not seem to be much use of numbers other than in practical areas of commerce and calendars.
2. The fact that they were so isolated – by the time western civilisation encountered the Mayans the place system was established, even though Europe was a millennium behind.

We have now covered mathematics of several early non-European civilisation. Next time we will cover a brilliant European prodigy who provided important aspects of mathematics as a more or less spare time activity.