# Aztec Number System

When Christopher Columbus landed in the Americas in 1492 the Aztecs of Mexico were a dominant native culture who had developed from a wandering band of people who called themselves *Mexica*. In 1325, they established a base in Tenochtitlan, now known as Mexico City. As their culture gained dominance in the region, they ventured onto foreign territory and took over other societies. For the most part, they left rulers in place as long as they paid tribute. The Aztecs allowed subjugated cultures to retain their own customs, religions, and social institutions, but borrowed from the religious and cultural practices of these cultures and made them its own, thus producing a highly diverse culture made up of many different sub-cultures.
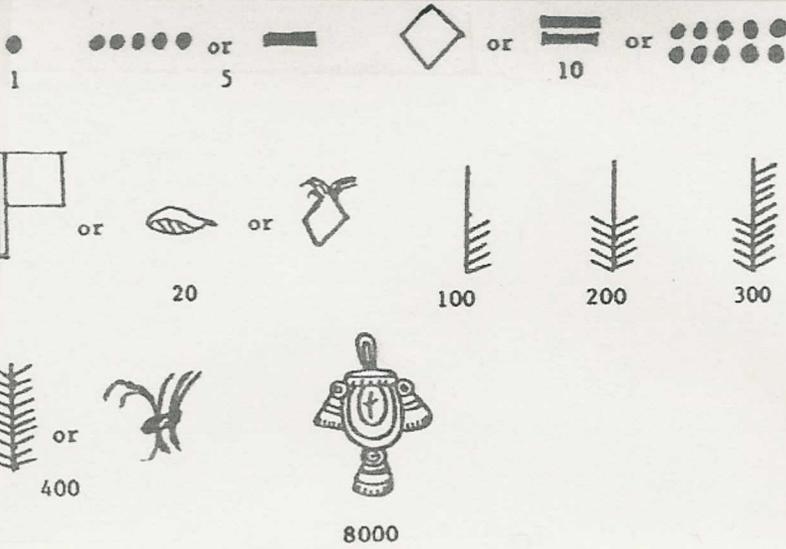
In terms of expressing numbers, the Aztecs used a vigesimal (base 20) number system. A single dot (•) represented the number 1. Occasionally, a finger was also used to indicate the number. Following in this sequence, the numbers 2, 3, and 4 were represented by two, three, and four dots, respectively. 5, though, introduced a new symbol; it was represented by five dots (•••••) or a full bar, as seen in the accompanying figure. From 6 through 9, dots alone or a combination of dots and a bar represented numbers. 10 was represented by a rhombus, two bars, or ten dots. The numbers between 10 and 20 were expressed as a combination of a rhombus, bars, and dots. 20 required a new symbol and resembled a flag, a shell, or a vase with grass growing out of it. After 20, higher numbers were expressed as combinations of the symbols already mentioned. The numbers for 100, 200, and 300 were expressed not only with the mentioned symbols but also by a feather with barbs, each representing twenty units. 100 had five barbs on the feather, 200 had ten, and 300 had fifteen. The next change in symbol occurred at the number 400, which was sometimes represented by twenty barbs on the feather by a bundle of stems tied together. The number 8000 was written as a symbol that represented a bag. The idea that the Aztec system was vigesimal stems from the fact that new symbols were produced for every power of 20; this reasoning, though, is not completely satisfactory because the symbols for higher powers ($20^4$, $20^5$, etc.) are unknown.

In terms of writing these numbers, the Aztec system mirrored that of the Egyptians. The positioning of symbols had no bearing; they could be written in any order, but were grouped together and written adjacent to each other. The Aztec number system was additive—the symbols were added together to produce the desired number. The number 0 was not prevalent in this number system. The Aztecs had a conceptual idea of what zero was, but there is no proof that they had a symbol representing it. A symbol for the number 0 played an interesting role in the Aztec culture. As stated earlier, when the Aztecs took over another civilization, they took pieces of its culture as well. In the Olmec civilization, which preceded the Aztecs, the shell represented 0. In the Aztec civilization, the shell represents the number 20. It seems that when the Aztecs took over the Olmec culture, they took the shell to represent the number 20 rather than 0. Following from that example, it would make sense to assume that other symbols were taken from conquered civilizations; however, there is not enough evidence to support it.

Ajaz Siddiqui
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Source: Luis Ortiz-Franco, The Aztec number system, algebra, and ethnomathematics, in Judith Elaine Hankes and Gerald R. Fast, eds., *Perspectives on Indigenous People of North America*, National Council of Teachers of Mathematics: Reston, VA, 2002, pp. 238-241.

# Aztec Numeration System

| | | | | | |
|---|---|---|---|---|---|
| ● | ●●●●● or ▬ | ◇ or ═ | ●●●●●● |
| 1 | 5 | 10 | |

| ⌐ or ▱ or ◊ | | | |
|---|---|---|---|
| 20 | 100 | 200 | 300 |

| ≸ or ✿ | |
|---|---|
| 400 | 8000 |

## Four Ways to express '8375' using Aztec Number Symbols