5—The Amazing Mayans

[1]The Mayan civilization dates back to 400 A.D. [2]The Mayans were a large group of Central American Indians who lived mainly on the Yucatán Peninsula in Mexico.

[3]The Mayans were incredible mathematicians and astronomers. [4]They kept elaborate calendars and were able to keep track of the movements of the moon, the sun, and Venus. [5]They were also able to predict eclipses and the equinoxes with very accurate measurements.

[6]The Mayans had one of the most advanced number systems in the world. [7]They could represent very large numbers by using only three symbols. [8]Their number system was the first to include a symbol for 0 as a place value, while Europeans were still using the Roman numeral system.

[9]The Mayan number system is *vigesimal*, which means it uses base 20 instead of our decimal (base 10) number system. [10]The Mayans used only three symbols (see diagram A), and their numbers were arranged vertically (see diagram B). [11]Each step up was a power of 20, as illustrated below.

Diagram A

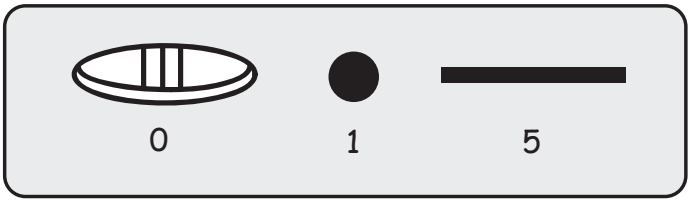
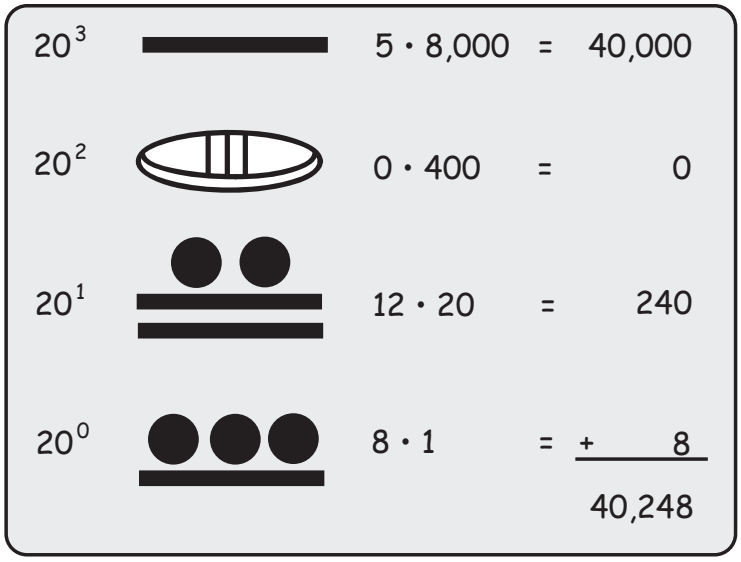


Diagram B



Source: Ascher, Robert and Marcia, Code of the Quipu. Ann Arbor: The University of Michigan Press, 1981.

Questions

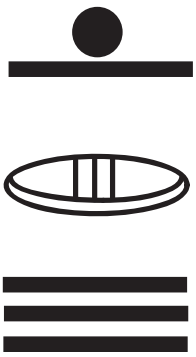
1. Write the number 500 using Mayan numerals.

2. Write the number 56,229 using Mayan numerals.

3. What is the next place value after 20^3 in the Mayan number system?
   a. 80
   b. 8,000
   c. 16,000
   d. 160,000

4. Subtract the smaller number from the larger number. Show your work.

A. 

B. 

5. Compare the Mayan number system with our number system. What is the same? What is different? Use complete sentences to explain your thinking.

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ANSWER

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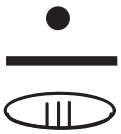
1. 

$1 \cdot 20^2$ or $1 \cdot 400$ = 400
$5 \cdot 20^1$ or $5 \cdot 20$ = 100
$0 \cdot 20^0$ or $0 \cdot 1$ = + 0
500

Notice that 20 to the zero power or any number to the zero power (except zero to the zero power, which is undefined) is 1.

2. 

$7 \cdot 20^3$ or $7 \cdot 8000$ = 56,000
$0 \cdot 20^2$ or $0 \cdot 400$ = 0
$11 \cdot 20^1$ or $11 \cdot 20$ = 220
$9 \cdot 20^0$ or $9 \cdot 1$ = + 9
56,229

3. d.
$20^4 = 20 \cdot 20 \cdot 20 \cdot 20 = 160{,}000$

4. 145
A is $(6 \cdot 400) + (8 \cdot 20) + (0 \cdot 1) = 2{,}560$ and B is $(6 \cdot 400) + (0 \cdot 20) + (15 \cdot 1) = 2{,}415$
Subtracting B from A, $2{,}560 - 2{,}415 = 145$

5. Same: Both systems have a symbol for 0. Both systems are positional (there is a place value for each position where the digits or symbols are located).
Different: Our system is decimal (base 10) while the Mayan system is vigesimal (base 20). Also, the Mayans used three symbols while our number system uses 10 symbols or digits.