

MAYAN MATH



Name _____

Period _____

Maya Mathematics

Math was a part of the Mayan culture with their numbers existing as far back as the 400AD. The Mayan's math was logical and ahead of its time. Their number system was similar to ours in that they had place value, but different in that they wrote their numbers vertically instead of horizontally. Where we use ten symbols, they only used three to represent all numbers. They used a stone or dot to represent one, a bar or stick to represent five, and a shell to represent zero. Using just these three symbols they were able to write very large numbers and do simple arithmetic. This shows how advanced this society was for its time, because in Europe, during the same time period the Roman Numerals used hundreds of symbols to represent numbers while the Mayans could represent the same numbers in three symbols.

The Maya used a base number of 20 also know as vigesimal. This means that, instead of the number in the second position having a value 10 times that of the numeral, in the Mayan system, the number in the second place has a value 20 times the value of the numeral. The number in the third place has a value of 20^2 , or 400, times the value of the numeral. So the number in the fourth place has a value of 20^3 or 8000 times the value of the numeral.

The first place had numbers from 0 to 19.

The second place had numbers from 20 to 399.

The third place had numbers from 400 to 7,999

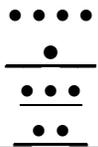
The fourth place had numbers from 8,000 to 159,000 And so on...

In the following table, you can see how their numbers were written.

	•	•	• •	• • •	• • • •
0	1	2	3	4	
	•	• •	• • •	• • • •	
5	6	7	8	9	
	•	• •	• • •	• • • •	
10	11	12	13	14	
	•	• •	• • •	• • • •	
15	16	17	18	19	

Compare Number Systems

Use this chart and compare how numbers are represented in the two systems.

Our Number System	Maya Number System
Represented in Base _____	Represented in Base _____
We have _____ distinctive symbols	They have _____ distinctive symbols
Our one-place numbers are smaller than _____	Their one-place numbers are smaller than _____
Our next place value represents groups of 10's.	Their next place value represents groups of 20's.
Our next place value represents groups of _____ x _____ or 100s.	Their next place value represents groups of 20 x 20 or _____
Our next place value represents groups of 100 x 10 or _____	Their next place value represents groups of 400 x 20 or _____
Our next place value represents groups of 1000 x 10 or _____	Their next place value represents groups of 8000 x 20 or _____
<p>The number 34,567 is represented by:</p> <p>3 units of 10,000 plus 4 units of 1,000 plus 5 units of 100 plus 6 units of 10 plus 7 units of 1</p>	<p>The number 34,567 is represented by: (remember to read from the bottom up)</p> <p>plus 4 groups of 8,000 = 32,000 plus 6 groups of 400 = 2,400 plus 8 groups of 20 = 160 plus 7 units of 1 = 7</p>
<p>We write the numbers horizontally, so this number is written: 34,567</p>	<p>The Maya wrote numbers vertically, so this number is written:</p> 



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HOMework FOR MONDAY NIGHT

Five different Arabic numbers are given below. Write those numbers in Mayan form. Use the cells to organize your symbols. Remember to start your number from the bottom.

Groups of:	4250	5555	6325	18422	99999
8,000's					
400's					
20's					
1's					

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Write these numbers in Arabic form.

1.



2.



3.



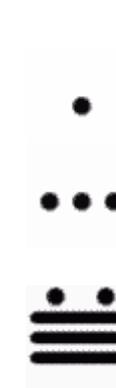
4.



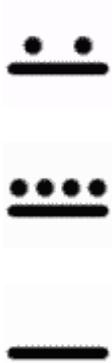
5.



6.



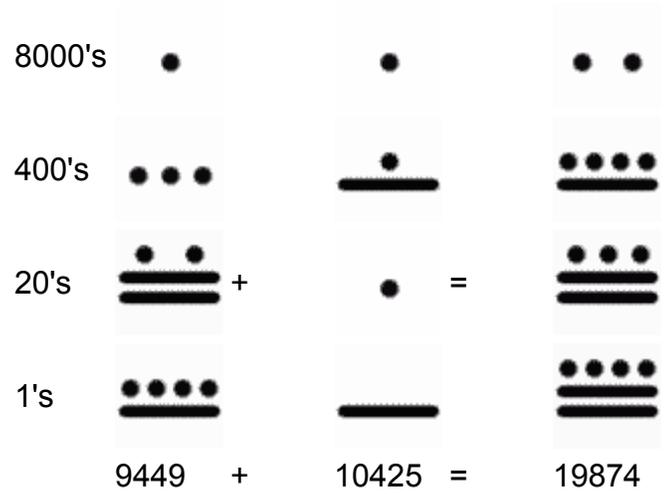
7.



8.



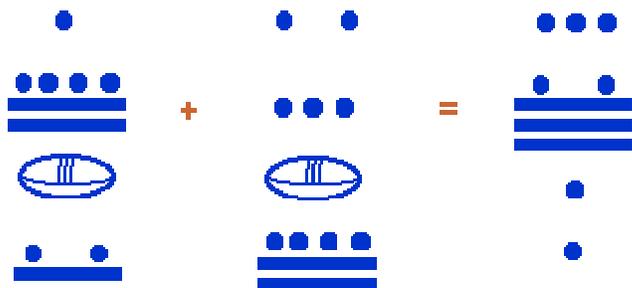
It was very easy to add and subtract using this number system, but they did not use fractions. Here's an example of a simple addition:



Simple additions can be performed by simply combining 2 or more sets of symbols (within their same set). This is shown below.



For more complicated arithmetic, you must simply remember that you borrow or carry only when you reach 20, not 10, as shown below.



It is important to note that this number system was in use in Mesoamerica while the people of Europe were still struggling with the Roman numeral system. That system suffered from serious defects: there was no zero (0) in the system, and, as opposed to the Mayan system, the numbers were entirely symbolic, without direct connection to the number of items represented. The ancient Maya were the first people in America or Europe to include zero in their numbering system.

It is not known whether a system was developed for multiplication and division.

Adding and Subtracting in the Maya System

1.

$$\begin{array}{c} \bullet \\ \hline \end{array} + \begin{array}{c} \bullet \\ \hline \end{array} =$$

2.

$$\begin{array}{c} \bullet \\ \hline \end{array} + \begin{array}{c} \bullet \\ \hline \end{array} =$$

3.

$$\begin{array}{c} \bullet \bullet \bullet \\ \hline \hline \hline \end{array} + \begin{array}{c} \bullet \bullet \bullet \bullet \\ \hline \hline \hline \end{array} =$$

4.

$$\begin{array}{c} \bullet \\ \hline \hline \hline \end{array} - \begin{array}{c} \bullet \bullet \bullet \bullet \\ \hline \hline \hline \end{array} =$$

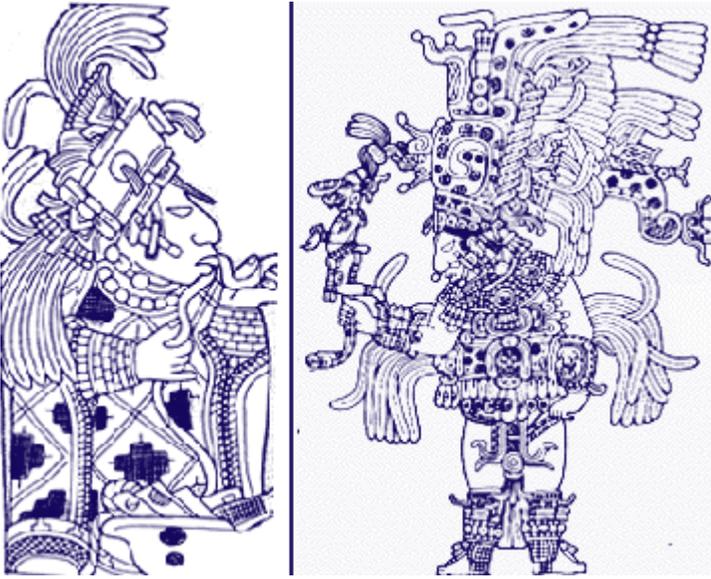
5.

$$\begin{array}{c} \hline \hline \hline \end{array} - \begin{array}{c} \bullet \bullet \bullet \bullet \end{array} =$$

6. Make up your own addition problem and show the solution both in Mayan and Arabic form.

7. Make up your own subtraction problem and show the solution both in Mayan and Arabic form.

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HOMEWORK FOR Tuesday NIGHT

Show each problem and solution in Mayan. Write your final answer in Arabic.

1. $3456 + 34 =$

2. $4578 + 19 =$

3. $342 + 890 =$

4. $20 + 400 =$

5. $8765 - 80 =$

6. $9854 - 6543 =$

7. $530 - 98 =$

8. $7425 - 7025 =$

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Maya Math Challenges

1. Write the possibilities in Maya math if the number is written with 1 bar and 2 dots and no shells. Try to come up with as many possibilities as you can.

2. Write the possibilities in Maya math if the number has 1 bar, 2 dots and one shell but is a three digit Arabic solution. Try to come up with as many possibilities as you can.

4. $5^6 =$ _____ (our number)
(Maya number)

5. $6^5 =$ _____ (our number)
(Maya number)

6. The solution to a math problem contains one shell, three bars and no dots. If you are limited to an Arabic four digit solution, write all of the different solutions that fit these requirements.

7. The solution to a math problem contains two shells, two bars and two dots. If you are limited to an Arabic five digit solution, write all of the different solutions that fit these requirements.

8. According to the Long Count calendar the Mayans believe that the current creation of the world will end on December 23, 2012. Write the three numbers of that date in Mayan.

