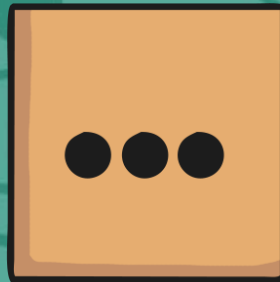


Maya Number System



LO: to understand how the Maya number system works.

Success Criteria

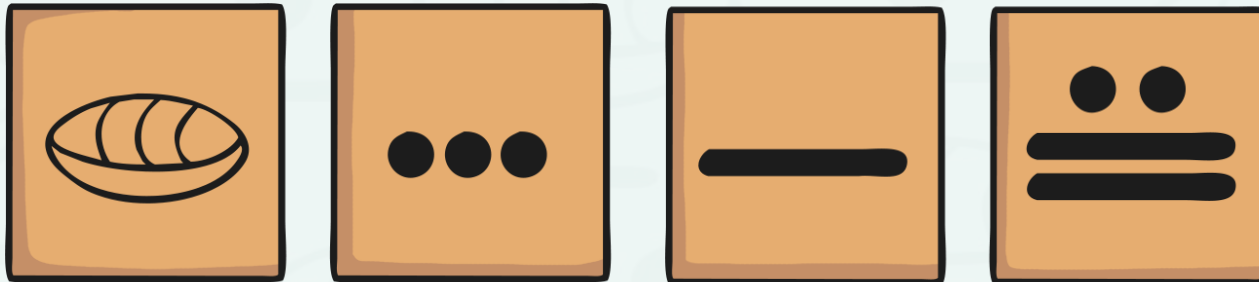
- I can read numbers using the Maya symbols for 0, 1 and 5.
- I can solve problems and write numbers using the Maya symbols for 0, 1 and 5.

The Maya and Numbers

The Maya had a good understanding of numbers and they developed a complex number and counting system which was advanced for their time.

They were one of only two cultures in the world to develop the concept of zero and this allowed them to develop a place value system where a zero could act as a place holder in large numbers. This enabled the Maya people to distinguish between numbers like 23 and 203, where the placement of the zero determines the value of the digit 2 as 200. This is a very important concept which many civilisations did not understand until much later than the Maya.

The Maya people used symbols to represent their numbers. Let's have a look at how it worked.



Number Symbols




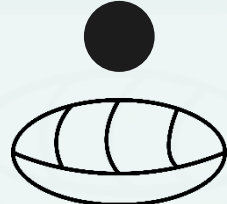
The Maya people used just three symbols in their number system. These are thought to represent items that the Maya people might have first used to count with such as pebbles, sticks and shells.

With your partner, look at the following Maya numbers. Can you work out what numbers the symbols represent and how the system works?

 $= 7$

 $= 18$

 $= 11$

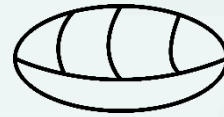
 $= 20$

Shells, Sticks and Pebbles



Knowing the value of each symbol, try to work out how numbers 0 – 19 would be written.

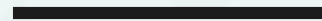
Answers on the next slide.



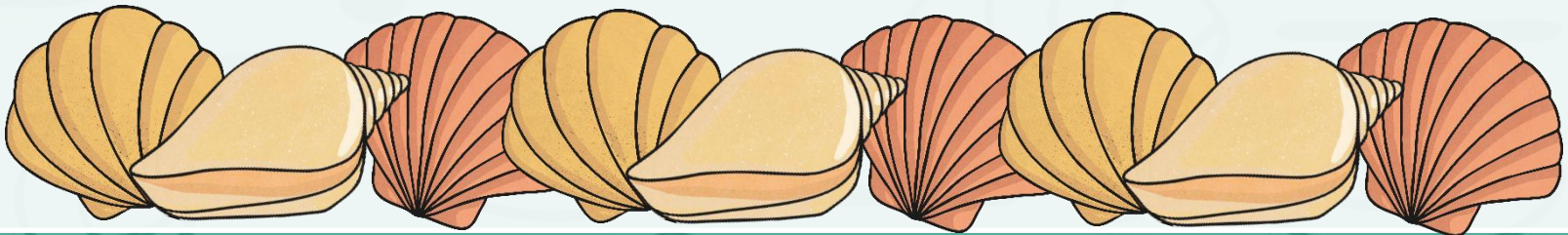
= 0



= 1



= 5



Maya Numbers

1	●
2	●●
3	●●●
4	●●●●
5	—
6	● —
7	●● —
8	●●● —
9	●●●● —
10	==

11	● ==
12	●● ==
13	●●● ==
14	●●●● ==
15	===
16	● ===
17	●● ===
18	●●● ===
19	●●●● ===

Maya Numbers

The Maya people used a base 20 number system, so after number 19 multiples of 20 were written above the bottom number. This is called a vigesimal positional number system.

For example:

$$\begin{array}{c} \bullet \\ \hline \end{array} \begin{array}{c} 1 \\ 5 \end{array} = 6$$

Place a dot above this number, to represents 20

$$\begin{array}{c} \bullet \\ \bullet \\ \hline \end{array} \begin{array}{c} 20 \\ 1 \\ 5 \end{array} = 26$$

Maya Numbers

$$\bullet \bullet \bullet = 3$$

A dot above = 20

$$\begin{array}{c} \bullet \\ \bullet \bullet \bullet \end{array} = 23$$

$$\begin{array}{c} \bullet \bullet \\ \hline \hline \end{array} = 12$$

A dot above = 20

$$\begin{array}{c} \bullet \\ \bullet \bullet \\ \hline \hline \end{array} = 32$$

Can you work out these values:

(A)
$$\begin{array}{c} \bullet \\ \bullet \bullet \bullet \bullet \end{array}$$

(B)
$$\begin{array}{c} \bullet \\ \hline \bullet \bullet \bullet \end{array}$$

(C)
$$\begin{array}{c} \bullet \\ \hline \hline \bullet \bullet \bullet \bullet \end{array}$$

(D)
$$\begin{array}{c} \bullet \\ \hline \hline \hline \end{array}$$

The number 20 uses a symbol for zero as a place holder below the dot representing 20, eg:



Maya Numbers

To create larger numbers, Mayan's would use more dots to represent 20.

After 4 dots, they would draw a line to represent (5 x 20) 100

For example:

$$\begin{array}{c} \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 20 \\ 5 \\ \hline \end{array} = 26$$


$$\begin{array}{c} \bullet \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 40 \\ 5 \\ \hline \end{array} = 46$$

$$\begin{array}{c} \bullet \bullet \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 60 \\ 5 \\ \hline \end{array} = 66$$

$$\begin{array}{c} \bullet \bullet \bullet \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 80 \\ 5 \\ \hline \end{array} = 86$$

$$\begin{array}{c} \hline \bullet \\ \hline \end{array} \begin{array}{l} 100 \\ 5 \\ \hline \end{array} = 106$$

$$\begin{array}{c} \bullet \\ \hline \bullet \\ \hline \end{array} \begin{array}{l} 120 \\ 5 \\ \hline \end{array} = 126$$

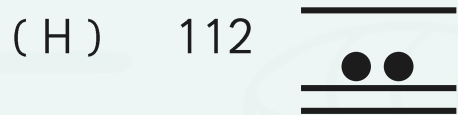
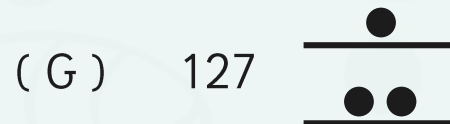
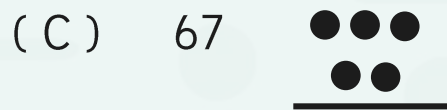
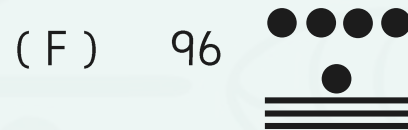
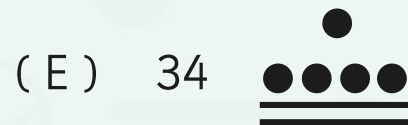
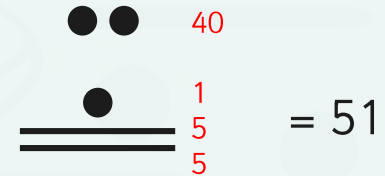
$$\begin{array}{c} \hline \\ \hline \end{array} \begin{array}{l} 100 \\ 0 \\ \hline \end{array} = 100$$


$$\begin{array}{c} \hline \\ \hline \hline \end{array} \begin{array}{l} 100 \\ 5 \\ 5 \\ \hline \end{array} = 110$$

Maya Numbers

Try to write these numbers....

Example:



Challenge: 200, 210, 300, 322

Maya Numbers

For greater numbers, Mayans used a third row representing 400! would use more dots to represent 20.

After 4 dots, they would draw a line to represent (5 x 20) 100

For example:

$$\begin{array}{c} \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 20 \\ 1 \\ 5 \end{array} = 26$$

$$\begin{array}{c} \bullet \\ \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 400 \\ 20 \\ 1 \\ 5 \end{array} = 426$$

$$\begin{array}{c} \bullet \bullet \bullet \bullet \\ \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 4 \times 400 = 1600 \\ 20 \\ 1 \\ 5 \end{array} = 1626$$

$$\begin{array}{c} \hline \bullet \\ \bullet \\ \hline \end{array} \begin{array}{l} 5 \times 400 = 2000 \\ 20 \\ 1 \\ 5 \end{array} = 2026$$

Maya Number System Activity Sheets



Use the information you have learnt about the Maya number system to help you work out the numbers on the **Maya Number System Activity Sheet**.

0-5080 Maya N

Read the Larger Maya Numbers Activity Sheet. Now can you

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

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0-19 Maya Number System

Can you work out these Maya numbers? Use the key to help you.

<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>

Key

- 0
- 1
- 5

Add up the value of each symbol.
 $1 + 1 = 2$

$5 + 5 + 5 = 15$

Then simply combine the two totals!
 $5 + 5 + 5 + 1 + 1 = ?$

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Number System

Can you work out these Maya numbers? Use the key to help you.

The Maya only counted up to 20. After that they would count in multiples of 20.

The symbols in the top row need to be added together and multiplied by 20:
 $(1+5) \times 20 = ?$

The bottom row simply needs to be added together:
 $1 + 1 + 5 + 5 = ?$

The total value of the symbols can be calculated by simply combining the two values together!
 $(6 \times 20) + (1 + 1 + 5 + 5) = ?$

Key

- 0
- 1
- 5

Number of 20s

Number of 1s and 5s

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Maya Calculations



Now you know all about Maya numbers are you able to solve this calculation?

Write down the answer and show me. Remember to use the Maya symbols!

The image shows a Maya calculation enclosed in an orange border. On the left, there are three black dots arranged horizontally above three parallel horizontal bars. To the right of this is a plus sign. Further right is a single black dot above a single horizontal bar. To the right of this is an equals sign. On the far right is the number 24 in a large, bold, orange font.

Now write 3 calculations of your own and challenge your partner to solve them.
The calculations can be addition, subtraction, or a mixture.

Use the numbers from your activity sheet to help you write the calculations then swap with your partner and work out each other's calculations.

When you have finished, check the answers together.

Maya Calculations



Are these numbers sentences true or false?



Aim



- I can understand how the Maya number system works.

Success Criteria

- I can read numbers using the Maya symbols for 0, 1 and 5.
- I can solve problems and write numbers using the Maya symbols for 0, 1 and 5.

