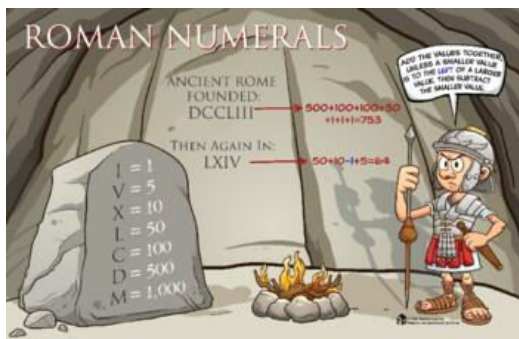


## Zero: The Idea that Changed the World



Roman numerals began back in the 8th to 9th century BC, at approximately the same time as the founding of ancient Rome. The number system remained in common use across much of the known world until the 14th century when it was replaced by the Arabic system we use today.

In Roman numerals, numbers are written with combinations of letters, where each letter has a fixed integer value. There are only seven values:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

To work out the number, you need to add the value of each letter starting from the left.

When a lower value letter is before a higher value letter, its value is subtracted from the higher value. For example, in IV the I comes before the V, so we subtract 1 from 5.  $IV = 4$  and  $IX = 9$

The year 2024 is written as: MMXXIV  
 $1000 + 1000 + 10 + 10 + 4$

When we look at the number 555 we know that the last 5 is worth exactly 5, the middle 5 is worth 50 and the first 5 is worth 500.

In Roman Numerals, a V is only ever worth 5. So, when 555 is written it becomes DLV with a different letter for each '5'.

Writing the number 444 becomes even more complicated: CDXLIV.

Trying to multiply or divide in Roman numerals was very difficult and writing large numbers was problematic. The system had many limitations.

The Roman's had no word for 'zero'. If they wanted to express the concept of nothing they would use the word 'nullus'.

In the Arabic system which we use today, 'zero' has two uses: as a placeholder (as in 101) and as a number in its own right.

The zero is thought to have originated in India. The earliest maths text book, with a circular figure for zero, is dated to around the 3<sup>rd</sup> century.

Zero helped merchants balance their books, an essential part of trading. It allowed scholars to invent algebra and calculus, which are central to physics, engineering and medicine. Zero was also key to inventing computing.

1. Fill in the blanks.

In Roman numerals, there are \_\_\_\_\_ letters, each with a fixed \_\_\_\_\_ value. To read a number, you need to \_\_\_\_\_ the value of each letter. The largest value is \_\_\_\_\_ represented by the letter \_\_\_\_\_.

The number MDCCLIV is \_\_\_\_\_. The number 2189 is written in Roman numerals as \_\_\_\_\_.

2. What is the main difference between the Arabic system we use today and Roman Numerals?

3. Explain how zero is used as a placeholder.

➤ Challenge: Find out why zero is central to computing (to discuss in lesson). You may use the back of this sheet to make notes.