

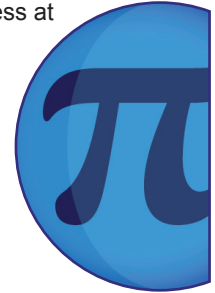


The Romans and Numerals

Key Learning Content

This film describes the difficulties of doing arithmetical with Roman numerals. Despite their great success at empire building, the Romans' legacy includes little mathematics scholarship.

The film requires no prior mathematical knowledge. It can be used as a starting point to consider the benefits of a place-value system such as the decimal system used today.



Core Outcomes

Learning Points

- Be able to understand that the decimal place-value system is only one of many possible number systems.
- Be able to understand and use the Roman numeral system.
- Be able to use the four rules of addition, subtraction, multiplication and division.

Suggested Activities

- Convert between numbers in Roman numeral and ordinary form.
- Run a quiz based on the shape and appearance of Roman numerals, e.g. symmetry and length.

Extension Outcomes

Learning Points

- Be able to understand place-value number systems.
- Be able to understand how a place-value number system simplifies arithmetic.

Suggested Activities

- Attempt simple arithmetic with Roman numerals and compare with using a place-value number system.
- Compare the Roman numeral system with other number systems and discuss the strengths and weaknesses of different systems.



Roman numerals use letters to represent base numbers.

Related Films

To use before the lesson plan:

The Egyptians and Multiplication

This film describes how the Egyptians had a number system that did not use place value and how, perhaps because of this, they developed a very different method of multiplication.

To use after the lesson plan:

The Egyptians and Unit Fractions

This film demonstrates another difficulty in non-place-value systems, which is how to express numbers less than one. The Egyptians used fractions, but not quite as we know them.

Calculating Pi: Archimedes

This film describes the work of the Greek mathematician who was famously (according to legend) killed by the Romans whilst at study.

The Greeks and Proof

This film looks at a major Greek contribution to mathematical thought.

Guide Lesson Plan

Introduction

Find examples of Roman numerals in books, at the end of television programmes and films, on monuments or tombstones, and ask students what they represent. What numbers do they stand for? Get students to describe the rules for using Roman numerals.

Show Film

The Romans and Numerals

Main Activity

Foundation

Begin by summarising what Roman numerals stand for, and how the numbering system works in terms of adding after a symbol/subtracting before. Then give simple exercises converting between Roman numerals and ordinary numbers. Next, set quiz questions concerning the length and appearance of year dates written in Roman numerals (up to this year) e.g. Which years are symmetric when written in Roman numerals? How many years are written with one, two or three numerals? Which year uses the most Roman numerals? (Answer: 1888) Finally, experiment with adding and subtracting numbers written as Roman numerals and ask if the students can see any pattern or rule. Ask them why arithmetic is much easier with ordinary numbers.

Main Activity cont ...

Advanced

Explain what a place-value number system is and give examples (Babylonian numbers, modern decimal numbers). Explain that the Roman numeral system is not a place-value system and ask students what consequences this has? Attempt to carry out addition, subtraction, multiplication and division using first Roman numerals and then a place-value system, and compare how easy each is. Ask students how numbers less than one would be recorded. Then ask them to speculate what this would have meant for the advancement of mathematics in Roman times. Explain how our current (Hindu-Arabic) decimal place-value system came out of India in the later years of the Roman empire and spread throughout Western Europe (with Arab influence) over the following centuries.

Extension Activity

Show examples of other number systems and compare how different systems show the same number. For each number system, plot a graph with the number on the x-axis and the number of characters needed to express it on the y-axis. (So, using Roman numerals, 98 is IIC which has three characters, 1001 is MI which has two etc.) Compare the shape of the graphs for different number systems (e.g. modern decimal, Roman, Egyptian, Babylonian, binary). Explore whether the profiles of place-value systems share any characteristics.

Optional Extra

Most Roman numerals seen today are for numbers up to the current year (since Roman numerals are often used to record dates). The Romans nevertheless used their number system to record much larger numbers (e.g. hundreds of thousands, millions). Research how they did this. Does this method have any modern parallel?

$$\begin{aligned}
 & \text{MDCCLXXVI} + \\
 & \text{DCLXXXVIII} + \\
 & \text{CCCXLIV} + \\
 & \text{XLIII} = \text{MMCMLI}
 \end{aligned}$$

In Roman numerals, the value of a letter is added to the preceding letter; a letter placed before another letter of higher value is subtracted.