



GENERAL MATHEMATICS • CHAPTER 1.1

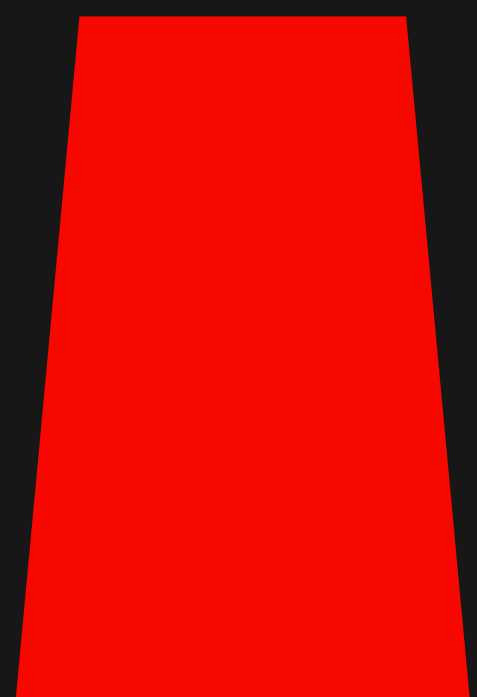
The Number System

Meet the kinds of numbers we use, how place value works, and what makes a number prime.

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CHAPTER 1.1

The Number System

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Meet the kinds of numbers we use, how place value works, and what makes a number prime.

Version 0.2.0 • Released 2026-10-08

By the end of this chapter you can

- Name the kinds of numbers and say which set a number belongs to.
- Use place value to read and compare numbers.
- Find the prime factors of a number.

1.1.1 Kinds of numbers

Numbers did not arrive all at once. People first needed to count goats and cassava, then to say "none left", then to owe someone money, and then to share a loaf fairly. Each need gave us a new kind of number.

The families of numbers

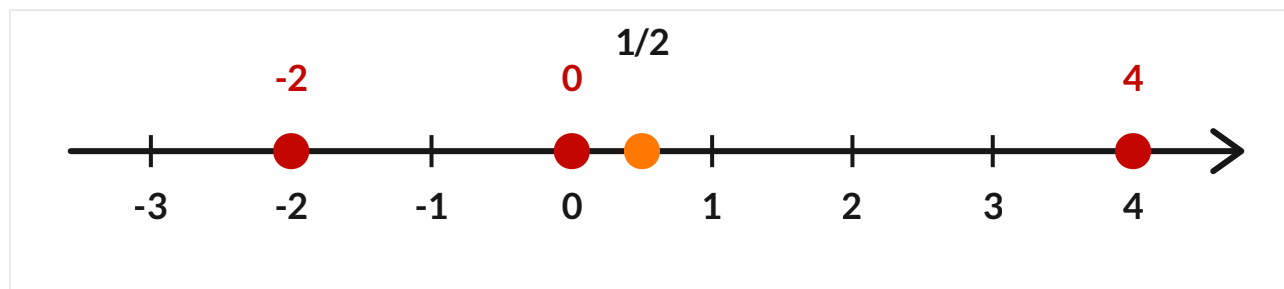
Name	Symbol	What it holds	Example
Natural numbers	$\mathbb{N}$	Counting numbers	$1, 2, 3, \dots$
Whole numbers	$\mathbb{W}$	Natural numbers and zero	$0, 1, 2, \dots$
Integers	$\mathbb{Z}$	Whole numbers and their negatives	$\dots, -2, -1, 0, 1, \dots$
Rational numbers	$\mathbb{Q}$	Fractions $\frac{a}{b}$ with $b \neq 0$	$\frac{3}{4}, -2.5, 7$

Every natural number is a whole number, every whole number is an integer, and every integer is a rational number.¹

KEY IDEA

Each family sits inside the next one. If a number is natural, it is also whole, an integer and rational.

1. In maths we say $\mathbb{N}$ is a subset of $\mathbb{W}$, which is a subset of $\mathbb{Z}$, which is a subset of $\mathbb{Q}$.



Natural numbers, integers and fractions all live on the same number line.

A number that is not rational

Some numbers cannot be written as a fraction of two integers. The length of the diagonal of a square with side 1 is $\sqrt{2}$, and no fraction equals it exactly. We call numbers like this **irrational**. Together, the rational and irrational numbers make up the **real numbers**.

WORKED EXAMPLE 1

Which families does $-\frac{6}{3}$ belong to?

Simplify first: $-\frac{6}{3} = -2$.

It is negative, so it is not natural and not whole. It is an integer, so it is also rational.

Answer: integers ($\mathbb{Z}$) and rational numbers ($\mathbb{Q}$).

1.1.2 Place value and ordering

The digit 5 means very different things in 5, 50 and 500. Its place gives it value. Each place is worth ten times the place to its right. A zero holds a place open, so 4 062 and 462 are different numbers.

Place	Thousands	Hundreds	Tens	Units
Value	1000	100	10	1
In 4 062	4	0	6	2

So $4\,062 = 4 \times 1000 + 0 \times 100 + 6 \times 10 + 2 \times 1$.

STORY**Keeping count at the market**

A trader in Oyingbo market kept her money in bundles. Ten naira notes made a small bundle, ten small bundles made a big bundle. When she had nine small bundles and added one more note, she did not write 10 in the small-bundle column. She tied them into a big bundle and wrote 1 in the next column. That is carrying, and it is why place value works.

Comparing numbers

To compare two numbers, compare their places from the left. The first place where they differ decides.

WORKED EXAMPLE 1

Which is greater, 4 062 or 4 206?

Both have 4 thousands. Compare the hundreds: 0 is less than 2.

So $4\ 062 < 4\ 206$.

KEY IDEA

Compare numbers from the left. The first place where the digits differ decides which number is greater.

Figure not added yet

A place value chart for large numbers.

1.1.3 Factors, multiples and primes

A **factor** of a number divides it exactly. The factors of 12 are 1, 2, 3, 4, 6 and 12. A **multiple** of 12 is what you get by multiplying 12 by a whole number: 12, 24, 36, . . .

Prime numbers

STORY

Seven oranges

Ada tried to share 7 oranges equally among her friends. With 2 friends, one orange was left over. With 3 friends, one was left over. With 4, 5 and 6, there was always something left. Only 1 friend, or 7 friends, shared them out with nothing left. Seven refuses to be split. That makes it a prime.

KEY IDEA

A **prime number** has exactly two factors: 1 and itself. The number 1 is not prime. The first primes are 2, 3, 5, 7, 11, 13, ...

Prime factors

Every whole number greater than 1 can be written as a product of primes in only one way, apart from the order. We find it by dividing by primes again and again.

WORKED EXAMPLE 1

Write 84 as a product of prime factors.

Divide by the smallest prime that goes in each time:

$$84 = 2 \times 42 = 2 \times 2 \times 21 = 2 \times 2 \times 3 \times 7 = 2^2 \times 3 \times 7$$

Answer: $84 = 2^2 \times 3 \times 7$.

Try it yourself

QUESTION 1 3 marks · Demo question, not a real exam item

Write 90 as a product of prime factors, then list all its prime factors.

Show solution

$$90 = 2 \times 45 = 2 \times 3 \times 15 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5.$$

The prime factors are 2, 3 and 5.

QUESTION 2 2 marks · Demo question, not a real exam item

Is 91 a prime number? Give a reason.

Show solution

No. $91 = 7 \times 13$, so 91 has factors other than 1 and itself.