

Key point

A **rational number** is one that you can write exactly in the form

$$\frac{p}{q}$$

where p and q are integers, $q \neq 0$

Numbers that you cannot write exactly in this form are **irrational numbers**. If you express them as decimals, they have an infinite number of non-repeating decimal places.

Some roots of numbers are irrational, for example, $\sqrt{3} = 1.732\dots$ and $\sqrt[3]{10} = 2.15443\dots$ are irrational numbers.

Key point

Irrational numbers involving roots, $\sqrt[n]{}$ or $\sqrt{}$, are called **surds**.

You can use the following laws to simplify surds

$$\sqrt{a} \times \sqrt{b} = \sqrt{ab}$$

$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

You usually write surds in their simplest form, with the smallest possible number written inside the root sign.

You can simplify surds by looking at their factors.

You should look for factors that are square numbers.

For example $\sqrt{80} = \sqrt{16} \times \sqrt{5} = 4\sqrt{5}$

If \sqrt{a} and \sqrt{b} cannot be simplified, then you cannot simplify $\sqrt{a} + \sqrt{b}$ or $\sqrt{a} - \sqrt{b}$ for $a \neq b$