

Powers, roots and standard form

Topic cliff notes / objectives, key ideas and examples

Learning objectives

- Interpret powers and square roots.
- Write and calculate numbers in standard form.

Key ideas

- A positive integer power means repeated multiplication.

$$3^4 = 3 \times 3 \times 3 \times 3$$

- The square-root symbol gives the non-negative root.

$$\sqrt{x} \geq 0 \quad \text{for } x \geq 0$$

- For the same non-zero base, add indices when multiplying.

$$a^m a^n = a^{m+n} \quad (a \neq 0, m, n \in \mathbb{Z})$$

- For a non-zero base and positive integer index, use these zero and negative index rules.

$$a^0 = 1, \quad a^{-n} = \frac{1}{a^n} \quad (a \neq 0, n \in \mathbb{Z}_{>0})$$

- For a positive number, standard form uses an integer power of ten.

$$A \times 10^n, \quad 1 \leq A < 10, \quad n \in \mathbb{Z}$$

Worked example

Write the small number in standard form. The first factor must be between one and ten.

$$0.00072 = \frac{7.2}{10\,000}$$

$$\frac{1}{10\,000} = 10^{-4}$$

Answer

$$7.2 \times 10^{-4}$$

Quick example

Multiply the numbers in standard form.

$$(3 \times 10^4)(2 \times 10^3) = (3 \times 2)10^{4+3} = 6 \times 10^7$$

Answer

$$6 \times 10^7$$

Watch out

A negative index means a reciprocal, not a negative answer. Check the first factor when giving standard form.

