

Exercise walk-through

C1.8

Standard form

IGCSE Mathematics

You must be able to

- Write numbers in normalised standard form
- Calculate products and quotients in standard form
- Align powers of ten when adding quantities

1

The method

Method — Key knowledge: Standard form

Standard form is $A \times 10^n$ with $1 \leq A < 10$ and integer n . Large numbers have positive powers; small positive numbers have negative powers. For multiplication, multiply coefficients and add powers. For division, divide coefficients and subtract powers. Renormalise the coefficient at the end. Core standard-form calculations belong to calculator Paper 3.

Exercises 2.1-2.3

2.1 Write 540000 in standard form.

[2]

2.2 Write 3.8×10^{-3} as an ordinary decimal.

[2]

2.3 Write 0.000091 in standard form.

[2]

Exercises 2.1-2.3

2.1 Write 540000 in standard form.

[2]

2.1

- Move the point five places: 5.4×10^5 .

2.2 Write 3.8×10^{-3} as an ordinary decimal.

[2]

2.2

- Divide by 1000: **0.0038**.

2.3 Write 0.000091 in standard form.

[2]

2.3

- The coefficient is 9.1; 9.1×10^{-5} restores the value.

Exercise 2.4

2.4 Calculate $(8 \times 10^6) \div (2 \times 10^2)$ in standard form.

[2]

Exercise 2.4

2.4 Calculate $(8 \times 10^6) \div (2 \times 10^2)$ in standard form.

[2]

2.4

- $Q = (8/2) \times 10^{6-2} = 4 \times 10^4.$

Exercise 3.1 (a)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(a) A factory makes 2.5×10^4 buttons each day for 12 days. Find the total in standard form. [2]

Exercise 3.1 (a)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(a) A factory makes 2.5×10^4 buttons each day for 12 days. Find the total in standard form. [2]

(a)

- $N = (2.5 \times 10^4) \times 12 = 30 \times 10^4 = \mathbf{3 \times 10^5}.$

Exercise 3.1 (b)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(b) Each box holds 6×10^2 buttons. Find the number of full boxes. [2]

Exercise 3.1 (b)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(b) Each box holds 6×10^2 buttons. Find the number of full boxes. [2]

(b)

- $B = (3 \times 10^5)/(6 \times 10^2) = 0.5 \times 10^3 = \mathbf{500}.$

Exercise 3.1 (c)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(c) Write the total number of buttons as an ordinary integer.

[2]

Exercise 3.1 (c)

3.1 Apply the standard form methods below. Show working and include units where appropriate.

(c) Write the total number of buttons as an ordinary integer. [2]

(c)

- $N = 3 \times 100000 = \mathbf{300000}.$

Exercise 3.2 (a)

3.2 A storage device holds 3.6×10^9 bytes. Each image uses 4.5×10^6 bytes.

(a) Find the maximum number of these images the device holds. State an assumption used. [3]

Exercise 3.2 (a)

3.2 A storage device holds 3.6×10^9 bytes. Each image uses 4.5×10^6 bytes.

(a) Find the maximum number of these images the device holds. State an assumption used. [3]

(a)

- Use $N = \text{capacity/image size}$.
- $N = (3.6/4.5)10^{9-6} = \mathbf{800}$ images.
- Assume all the stated capacity is available for images, with no other storage used.

Exercise 3.2 (b)

3.2 A storage device holds 3.6×10^9 bytes. Each image uses 4.5×10^6 bytes.

(b) Two backups occupy 2.8×10^8 bytes and 7.5×10^7 bytes. Find their combined size in standard form. [3]

Exercise 3.2 (b)

3.2 A storage device holds 3.6×10^9 bytes. Each image uses 4.5×10^6 bytes.

(b) Two backups occupy 2.8×10^8 bytes and 7.5×10^7 bytes. Find their combined size in standard form. [3]

(b)

- Write the second size as 0.75×10^8 .
- Total $S = (2.8 + 0.75)10^8$, so $S = \mathbf{3.55 \times 10^8}$ bytes.