



eClassroom

GCSE Mathematics

Standard Form

Questions

Pearson Edexcel GCSE & iGCSE Mathematics



Section A — Foundation

Worked Examples

[Fluency]

Write 0.000 47 in standard form.

Move the decimal point until the number is between 1 and 10:

$$0.000\ 47 = 4.7 \times 10^{-4}$$

The power is negative because the original number is less than 1.

[Reasoning]

Without a calculator, work out $(3 \times 10^4) \times (2.5 \times 10^3)$. Give your answer in standard form.

Multiply the numbers: $3 \times 2.5 = 7.5$

Multiply the powers of 10: $10^4 \times 10^3 = 10^7$

$$= 7.5 \times 10^7$$

[Problem Solving]

A bacterium is 0.000 003 m long. How many bacteria would fit end-to-end across a 0.015 m gap?

Write both in standard form: 3×10^{-6} and 1.5×10^{-2}

Number = $(1.5 \times 10^{-2}) \div (3 \times 10^{-6})$

$$= (1.5 \div 3) \times 10^{-2-(-6)} = 0.5 \times 10^4 = \mathbf{5000}$$

[Fluency]

1. Write 34 000 in standard form.

(1 mark)

[Fluency]

2. Write 0.0056 in standard form.

(1 mark)

[Fluency]

3.

Write as an ordinary number:

$$2.7 \times 10^3$$

(1 mark)



**[Fluency]**

4.

Write as an ordinary number:

$$4.05 \times 10^{-2}$$

(1 mark)

[Fluency]

5.

Write these values in order of size, starting with the smallest:

$$3.2 \times 10^3 \quad 4.1 \times 10^2 \quad 8.9 \times 10^3 \quad 1.6 \times 10^4$$

(2 marks)

[Reasoning]

6.

Without a calculator, work out:

$$(3.2 \times 10^4) + (4.5 \times 10^3)$$

Give your answer in standard form.

(2 marks)

[Reasoning]

7.

Without a calculator, work out:

$$(2.4 \times 10^5) \times (3.0 \times 10^2)$$

Give your answer in standard form.

(2 marks)

[Reasoning]

8.

Without a calculator, work out:

$$(9.6 \times 10^8) \div (3.2 \times 10^3)$$

Give your answer in standard form.

(2 marks)

[Problem Solving]9. The mass of an electron is 9.11×10^{-31} kg.The mass of a proton is 1.67×10^{-27} kg.

How many times heavier is a proton than an electron?

Give your answer correct to 3 significant figures.

(3 marks)

**[Problem Solving]**

10. The distance from the Earth to the Sun is approximately 1.5×10^{11} metres.
The speed of light is 3×10^8 metres per second.

- (a)** Calculate the time, in seconds, for light to travel from the Sun to the Earth. Give your answer in standard form. (2)
- (b)** Convert your answer to minutes and seconds. (1)

(3 marks)



Section B — Higher

Worked Examples

[Fluency]

Work out $(4.8 \times 10^{-3}) \div (1.6 \times 10^4)$. Give your answer in standard form.

Divide the numbers: $4.8 \div 1.6 = 3.0$

Divide the powers: $10^{-3} \div 10^4 = 10^{-7}$

$$= 3.0 \times 10^{-7}$$

[Reasoning]

The speed of light is 3×10^8 m/s. A star is 4.5×10^{15} m away. How many seconds does light take to reach us from that star?

Time = Distance \div Speed

$$= \frac{4.5 \times 10^{15}}{3 \times 10^8} = 1.5 \times 10^7 \text{ seconds}$$

[Problem Solving]

$n = 2.4 \times 10^5$ and $m = 6 \times 10^3$. Find $n + m$ and $n \times m$. Give both in standard form.

$$n + m: \text{convert to same power: } 2.4 \times 10^5 + 0.06 \times 10^5 = 2.46 \times 10^5$$

$$n \times m: 2.4 \times 6 = 14.4, 10^{5+3} = 10^8 \rightarrow 1.44 \times 10^9$$

[Fluency]

1.

Without a calculator, work out:

$$(3.6 \times 10^5) + (8.4 \times 10^4)$$

Give your answer in standard form.

(2 marks)

[Fluency]

2.

Without a calculator, work out:

$$(7.2 \times 10^{-3}) \div (1.8 \times 10^2)$$

Give your answer in standard form.

(2 marks)

**[Fluency]****3.**

Without a calculator, work out:

$$(2.5 \times 10^3)^2$$

Give your answer in standard form.

(2 marks)**[Reasoning]****4.**

$$n = 2.4 \times 10^{-5} \quad m = 6.0 \times 10^{-3}$$

Work out the value of:

$$\frac{n \times m}{n + m}$$

Give your answer in standard form, correct to 2 significant figures.

(4 marks)**[Reasoning]****5.** The distance to the nearest star (Proxima Centauri) is approximately 4.07×10^{16} metres.The speed of light is 3×10^8 m/s.1 year $\approx 3.156 \times 10^7$ seconds.

Calculate the distance to Proxima Centauri in light-years.

Give your answer correct to 3 significant figures.

(4 marks)**[Reasoning]****6.** Town A has a population of 2.4×10^6 .Town B has a population of 6.0×10^5 .**(a)** Write down the total population of the two towns in standard form. (1)**(b)** Find the fraction of the total population that lives in Town B. Give your answer as a fraction in its simplest form. (2)**(3 marks)****[Problem Solving]****7.** The mass of the Earth is 5.97×10^{24} kg.The mass of the Moon is 7.35×10^{22} kg.

Calculate the Moon's mass as a percentage of the combined mass of the Earth and Moon.

Give your answer correct to 3 significant figures.

(4 marks)

**[Problem Solving]**

8. A square has side length 3.6×10^3 cm.

(a) Convert the side length to metres. Give your answer in standard form. (1)

(b) Find the area of the square in m^2 . Give your answer in standard form. (2)

(3 marks)

[Problem Solving]

9.

Without a calculator, work out:

$$\frac{4.2 \times 10^8}{7 \times 10^{-3}}$$

Give your answer in standard form.

(2 marks)

[Problem Solving]

10. a and b are both written in standard form.

$$a = p \times 10^m \quad b = q \times 10^n$$

where $1 \leq p < 10$ and $1 \leq q < 10$.

(a) Show that $a \times b$ can always be written in the form $k \times 10^{m+n}$, where k may or may not be in standard form. (2)

(b) Explain the additional step needed to ensure the result is in standard form. Give an example where this step is required. (2)

(4 marks)