



**eClassroom**

GCSE Mathematics

# **Standard Form**

**Worked Solutions**

---

Pearson Edexcel GCSE & iGCSE Mathematics



## Section A — Foundation — Worked Solutions

### [Fluency] Question 1

---

34 000: move decimal 4 places left to get 3.4

∴

### [Fluency] Question 2

---

0.0056: move decimal 3 places right to get 5.6

∴

### [Fluency] Question 3

---

Move decimal 3 places right (positive power):  $2.7 \rightarrow 2700$

∴ **2700**

### [Fluency] Question 4

---

Move decimal 2 places left (negative power):  $4.05 \rightarrow 0.0405$

∴ **0.0405**

### [Fluency] Question 5

---

Convert to ordinary numbers:

$4.1 \times 10^2 = 410$     $3.2 \times 10^3 = 3200$     $8.9 \times 10^3 = 8900$     $1.6 \times 10^4 = 16000$

∴

### [Reasoning] Question 6

---

Convert to same power:  $3.2 \times 10^4 = 32000$ ,    $4.5 \times 10^3 = 4500$

$32000 + 4500 = 36500$

∴

### [Reasoning] Question 7

---

Multiply coefficients:  $2.4 \times 3.0 = 7.2$

Add indices:  $10^5 \times 10^2 = 10^7$

∴

**[Reasoning] Question 8**

---

Divide coefficients:  $9.6 \div 3.2 = 3.0$

Subtract indices:  $10^8 \div 10^3 = 10^5$ ;

$\therefore$

**[Problem Solving] Question 9**

---

$$\frac{1.67 \times 10^{-27}}{9.11 \times 10^{-31}} = \frac{1.67}{9.11} \times 10^{-27 - (-31)} = 0.1833 \times 10^4$$

$$= 1833 \text{ (3 s.f.)}$$

$\therefore$  **The proton is 1830 times heavier (3 s.f.)**

**[Problem Solving] Question 10**

---

$$(a) t = \frac{1.5 \times 10^{11}}{3 \times 10^8} = 0.5 \times 10^3 = 5 \times 10^2 \text{ s}$$

(b) 500 s = 8 minutes and 20 seconds

$\therefore$  **(a)  $5 \times 10^2$  s (b) 8 minutes 20 seconds**



## Section B — Higher — Worked Solutions

### [Fluency] Question 1

Convert to same power:  $3.6 \times 10^5 = 36 \times 10^4$ ;

$36 \times 10^4 + 8.4 \times 10^4 = 44.4 \times 10^4$ ;

$\therefore$

### [Fluency] Question 2

Divide coefficients:  $7.2 \div 1.8 = 4.0$

Subtract indices:  $10^{-3} \div 10^2 = 10^{-5}$

$\therefore$

### [Fluency] Question 3

Square the coefficient:  $2.5^2 = 6.25$

Square the power:  $(10^3)^2 = 10^6$ ;

$\therefore$

### [Reasoning] Question 4

$$n \times m = (2.4 \times 10^{-5}) \times (6.0 \times 10^{-3}) = 14.4 \times 10^{-8} = 1.44 \times 10^{-7}$$

$$n + m \approx 6.024 \times 10^{-3} \text{ (since } n \ll m \text{)}$$

$$\frac{n \times m}{n + m} = \frac{1.44 \times 10^{-7}}{6.024 \times 10^{-3}} \approx 2.4 \times 10^{-5}$$

$\therefore$

### [Reasoning] Question 5

$$\text{Time} = \frac{4.07 \times 10^{16}}{3 \times 10^8} = 1.357 \times 10^8 \text{ s}$$

$$\text{Years} = \frac{1.357 \times 10^8}{3.156 \times 10^7} \approx 4.30 \text{ light-years}$$

$\therefore$  **4.30 light-years (3 s.f.)**

### [Reasoning] Question 6

(a) Total =  $2.4 \times 10^6 + 0.6 \times 10^6 = 3.0 \times 10^6$ ;

(b) Fraction =  $6.0 \times 10^5 \div 3.0 \times 10^6 = 0.2 = 1/5$

$\therefore$  **(a)  $3.0 \times 10^6$  (b)  $1/5$**



### [Problem Solving] Question 7

$$\text{Total} = 5.97 \times 10^{24} + 7.35 \times 10^{22} = 5.97 \times 10^{24} + 0.0735 \times 10^{24} = 6.0435 \times 10^{24}$$

$$\text{Moon \%} = \frac{7.35 \times 10^{22}}{6.0435 \times 10^{24}} \times 100 = 1.216\% \approx 1.22\%$$

$\therefore$  **1.22% (3 s.f.)**

### [Problem Solving] Question 8

$$(a) 3.6 \times 10^3 \text{ cm} = 3.6 \times 10^3 \div 100 \text{ m} = 3.6 \times 10^1 \text{ m}$$

$$(b) \text{Area} = (3.6 \times 10^1)^2 = 12.96 \times 10^2 = 1.296 \times 10^3 \text{ m}^2$$

$\therefore$  **(a)  $3.6 \times 10^1 \text{ m}$  (b)  $1.296 \times 10^3 \text{ m}^2$**

### [Problem Solving] Question 9

Divide coefficients:  $4.2 \div 7 = 0.6$

Subtract indices:  $10^8 \div 10^{-3} = 10^{8-(-3)} = 10^{11}$

$0.6 \times 10^{11}$  is not in standard form  $\rightarrow$  adjust:  $6 \times 10^{10}$

$\therefore$

### [Problem Solving] Question 10

$$(a) a \times b = (p \times 10^m) \times (q \times 10^n) = pq \times 10^{m+n}$$

This is of the form  $k \times 10^{m+n}$  where  $k = pq$ . ✓

(b) If  $pq \geq 10$ , the result is not in standard form. We must divide  $pq$  by 10 and add 1 to the power.

$$\text{Example: } (5 \times 10^3) \times (4 \times 10^2) = 20 \times 10^5$$

$\rightarrow$  adjust:  $2.0 \times 10^6$

$\therefore$  **(a)  $pq \times 10^{m+n}$  shown ✓ (b) If  $pq \geq 10$ , divide by 10 and increase power by 1.**