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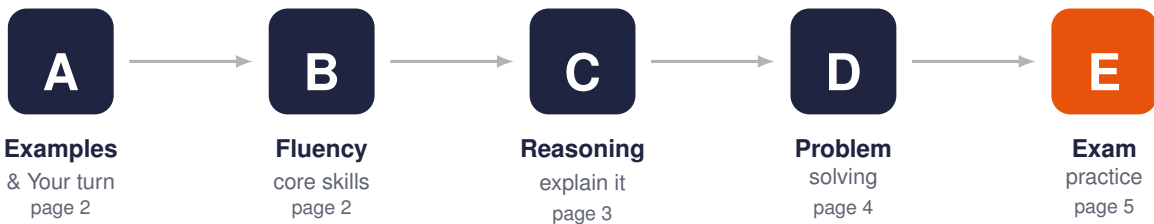
GCSE MATHEMATICS • NUMBER

Standard Form

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator only where shown

Full worked solutions for the free Standard Form worksheet, GCSE and iGCSE Maths



Tap a section to jump straight to it

Full worked solutions for every question on the Standard Form worksheet, in the same order and with the same question numbers.

How to mark your work. Tick each step you got right, not just the final answer. In the exam, method marks are given for correct working even when the final answer is wrong. If you lost marks, find the *first* line where your working is different from ours. That is the thing to fix.

In Section E: **M** = method mark, **P** = process mark, **A** = accuracy mark, **B** = independent mark, **C** = communication mark.

Question sheet

Number revision engine

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION

A1 (a) 5.08 made 6 places bigger: 5.08×10^6 (b) 3.9 made 5 places bigger: $390\,000$

A2 (a) 7.6 made 3 places smaller: 7.6×10^{-3} (b) 2.4 made 5 places smaller: $0.000\,024$

A3 $5 \times 7 = 35$ $10^4 \times 10^6 = 10^{10}$ $35 \times 10^{10} = 3.5 \times 10^1 \times 10^{10} = 3.5 \times 10^{11}$

A4 $1.8 \div 9 = 0.2$ $10^7 \div 10^2 = 10^5$ $0.2 \times 10^5 = 2 \times 10^4$

HIGHER

A5 $6.1 \times 10^6 = 61 \times 10^5$ $61 \times 10^5 - 2.8 \times 10^5 = 58.2 \times 10^5 = 5.82 \times 10^6$

A6 $2.4 \div 8 = 0.3$ $10^{-5} \div 10^{-8} = 10^{-5-(-8)} = 10^3$ $0.3 \times 10^3 = 3 \times 10^2$ **300 times**

A7 Make the power even: $3.6 \times 10^7 = 36 \times 10^6$ $\sqrt{36} = 6$ and $\sqrt{10^6} = 10^3$ **6×10^3**

A8 $40y = 40 \times 3 \times 10^n = 120 \times 10^n$ $120 = 1.2 \times 10^2$ **$1.2 \times 10^{n+2}$**

B**Fluency solutions**One mark for each correct part unless stated. The notes in *italics* explain why each sequence was chosen.**FOUNDATION**

B1 (a) 3×10^3 (b) 3.4×10^3 (c) 3.4×10^6 (d) 3.4×10^1

The digits 3 and 4 stay the same. Only the power changes with the size of the number.

B2 (a) 3×10^{-1} (b) 3.4×10^{-2} (c) 3.4×10^{-4} (d) 3.04×10^{-5}

In (d) the zero between the 3 and the 4 must be kept.

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B3 (a) $50\,000$ (b) $52\,000$ (c) $0.005\,02$ (d) $10^0 = 1$, so 5

B4 (a) $4.5 \times 10^1 \times 10^3 = 4.5 \times 10^4$ (b) $6 \times 10^{-1} \times 10^5 = 6 \times 10^4$

(c) $2.3 \times 10^2 \times 10^{-4} = 2.3 \times 10^{-2}$ (d) $8 \times 10^{-2} \times 10^{-2} = 8 \times 10^{-4}$

If the front number is too big the power goes up. If it is too small the power goes down.

B5 (a) 8×10^8 (b) $10^{-2+6} = 6 \times 10^4$ (c) 4×10^4 (d) $10^{2-(-4)} = 3 \times 10^6$

B6 (a) 1.073×10^{10} (b) 3.6×10^{-8} (c) 1.681×10^{13}

B7 $6.1 \times 10^4 = 61\,000$ $5.8 \times 10^5 = 580\,000$ $6 \times 10^{-4} = 0.0006$

6×10^{-4} , 6.1×10^4 , $61\,500$, 5.8×10^5

HIGHER

B8 (a) $30 \times 10^7 = 3 \times 10^8$ (b) $56 \times 10^{-5} = 5.6 \times 10^{-4}$ (c) $0.25 \times 10^3 = 2.5 \times 10^2$ (d) $0.5 \times 10^{-7} = 5 \times 10^{-8}$

B9 (a) 8×10^4 (b) $13 \times 10^5 = 1.3 \times 10^6$ (c) $420 \times 10^4 + 3 \times 10^4 = 423 \times 10^4 = 4.23 \times 10^6$

(d) $50 \times 10^{-4} - 4 \times 10^{-4} = 46 \times 10^{-4} = 4.6 \times 10^{-3}$

B10 (a) 9×10^8 (b) $25 \times 10^6 = 2.5 \times 10^7$ (c) $\sqrt{16 \times 10^8} = 4 \times 10^4$ (d) 8×10^{-9}

C

Reasoning solutions

Your wording can be different. Check that your reason makes the same point.

FOUNDATION

C1 3.5×10^{-2} and 9.99×10^0 are in standard form. In 12×10^4 the front number is 10 or more. In 0.7×10^3 it is less than 1.

C2 0.0045 is less than 1, so the power must be negative. 4.5×10^{-3}



C3 1.2×10^6 is larger, because it has the higher power of 10 (1 200 000 compared with 890 000). Compare the powers first.

C4 (a) 3.6×10^{-5} (b) $0.000\ 036$

C5 (a) $206\ 000 = 2.06 \times 10^5$ (b) $72\ 000\ 000 = 7.2 \times 10^7$ (c) $0.000\ 003 = 3 \times 10^{-6}$

HIGHER

C6 She added the front numbers and added the powers. To add, the powers of 10 must match: $40 \times 10^2 + 3 \times 10^2 = 43 \times 10^2 = 4.3 \times 10^3$

C7 For example $(5 \times 10^2) \times (4 \times 10^3) = 20 \times 10^5 = 2 \times 10^6$. The power is 6, not $2 + 3 = 5$, because 5×4 is 10 or more.

C8 $xy = 15 \times 10^{m+n}$ $15 = 1.5 \times 10^1$ $1.5 \times 10^{m+n+1}$

C9 (a) $p^3 = 2^3 \times 10^{3n} = 8 \times 10^{3n}$

(b) $\frac{1}{p} = \frac{1}{2} \times 10^{-n} = 0.5 \times 10^{-n} = 5 \times 10^{-n-1}$

C10 $2^{40} = (2^{10})^4 = 1024^4$ and $10^{12} = (10^3)^4 = 1000^4$
 $1024 > 1000$, so $1024^4 > 1000^4$ 2^{40} is larger

D

Problem solving solutions

There is often more than one correct method. Any complete, correct method scores full marks.

FOUNDATION

D1 (a) **Mercury**, the only distance with the power 10^7 . (b) $2.28 \times 10^8 - 1.5 \times 10^8 = 0.78 \times 10^8 = 7.8 \times 10^7$ km

D2 $5\text{ cm} = 0.05\text{ m}$ $0.05 \div 500 = 0.0001$ $1 \times 10^{-4}\text{ m}$

D3 $1\text{ hour} = 3600\text{ seconds}$ $3 \times 10^8 \times 3600 = 1.08 \times 10^{12}\text{ m}$



D4 $2.4 \times 10^6 \div 30 = 2\,400\,000 \div 30 = 80\,000$ 8×10^4

D5 $3 \div (6 \times 10^{-5}) = 0.5 \times 10^5$ 5×10^4 grains

HIGHER

D6 $6.4 \div 2.5 = 2.56$ $10^7 \div 10^5 = 10^2$ $2.56 \times 10^2 = 256$ people per km^2

D7 $c^2 = 9 \times 10^{16}$ $E = 2.5 \times 10^{-3} \times 9 \times 10^{16} = 22.5 \times 10^{13} = 2.25 \times 10^{14}$

D8 $k = (2 \times 10^{30}) \div (6 \times 10^{24}) = 333\,333.3\ldots$ 3.3×10^5

D9 Write all three with the power 10^6 : $4.7 \times 10^6 + 0.85 \times 10^6 + 12 \times 10^6 = 17.55 \times 10^6$ $£1.755 \times 10^7$

D10 (a) $x = 6 \times 10^n = 60 \times 10^{n-1}$ $x + y = 65 \times 10^{n-1} = 6.5 \times 10^n$

(b) $\frac{x}{y} = \frac{6}{5} \times 10^{n-(n-1)} = 1.2 \times 10^1$ 1.2×10^1

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 (a) 306 000 B1

(b) 9.1×10^{-4} B1

(c) $45\,000\,000 = 4.5 \times 10^7$ B1

E2 (a) $3 \times 2 = 6$ and 10^{4+5} M1

6×10^9 A1

(b) $8.4 \div 2 = 4.2$ and 10^{9-3} M1

4.2×10^6 A1



E3 $3.2 \times 10^{-2} = 0.032$ $3.4 \times 10^{-3} = 0.0034$ M1
 $0.003, 3.4 \times 10^{-3}, 0.03, 3.2 \times 10^{-2}$ A1

E4 Top: 3.25×10^7 M1
 $3.25 \times 10^7 \div 1.3 \times 10^{-2}$ M1
 2.5×10^9 A1

HIGHER

E5 56×10^3 M1
 5.6×10^4 A1

E6 $2.7 \div 9 = 0.3$ and $10^{4-(-3)} = 10^7$, giving 0.3×10^7 M1
 3×10^6 A1

E7 $6.4 \times 10^5 = 64 \times 10^4$ M1
 $64 \times 10^4 - 3.9 \times 10^4 = 60.1 \times 10^4$ M1
 6.01×10^5 A1

E8 (a) $4.5 \div 2.5 = 1.8$ and 10^{8-4} M1
 1.8×10^4 hours A1
 (b) $18000 \div 24$ M1
 750 days A1

E9 $xy = 10 \times 10^{m+n} = 10^{m+n+1}$, so $m+n+1 = 7$ and $m+n = 6$ P1 P1
 $\frac{x}{y} = 0.625 \times 10^{m-n} = 6.25 \times 10^{m-n-1}$, so $m-n-1 = 3$ and $m-n = 4$ P1 P1
 Adding: $2m = 10$ $m = 5, n = 1$ A1 Check: $2.5 \times 10^5 \times 4 \times 10^1 = 10^7$

