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GCSE MATHEMATICS • NUMBER

Percentages

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • Calculator for B7, B11 and Sections D and E only

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



Tap a section to jump straight to it

Full worked solutions for every question on the Percentages 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

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION

A1 $10\% \text{ of } 80 = 8$, so $40\% = 32$ $5\% = 4$ $32 + 4 = \boxed{36}$

A2 $100\% - 6\% = 94\%$, so the multiplier is 0.94 $650 \times 0.94 = \boxed{611}$

A3 The new price is 70% of the original. $91 \div 0.7 = \boxed{£130}$ Check: $130 \times 0.7 = 91$

HIGHER

A4 $0.9 \times 1.3 = 1.17$ original $\times 1.17 = 585$ $585 \div 1.17 = \boxed{£500}$ Check: $500 \rightarrow 450 \rightarrow 585$

A5 Year 12 is 65% of the students. Year 13: $0.35 \times 0.8 = 0.28$ Year 12: $0.65 \times 0.6 = 0.39$ $0.28 + 0.39 = 0.67$ $\boxed{67\%}$

A6 $\left(1 - \frac{x}{100}\right)^2 = 0.49$ $1 - \frac{x}{100} = 0.7$ $\frac{x}{100} = 0.3$ $\boxed{x = 30}$ Check: $0.7 \times 0.7 = 0.49$

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

B1 (a) $\boxed{7}$ (b) half of (a): $\boxed{3.5}$ (c) (a) + (b): $\boxed{10.5}$ (d) $70 + 10.5 = \boxed{80.5}$

Every answer is built from 10%. More than 100% gives more than the original.

B2 (a) $48 \div 4 = \boxed{12}$ (b) (a) $\div 10$: $\boxed{1.2}$ (c) $4 + 2 + 1 = \boxed{7}$ (d) $1\% = 6$, so $\boxed{3}$

B3 (a) $\boxed{35\%}$ (b) $\boxed{36\%}$ (c) $\frac{36}{80} = \frac{9}{20} = \boxed{45\%}$ (d) $\frac{45}{40} = \frac{9}{8} = \boxed{112.5\%}$

In (d) the first number is bigger than the second, so the percentage is more than 100.

B4 (a) $\boxed{1.15}$ (b) $\boxed{0.92}$ (c) $\boxed{1.025}$ (d) $100\% + 120\% = 220\%$: $\boxed{2.2}$



B5 (a) $320 \times 1.15 = 368$ (b) $320 \times 0.85 = 272$ (c) $84 \times 1.025 = 86.1$ (d) $1200 \times 0.825 = 990$

B6 (a) $\frac{10}{40} \times 100 = 25\% \text{ increase}$ (b) $\frac{10}{50} \times 100 = 20\% \text{ decrease}$ (c) $\frac{40}{250} \times 100 = 16\% \text{ decrease}$

(a) and (b) use the same two numbers, but the percentage is different because the original amount is different.

B7 (a) $0.23 \times 185 = 42.55$ (b) $0.075 \times 64 = £4.80$ (c) $38 \div 95 \times 100 = 40\%$

B8 (a) $96 \div 1.2 = 80$ (b) $170 \div 0.85 = 200$ (c) $468 \div 1.04 = 450$ (d) $78 \div 0.65 = 120$

B9 (a) $1.2 \times 1.25 = 1.5$ 50% increase (b) $0.9 \times 0.9 = 0.81$ 19% decrease (c) $1.5 \times 0.5 = 0.75$
25% decrease

HIGHER

B10 (a) $1.1 \times 1.2 = 1.32$, $264 \div 1.32 = 200$ (b) $0.8 \times 0.5 = 0.4$, $60 \div 0.4 = 150$ (c) $1.25 \times 0.8 = 1$, so 88
In (c) the two changes cancel exactly, because $1.25 \times 0.8 = 1$.

B11 (a) $2000 \times 1.05^3 = £2315.25$ (b) $800 \times 0.9^4 = 524.88$ (c) $1.2^3 = 1.728$, $1.2^4 = 2.0736$: 4 years

B12 (a) $1.3p$ (b) $y \left(1 - \frac{x}{100}\right)$ (c) $1.08n = 270$, $n = 270 \div 1.08 = 250$

C

Reasoning solutions

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

FOUNDATION

C1 30% of 50 = 15 50% of 30 = 15 Yes, both are 15

C2 Dividing by 5 finds one fifth, which is 20%. For 5%, find 10% and halve it (or divide by 20). 10% of 80 = 8, so 5% = 4

C3 $200 \times 1.1 = £220$ $220 \times 0.9 = £198$ No, it costs £198. The second 10% is 10% of a bigger amount.



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- C4** The sale price is 80% of the original. $80\% = £40$, so $10\% = £5$ and $100\% = £50$ No, it cost £50.
The 20% was taken from the original price, not from £40.
- C5** The 30% is applied to the already increased amount. $1.2 \times 1.3 = 1.56$, a 56% increase, not 50%.
- C6** (a) The VAT is 20% of the price **before** VAT. £960 is 120% of that price, so 20% of £960 is too much.
(b) $960 \div 1.2 =$ £800

HIGHER

- C7** New = $1.25 \times$ original, so original = new $\div 1.25 =$ new $\times 0.8$ 20% decrease
- C8** $y = 0.6x$, so $x = \frac{y}{0.6} = \frac{5}{3}y$ $\frac{5}{3} \times 100 = \frac{500}{3}$ $166\frac{2}{3}\%$
- C9** $A = 1.2B$ and $B = 0.75C$ so $A = 1.2 \times 0.75C = 0.9C$
 A is 90% of C , which is 10% less than C . shown
- C10** (a) Final value = $N \left(1 + \frac{x}{100}\right) \left(1 - \frac{x}{100}\right) = N \left(1 - \frac{x^2}{10000}\right)$
For $x > 0$, $\frac{x^2}{10000}$ is positive, so the final value is less than N . proved
(b) $\frac{x^2}{10000} \times 100 =$ $\frac{x^2}{100}\%$

D**Problem solving solutions**

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

FOUNDATION

- D1** Car: $100\% - 45\% - 30\% = 25\%$ $240 \div 4 =$ 60 students
- D2** Shop A: $85 \times 0.8 = £68$ Shop B: $90 \times 0.75 = £67.50$ Shop B is cheaper, by 50p



D3 One year: 3% of $\pounds 800 = \pounds 24$ $4 \times 24 = \pounds 96$

D4 Profit = $\pounds 12$ $\frac{12}{40} \times 100 = 30\%$

D5 $2400 \times 1.05 = \pounds 2520$ She keeps 80% : $2520 \times 0.8 = \pounds 2016$

D6 $\pounds 1140$ is 120% of the price before VAT. $1140 \div 1.2 = \pounds 950$

D7 (a) $323 \div 0.85 = \pounds 380$ (b) $323 \times 0.9 = \pounds 290.70$

HIGHER

D8 Boys are 45% of the school. $0.55 \times 0.4 = 0.22$ $0.45 \times 0.6 = 0.27$ $0.22 + 0.27 = 0.49$ 49%

D9 $1.15 \times 0.8 = 0.92$ cost $\times 0.92 = 5520$ $5520 \div 0.92 = \pounds 6000$ Check: $6000 \rightarrow 6900 \rightarrow 5520$

D10 Cost = C Sale price = $C \times 1.6 \times 0.75 = 1.2C$ Profit = $0.2C = 24$ $C = \pounds 120$

D11 Copper at the start: $0.35 \times 400 = 140$ g Let x grams of copper be added.

$\frac{140+x}{400+x} = 0.48$ $140+x = 192+0.48x$ $0.52x = 52$ $x = 100$ 100 g

Check: $\frac{240}{500} = 0.48$

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 (a) 0.35×240

84

(b) $\frac{27}{60} \times 100$

45%

M1

A1

M1

A1



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E2	15% of 360 = 54 or multiplier 1.15	M1
	360 + 54 or 360×1.15	M1
	£414	A1
E3	$\frac{57}{75} \times 100$	M1
	= 76%	A1
	Distinction	C1
E4	$0.024 \times 2500 = £60$	M1
	$3 \times 60 = £180$	M1
	$2500 + 180 = \text{£2680}$	A1
E5	£76 is 80% of the normal price	M1
	$76 \div 0.8$	M1
	£95	A1
E6	1.2×0.85	M1
	= 1.02	A1
	2% increase	A1
HIGHER		
E7	Cost: $150 \times 4 = £600$	P1
	$90 \times 6 = £540$	P1
	$60 \times 4.50 = £270$, total income £810	P1
	$\frac{810 - 600}{600} \times 100$	P1
	35%	A1
E8	Eli = $84 \div 0.6 = £140$	P1
	Dev = 140×1.25	P1
	£175	A1
E9	Total marks = 250	P1
	65% of 250 = 162.5, so he needs at least 163	P1
	$163 - (52 + 41)$	P1
	70 marks	A1



E10 $\left(1 + \frac{x}{100}\right) \left(1 - \frac{x}{100}\right) = 0.96$

P1

$$1 - \frac{x^2}{10000} = 0.96$$

P1

$$x^2 = 400$$

P1

$$x = 20$$

A1

