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GCSE MATHEMATICS • RATIO & PROPORTION

Sharing Ratio

Worked Solutions

Pearson Edexcel GCSE (1MA1) & International GCSE (4MA1) • No calculator

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



Tap a section to jump straight to it

Full worked solutions for every question on the Sharing Ratio 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

Ratio revision engine

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A**Your turn answers**

Compare each line of your working with the solution.

FOUNDATION**A1** Same units: $2\text{ kg} = 2000\text{ g}$, so the ratio is $750 : 2000$ Divide both parts by 250: $750 : 2000 = \boxed{3 : 8}$ **A2** $1 + 3 + 7 = 11$ parts $132 \div 11 = 12$, so 1 part is £12Fin gets $7 - 1 = 6$ more parts than Dan: $6 \times 12 = \boxed{£72}$ Check: Dan £12, Fin £84**A3** The water is 9 parts: $450 \div 9 = 50$, so 1 part is 50 mlSquash is 2 parts: $2 \times 50 = \boxed{100\text{ ml}}$ **HIGHER****A4** y is 2 in one ratio and 3 in the other. The LCM of 2 and 3 is 6. $x : y = 15 : 6$ $y : z = 6 : 8$ so $x : y : z = \boxed{15 : 6 : 8}$ **A5** The total stays the same. Before: $4 : 1$, 5 parts. After: $3 : 2$, also 5 parts.Amy goes from 4 parts to 3 parts, so 1 part is the £30 she gave. $4 \times 30 = \boxed{£120}$ Check: $120 : 30$, then $90 : 60 = 3 : 2$ **A6** $\frac{3x-2}{x+6} = \frac{4}{3}$ $3(3x-2) = 4(x+6)$ $9x-6 = 4x+24$ $5x = 30$ $\boxed{x = 6}$ Check: $16 : 12 = 4 : 3$ **A7** Tin A: $4 \div 4 = 1$, so 3 litres red and 1 litre whiteTin B: $6 \div 3 = 2$, so 2 litres red and 4 litres whiteTotal: 5 litres red and 5 litres white $5 : 5 = \boxed{1 : 1}$ 

B**Fluency solutions**

One mark for each correct part. The notes in *italics* explain why each sequence was chosen.

FOUNDATION

- B1** (a) $3:5$ (b) $3:2$ (c) $1:3:4$ (d) **cannot be simplified** 14 and 25 have no common factor
In (b) the first part is bigger, so the answer is too. Keep the order of the question. In (c) divide all three parts by 15.

- B2** (a) $\times 2: 5:8$ (b) $6:15 = 2:5$ (c) $\times 4: 2:3$ (d) $40:200 = 1:5$
Multiply to clear decimals and fractions first. In (d) change 2m to 200cm first: $40:2$ would be wrong.

- B3** (a) $1:3$ (b) $\div 5: 1:1.6$ (c) $\div 8: 1:0.25$ (d) $20:50 = 1:2.5$
Divide both parts by the first number. n does not have to be a whole number, and it can be less than 1.

- B4** (a) 8 parts, 1 part = £5: **£15 and £25** (b) **£25 and £15**
 (c) 10 parts, 1 part = 4 kg: **4 kg, 16 kg and 20 kg** (d) $50 \div 8 = 6.25$: **£18.75 and £31.25**
Reversing the ratio swaps the shares. In (d) one part is not a whole number of pounds, so the shares include pence.

- B5** (a) $64 \div 8 = 8$ **40** (b) $18 \div 3 = 6$ **30** (c) the difference is 2 parts, so 1 part is 7 **35**
The ratio stays the same. What you are told is 8 parts, then 3 parts, then 2 parts.

- B6** (a) $\frac{2}{9}$ (b) $\frac{2}{12} = \frac{1}{6}$ (c) $3:5$ (d) $40:60 = 2:3$
In (a) and (b) red is 2 parts both times, but the whole is different. The denominator is the total number of parts, never the other part.

- B7** (a) $2:1$ (b) $1:2$ (c) $1.5:1 = 3:2$ (d) Ben = 1 part, Ann = 3, Cal = 2: **3:1:2**
"Half as much" gives $1:2$, not $2:1$. In (d) start from the person the others are compared with.

HIGHER

- B8** (a) $1:2:5$ (b) $4:6$ and $6:7$ **4:6:7** (c) $15:20$ and $20:6$ **15:20:6** (d) $12:9$ and $12:10$ **12:9:10**

Make the shared letter the same number in both ratios. In (d) the shared letter is a , which comes first in both.

- B9** (a) $4x = 36$ **$x = 9$** (b) $2x = 15$ **$x = 7.5$** (c) $2(x+1) = 3(x-1)$ **$x = 5$** (d) $4(2x+1) = 5(x+5)$ **$x = 7$**



- B10** (a) $3:2$ (b) $2x = 5y$ $5:2$ (c) $3x + 3y = 7y$, $3x = 4y$ $4:3$ (d) $3x + 3y = 5x - 5y$, $2x = 8y$ $4:1$

If $2x = 3y$ then x is the bigger number, so $x:y = 3:2$. The numbers swap sides.

- B11** Let $a = 3k$ and $b = 5k$. (a) $8k:5k$ $8:5$ (b) $3:8$ (c) $11k:8k$ $11:8$ (d) $2k:8k = 1:4$

C

Reasoning solutions

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

FOUNDATION

- C1** (a) Jack divided by each number in the ratio. He should divide by the total number of parts, $2 + 3 = 5$
 (b) $60 \div 5 = 12$ $2 \times 12 = 24$ and $3 \times 12 = 36$ **£24 and £36**
- C2** **No.** There are $2 + 3 = 5$ parts, and boys are 2 of them. So $\frac{2}{5}$ of the class are boys, not $\frac{2}{3}$
- C3** (a) **No.** $2 + 3 + 4 = 9$ parts, and 50 is not a multiple of 9
 (b) The next multiple of 9 after 50 is 54 $54 - 50 = 4$ sweets Check: $54 \div 9 = 6$, shares 12, 18 and 24
- C4** Perimeter = $5k + 2k + 5k + 2k = 14k = 56$, so $k = 4$
 Length = 20 cm, width = 8 cm Area = $20 \times 8 = 160 \text{ cm}^2$ as required

HIGHER

- C5** Let $a = 3k$ and $b = 4k$.
 (i) **False** $3a = 9k$ but $4b = 16k$ (ii) **True** $4a = 12k$ and $3b = 12k$
 (iii) **False** $b - a = k$, which is 1 only when $k = 1$ (for example $a = 6$, $b = 8$) (iv) **True** $a + b = 7k$ and $a = 3k$
- C6** $3:5$ is in its simplest form, so the numbers are $3k$ and $5k$ for some whole number k
 Product = $3k \times 5k = 15k^2$ k^2 is a square number, so the product is 15 times a square number. **proved**
- C7** Jo's larger share is $\frac{5}{8}$ of her sum J . Kay's larger share is $\frac{7}{9}$ of her sum K .
 $\frac{5}{8}J = \frac{7}{9}K$ multiply by 72: $45J = 56K$ so $J:K = 56:45$ as required



- C8** (a) $EB = x - 1$ and $BC = 1$. Since $x < 2$, EB is less than 1, so the longer side of $EBCF$ is BC .

Longer : shorter is the same for both rectangles: $\frac{1}{x-1} = \frac{x}{1}$

So $x(x-1) = 1$, which gives $x^2 - x - 1 = 0$

as required

(b) $x = \frac{1 \pm \sqrt{(-1)^2 - 4 \times 1 \times (-1)}}{2} = \frac{1 \pm \sqrt{5}}{2}$

$x > 1$, so

$$x = \frac{1 + \sqrt{5}}{2}$$

This number, about 1.618, is called the golden ratio.

D

Problem solving solutions

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

FOUNDATION

- D1** Ratio of ages 7 : 9 : 12. The youngest gets 7 parts = £42, so 1 part is £6

Total parts = $7 + 9 + 12 = 28$ $28 \times 6 = \text{£168}$

- D2** Cars have $7 - 2 = 5$ more parts than vans. 5 parts = 45, so 1 part = 9

Total = 9 parts = $9 \times 9 = \text{81 vehicles}$ Check: 63 cars and 18 vans

- D3** Find how big 1 part could be for each ingredient:

strawberries $1200 \div 3 = 400$ g banana $1000 \div 2 = 500$ g yoghurt $2500 \div 5 = 500$ g

The strawberries run out first, so 1 part is 400 g. $10 \times 400 = 4000$ g = **4 kg**

- D4** $AP : PB = 1 : 2$, so $AP = 48 \div 3 = 16$ cm and $PB = 32$ cm

$PQ : QB = 3 : 5$, so $PQ = 32 \div 8 \times 3 = 12$ cm $AQ = 16 + 12 = \text{28 cm}$

HIGHER

- D5** Maya is m and her mum is $4m$. In 8 years: $\frac{m+8}{4m+8} = \frac{1}{3}$ $3m + 24 = 4m + 8$ $m = 16$

Ages now 16 and 64. In t years: $\frac{16+t}{64+t} = \frac{1}{2}$ $32 + 2t = 64 + t$ **$t = 32$ years**

Check: in 32 years Maya is 48 and her mum is 96, and $48 : 96 = 1 : 2$

- D6** $P(\text{green}) = \frac{x}{9+x} = \frac{1}{4}$ $4x = 9+x$ $x = 3$

Blue is 5 parts = 20, so 1 part is 4. Green = $3 \times 4 = \text{12}$



D7 Let Alex start with £ T . The rest is $\frac{2}{3}T$, shared into 8 parts.

Cole has 2 more parts than Bea, which is $\frac{2}{8}$ of $\frac{2}{3}T = \frac{1}{6}T$ $\frac{1}{6}T = 60$ **£360**

Check: charity £120, the rest £240 is shared as £90 and £150

D8 Let the side be $4k$. Then $AP = k$, $PB = 3k$, $BQ = QC = 2k$.

Area of the square minus the three corner triangles:

$$16k^2 - \frac{1}{2}(4k)(k) - \frac{1}{2}(3k)(2k) - \frac{1}{2}(2k)(4k) = 16k^2 - 2k^2 - 3k^2 - 4k^2 = 7k^2$$

$7k^2 = 63$, so $k^2 = 9$ and $k = 3$. Side = 12 cm. Area = **144 cm²**

E

Exam practice solutions

Marks are shown on the right of each line.

FOUNDATION

Foundation and Higher crossover

E1 (a) **3 : 4** B1
 (b) 1200 : 400 M1
3 : 1 A1

E2 $3 + 4 + 9 = 16$ $160 \div 16 = 10$ M1
 $9 \times 10 - 3 \times 10$ or 6×10 M1
£60 A1

E3 (a) $450 \div 3 = 150$ M1
 $150 \times 10 =$ **1500 ml** A1
 (b) $\frac{2}{10} = \frac{1}{5}$ B1

E4 red : blue : green = 2 : 3 : 6 P1
 $44 \div 11 = 4$ P1
 Blue = $3 \times 4 =$ **12** A1



- E5** $180 \div 12 = 15$ M1
 Angles are 30° , 45° and 105° A1
 105° is greater than 90° , so it is obtuse. C1

- E6** Sky: blue is $\frac{3}{8}$ of the paint. Ocean: blue is $\frac{2}{5}$ of the paint. M1
 $\frac{3}{8} = \frac{15}{40}$ and $\frac{2}{5} = \frac{16}{40}$ M1
Ocean has the greater proportion of blue. C1
 Other methods: $\frac{3}{8} = 0.375$ and $\frac{2}{5} = 0.4$, or blue : white as $1 : n$, which gives $1 : 1.67$ and $1 : 1.5$

HIGHER

- E7** Make silver the same: $3 : 4 = 9 : 12$ and $6 : 5 = 12 : 10$ P1
 red : silver : black = $9 : 12 : 10$, 31 parts P1
 $\frac{9}{31}$ A1

- E8** The total stays the same. Before $7 : 3$ is 10 parts. After $3 : 2 = 6 : 4$ is also 10 parts. P1
 Rosa goes from 7 parts to 6 parts, so 1 part = £40 P1
 7×40 P1
£280 A1
 Check: £280 and £120, then £240 and £160, and $240 : 160 = 3 : 2$

- E9** $3(2a + 3b) = 4(4a - b)$ M1
 $6a + 9b = 16a - 4b$, so $13b = 10a$ M1
 $a : b = 13 : 10$ A1

- E10** Orange juice is $\frac{1}{5}$ of drink A, $\frac{2}{5}$ of drink B and $\frac{1}{4}$ of the new drink. P1
 Orange in the new drink = $\frac{1}{4} \times 1000 = 250$ ml P1
 Let a ml of A be used, so $1000 - a$ ml of B: $\frac{1}{5}a + \frac{2}{5}(1000 - a) = 250$ P1
 $a + 2000 - 2a = 1250$ so $a = 750$ P1
750 ml A1
 Check: A gives 150 ml orange, B (250 ml) gives 100 ml. $250 : 750 = 1 : 3$

