

Ratio Problems

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

The trees in an orchard are apple trees or cherry trees in the ratio
apple : cherry = 4 : 5

What fraction of the trees are cherry trees?

Circle your answer.

Options: $\frac{4}{5}$, $\frac{5}{9}$, $\frac{4}{9}$, $\frac{5}{4}$

Total number of parts = $4 + 5 = 9$

5 of the 9 parts are cherry trees.

Answer: $\frac{5}{9}$

Tip: $\frac{4}{5}$ is the most common wrong answer. The bottom of the fraction is the **total** number of parts, $4 + 5 = 9$.

2 (2 marks)

(a) A tennis player wins or loses matches in the ratio win : lose = 5 : 9
What fraction of the matches do they win?

Total number of parts = $5 + 9 = 14$

5 of the 14 parts are wins.

Answer: $\frac{5}{14}$

- (b) In a choir, $\frac{3}{8}$ of the singers are men.
The rest of the singers are women.
Write down the ratio men : women

Think of the choir as 8 equal parts.

Men are 3 of the 8 parts.

So women are $8 - 3 = 5$ parts.

men : women = 3:5

Answer: 3 : 5

Tip: The ratio is not 3:8. The 8 is the whole choir, so the women are $8 - 3 = 5$ parts.

3 (1 mark)

In a sale, the price of a jacket is 20% less than its original price.

Circle the ratio sale price : original price

Options: 4 : 5, 5 : 4, 1 : 5, 5 : 6

Pick a value for the original price, e.g. £100.

20% of £100 is £20, so the sale price is $100 - 20 = £80$

sale price : original price = 80:100

Divide both parts by 20: 4:5

Answer: 4 : 5

Tip: Check the order. The sale price comes first and it is the smaller amount, so the first number must be smaller.

4 (3 marks)

Two candles are lit at the same time.

Candle A is 24 cm tall and gets 1.5 cm shorter every hour.

Candle B is 18 cm tall and gets 0.5 cm shorter every hour.

After how many hours will the heights of candle A and candle B be in the ratio 1 : 2?

After h hours: candle A is $24 - 1.5h$ cm and candle B is $18 - 0.5h$ cm tall.

Try some values of h :

$h = 4$: A is $24 - 6 = 18$ cm, B is $18 - 2 = 16$ cm. 18:16 is not 1:2

$h = 10$: A is $24 - 15 = 9$ cm, B is $18 - 5 = 13$ cm. 9:13 is not 1:2

$h = 12$: A is $24 - 18 = 6$ cm, B is $18 - 6 = 12$ cm

6:12 = 1:2 ✓

So the answer is 12 hours.

Answer: 12 hours

Tip: Both candles get shorter at the same time. Work out both heights for the same number of hours, then check if B is twice A.

Marks: 1 mark for the heights of both candles after the same number of hours. 1 mark for comparing the heights with the ratio 1:2. 1 mark for 12.

5 (2 marks)

At a cinema, the ratio of adults to children watching a film is 7 : 4

Hana says,

‘There could be exactly 150 people watching the film.’

Is Hana correct? Tick a box.

Give a reason for your answer.

adults : children = 7:4, so there are $7 + 4 = 11$ parts.

Each part is a whole number of people.

So the total number of people must be a multiple of 11.

$150 \div 11 = 13.63 \dots$, which is not a whole number.

($11 \times 13 = 143$ and $11 \times 14 = 154$.)

So there cannot be exactly 150 people.

Answer: No, the total must be a multiple of 11 and 150 is not

Tip: Add the parts of the ratio. The total must be a multiple of this number.

Marks: 1 mark for 11 parts or $150 \div 11$. 1 mark for No with a correct reason.

6 (1 mark)

Nell mixes blue paint and white paint in the ratio 1 : 4

Leon mixes blue paint and white paint in the ratio 1 : 6

Leon says,

‘My mix must have more white paint in it than Nell’s mix, because 6 is bigger than 4.’

Give an example to show that Leon might be wrong.

A ratio tells you how the amounts compare, not how much paint was mixed altogether.

Example: Nell mixes 10 litres of blue and 40 litres of white (1: 4).

Leon mixes 1 litre of blue and 6 litres of white (1: 6).

Nell’s mix has more white paint than Leon’s.

Answer: e.g. Nell 10 litres blue, 40 litres white; Leon 1 litre blue, 6 litres white

7 (2 marks)

$$a:b = 2:3 \quad \text{and} \quad b:c = 4:5$$

Work out $a:b:c$

Give your answer in its simplest form.

b is 3 in the first ratio and 4 in the second.

Make b the same in both: the LCM of 3 and 4 is 12.

$$a:b = 2:3 = 8:12 \quad (\text{multiply by } 4)$$

$$b:c = 4:5 = 12:15 \quad (\text{multiply by } 3)$$

$$\text{So } a:b:c = 8:12:15$$

Answer: 8 : 12 : 15

Tip: You cannot just join them as 2:3:5 or 2:4:5. First make the b parts the same.

Marks: 1 mark for 8:12 or 12:15. 1 mark for 8:12:15.

8 (2 marks)

A drink is made from apple juice and mango juice in the ratio

$$\text{apple} : \text{mango} = n : 12$$

25% of the drink is apple juice.

Work out the value of n .

25% is apple juice, so $100 - 25 = 75\%$ is mango juice.

$$\text{apple} : \text{mango} = 25:75$$

Divide both parts by 25: $1:3$

To make the mango part 12, multiply both parts by 4: $4:12$

$$\text{So } n = 4$$

Answer: $n = 4$

Tip: 12 parts are the mango juice, which is 75% of the drink, not 100%.

Marks: 1 mark for 25:75 or 1:3 (or 12 parts = 75%). 1 mark for 4.

9 (3 marks)

A hiking club goes on a trip.

The cost of the trip is paid by the club and by the members in the ratio

$$\text{club} : \text{members} = 2 : 3$$

There are 25 members. Each member pays £36

Work out the total cost of the trip.

The members pay $25 \times 36 = \text{£}900$ altogether.

The members' share is 3 parts, so 3 parts = £900

$$\text{One part} = 900 \div 3 = \text{£}300$$

$$\text{Total number of parts} = 2 + 3 = 5$$

Total cost = $5 \times 300 = \text{£}1500$

Answer: £1500

Tip: £900 is only the members' share (3 parts). The total cost is all 5 parts.

Marks: 1 mark for $25 \times 36 = 900$. 1 mark for $900 \div 3 = 300$. 1 mark for £1500.

10 (3 marks)

Freya makes compost by mixing soil, sand and bark in the ratio
soil : sand : bark = 5 : 2 : 1

She has 60 litres of soil, 20 litres of sand and 20 litres of bark.
What is the greatest amount of compost she can make?

soil : sand : bark = 5:2:1

Soil: $60 \div 5 = 12$ litres for each part.

Sand: $20 \div 2 = 10$ litres for each part.

Bark: $20 \div 1 = 20$ litres for each part.

The sand runs out first, so one part can be at most 10 litres.

Soil = $5 \times 10 = 50$ litres, sand = $2 \times 10 = 20$ litres, bark = $1 \times 10 = 10$ litres.

Compost = $50 + 20 + 10 = 80$ litres

Answer: 80 litres

Tip: Do not just add up everything she has. Find which ingredient runs out first.

Marks: 1 mark for working out the size of one part for at least two ingredients (or finding that sand runs out first). 1 mark for 10 litres per part. 1 mark for 80.
