Worksheet - Ratio and proportion

Year: Year 8 · 20

Show your working.

Question 1

Question 1 – Simplifying ratios *(Section A · Skills practice)*

Write each ratio in its simplest form.

a. $18 : 24$
b. $45 : 60 : 75$
c. $2.5 : 10$
d. $\frac{1}{2} : \frac{3}{4}$
e. 200 g : 1.5 kg (change units first)

Question 2

Question 2 – Ratios in the form 1 : n *(Section A · Skills practice)*

Write each ratio in the form $1 : n$, and in the form $n : 1$.

a. $4 : 10$
b. $5 : 12$
c. $8 : 20$
d. $3 : 15$

Question 3

Question 3 – Sharing in a ratio *(Section A · Skills practice)*

Share each amount in the given ratio. Show the value of one part.

a. £60 in the ratio $2 : 3$
b. £84 in the ratio $4 : 3$
c. 180 kg in the ratio $5 : 3 : 1$
d. £7.50 in the ratio $1 : 4$

Question 4

Question 4 – Finding a missing amount *(Section A · Skills practice)*

Use the ratio to find the missing amounts.

a. The ratio of boys to girls is $3 : 5$. There are 24 boys. How many girls?
b. Red paint to white paint is $4 : 7$. There are 35 litres of white. How much red?

c. The ratio of cats to dogs is $5 : 2$. There are 63 cats and dogs altogether. How many of each?
d. The ratio of $A : B$ is $2 : 5$ and $B - A = 36$. Find A and B.

Question 5

Question 5 – Direct proportion: the unitary method *(Section A · Skills practice)*

Use the unitary method (find the value of one) for each question.

a. 5 pens cost £3.20. How much do 8 pens cost?
b. A car uses 18 litres of petrol for 150 miles. How much for 400 miles?
c. 12 identical biscuits contain 840 calories. How many calories are in 7 biscuits?
d. A machine makes 450 bottles in 6 minutes. How many bottles in 14 minutes?

Question 6

Question 6 – Inverse proportion *(Section A · Skills practice)*

In inverse proportion, when one quantity increases the other decreases. The total (product) stays the same.

a. 4 workers take 9 days to paint a fence. How many days will 6 workers take?
b. A tank is filled in 40 minutes by 3 identical pipes. How long for 5 pipes?
c. A pack of sweets is shared equally among 12 children and each gets 8. How many each if there are 16 children?
d. 6 pumps empty a pool in 10 hours. How many pumps are needed to empty it in 4 hours?

Question 7

Question 7 – Scaling a recipe *(Section B · Real-life practice)*

This recipe makes 12 flapjacks.

Ingredient	Amount for 12 flapjacks
Rolled oats	300 g
Butter	150 g
Golden syrup	90 g
Brown sugar	75 g

a. Write the ratio of oats to butter to syrup in its simplest form.
b. How much of each ingredient is needed for 30 flapjacks?
c. Sophie only has 200 g of butter. What is the greatest number of flapjacks she can make?
d. Her class of 28 pupils each want one flapjack. How much oats are needed? Round up to a whole 100 g.

Question 8

Question 8 – Mixing concrete *(Section B · Real-life practice)*

Builders mix concrete using cement, sand and gravel in the ratio $1 : 2 : 4$ by volume. A garden path needs 0.7 cubic metres of concrete altogether.



a. How many parts are there?
b. What volume of each material is needed?
c. Cement costs £48 per cubic metre, sand £30 and gravel £36. Find the cost of the materials.
d. The builder decides to change to a $1 : 3 : 5$ mix for the same 0.7 m³. How much more sand is needed than before?

Question 9

Question 9 – Maps and scale *(Section B · Real-life practice)*

A map of the Lake District has a scale of 1 : 50 000.

a. Two villages are 6.4 cm apart on the map. What is the real distance in km?
b. Real distance between a car park and a lake is 3.5 km. How far apart are they on the map, in cm?
c. Write the scale as "1 cm represents ... km".
d. A hiker walks at 4 km/h. How long does it take to walk the distance in part (a)? Give your answer in hours and minutes.

Question 10

Question 10 – Changing money *(Section B · Real-life practice)*

Priya is going on holiday to Spain. The exchange rate is £1 = €1.15. She changes £350.

a. How many euros does she receive?
b. She spends €280 and changes the rest back at £1 = €1.25 (a worse rate). How many pounds does she get?
c. How many pounds is a €60 meal worth at the first rate, to the nearest penny?
d. Compare the two rates: which is better for someone changing euros into pounds? Explain.

Question 11

Question 11 – Best buys at the supermarket *(Section B · Real-life practice)*

Three sizes of orange juice are sold in a supermarket.

Size	Volume	Price
Small	500 ml	£0.85
Medium	1.5 litres	£2.10
Large	2.5 litres	£3.75

a. Work out the price per 100 ml for each size.
b. Which size is the best value?
c. Josh needs 4.5 litres for a party. Which combination of bottles costs the least?
d. Explain why the cheapest bottle is not always the best value.

Question 12

Question 12 – Paint mixing *(Section B · Real-life practice)*

Aisha mixes blue and yellow paint in the ratio $3 : 2$ to make green. She makes 2.5 litres of green.

a. How much blue and how much yellow is in 2.5 litres?
b. How much blue is needed to make 12 litres of green?
c. She runs out of yellow with 0.8 litres of yellow left. How much green can she make at most?
d. The blue costs £6 per litre and the yellow costs £8 per litre. Find the cost of 2.5 litres of green.

Question 13

Question 13 – Workers and days *(Section B · Real-life practice)*

A school fence needs repainting. Four caretakers can paint it in 6 days.

a. How many caretaker-days does the job need?
b. How long will 3 caretakers take?
c. How many caretakers are needed to finish in 2 days?
d. A caretaker works for 2 days alone and then three more join him. How long will it take altogether?

Question 14

Question 14 – Prize money *(Section B · Real-life practice)*

Three friends enter a charity quiz as a team and win a £280 prize. They share it in the ratio of the questions each answered correctly: Jo 14, Kai 18 and Lee 8.

a. Write the ratio in its simplest form.
b. How much does each friend receive?
c. If the prize were shared equally, how much more would Lee receive?
d. The team wins again with £420. Use the same ratio to share it.

Question 15

Question 15 – The school disco budget *(Section C · Problem solving)*

Year 8 is organising a disco. The profit of £450 is to be shared between three causes: the school library, the sports club and a local food bank, in the ratio $5 : 3 : 2$.

a. How much does each cause receive?
b. The food bank asks to receive £150 instead. The other two causes share the rest in the ratio $5 : 3$. How much does each cause receive now?
c. The disco costs £120 to run and each ticket costs £4. Write the ratio of costs to income if 150 tickets are sold.
d. How many tickets must be sold to make a profit of £450?

Question 16

Question 16 – The model aeroplane *(Section C · Problem solving)*

A model aeroplane is built to a scale of 1:72. The real aeroplane is 36 m long with a wingspan of 38.4 m.

a. Find the length and wingspan of the model in cm.
b. The tail of the model is 7.5 cm tall. How tall is the real tail in metres?
c. The real aeroplane carries 180 passengers. The model has 1 toy figure per 12 real passengers. How many figures?
d. The real wing area is 90 m². Find the area of the wing of the model in cm², to 1 decimal place. (Areas scale by the square of the scale factor.)

Question 17

Question 17 – Currency and ratios *(Section C · Problem solving)*

Two friends, Ali and Beth, share a taxi to the airport. The fare is £48. Ali travelled for 12 miles and Beth for 20 miles, as they were dropped off at different points. They split the fare in the ratio of the distances.

a. Write the distances as a ratio in its simplest form.
b. How much does each pay?
c. The taxi driver has a 15% tip added to the fare before sharing. What is the new fare and the new share each?
d. Is Beth's new share the same as her old share increased by 15%? Explain.

Question 18

Question 18 – Comparing recipes *(Section C · Problem solving)*

Two recipes for pancake batter are compared.

Recipe	Flour	Milk	Eggs
Gran's	240 g	400 ml	3
Cookbook	300 g	450 ml	4

a. Write the ratio flour : milk for each recipe in the form $1 : n$.
b. Which recipe gives the thicker batter (more flour for the same milk)? Explain.
c. Using Gran's recipe, how much flour and milk are needed for 6 eggs?
d. Find the ratio of flour : milk : eggs for Gran's recipe with 1 litre of milk.

Question 19

Question 19 – Inverse proportion and a holiday *(Section C · Problem solving)*

A group of 8 friends rent a villa for a week. The total cost is £1 120, shared equally.

a. How much does each person pay?
b. Four more friends join. How much does each person pay now?
c. Explain why this is inverse proportion.
d. The villa owner reduces the price by 10%. What is the cost for 12 people?
e. Another villa costs £1 500 for 10 people. Which villa gives the lower cost per person?

Question 20

Question 20 – Challenge: ratios with three quantities *(Section D · Challenge)*

A bag contains red, green and blue marbles. The ratio of red to green is $2 : 3$ and the ratio of green to blue is $4 : 5$.

a. Make the number of green marbles the same in both ratios and combine them as red : green : blue.
b. There are 210 marbles. How many of each colour are there?
c. Marbles are removed: all the blue ones. What is the new ratio of red to green?
d. What fraction of the original bag was blue? Write as a percentage to 1 decimal place.