Worksheet - Ratio, proportion and percentage change

Year: Year 10 · 20

Show your working.

Question 1

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

Non-calculator. Write each ratio in its simplest form with whole numbers.

a. $24 : 36$
b. $1.5 : 4.5$
c. $\frac{1}{2} : \frac{3}{4}$
d. $250\text{ g} : 1.5\text{ kg}$

Question 2

Question 2 – Sharing in a ratio *(Section A · Skills practice)*

Share each amount in the given ratio. Show your working.

a. £240 in the ratio $3 : 5$
b. 56 sweets in the ratio $2 : 5 : 1$
c. £1.20 in the ratio $1 : 3$
d. What fraction of the £240 does the larger share make?

Question 3

Question 3 – Ratios with a known part *(Section A · Skills practice)*

Use the given quantity to find the other amounts.

a. Red:blue $= 3 : 7$. There are 21 red counters. How many blue counters are there?
b. How many counters are there in total?
c. Boys:girls $= 5 : 6$. There are 45 boys. How many girls?
d. Apples:pears $= 4 : 3$ and there are 56 pieces of fruit altogether. How many pears?

Question 4

Question 4 – The unitary method *(Section A · Skills practice)*

Find the cost of one item first, then work out the new cost.

a. 6 apples cost £2.34. Find the cost of 9 apples.

b. 12 pencils cost £3.00. Find the cost of 20 pencils.
c. A recipe for 8 people needs 600 g of rice. How much for 5 people?
d. 15 litres of paint cover 120 m². How many m² will 22 litres cover?

Question 5

Question 5 – Best buys *(Section A · Skills practice)*

Work out which is the better buy in each pair by finding the price per 100 g or per litre.

Item	Size and price
Cereal A	500 g for £1.80
Cereal B	750 g for £2.55
Juice A	1.5 litres for £1.35
Juice B	2 litres for £1.90

a. Cereal A: find the price per 100 g.
b. Cereal B: find the price per 100 g.
c. Which cereal is better value?
d. Which juice is better value? Show the price per litre.

Question 6

Question 6 – Scale and maps *(Section A · Skills practice)*

A map has a scale of $1 : 25\,000$. Non-calculator.

a. Two villages are 6.4 cm apart on the map. How far apart are they in real life, in km?
b. A footpath is 3 km long. How long is it on the map in cm?
c. What does 1 cm on the map represent in metres?
d. A lake covers 4 cm² on the map. Find its real area in km² (hint: square the scale).

Question 7

Question 7 – Mixing paint *(Section B · Real-life practice)*

A decorator mixes blue paint and yellow paint in the ratio $3 : 2$ to make green. He needs 15 litres of green paint.

a. How many litres of blue and of yellow does he need?
b. Blue paint costs £8 per litre and yellow costs £6.50 per litre. Find the cost of the mixture.
c. Find the cost per litre of the mixture.
d. He only has 4.5 litres of blue. What is the most green paint he can make?

Question 8

Question 8 – The lottery syndicate *(Section B · Real-life practice)*

Three friends buy lottery tickets together, paying in the ratio $2 : 3 : 4$. They win £1260 and share the prize in the same ratio.

Friend	Share of the cost
Amir	2
Beth	3
Chen	4

a. How much does each friend receive?
b. What fraction of the prize does Chen get?
c. Beth uses her share to buy a bike costing £390. How much is left?
d. Amir says, “Chen gets double my share.” Is he correct? Explain.

Question 9

Question 9 – Scaling a recipe *(Section B · Real-life practice)*

A cake uses flour, sugar and butter in the ratio $5 : 3 : 2$ by mass. A baker has 400 g of butter.

a. How much flour and sugar does she need to use all the butter?
b. What is the total mass of the mixture?
c. What percentage of the mixture is sugar?
d. She wants 1.5 kg of mixture in total. How much of each ingredient?

Question 10

Question 10 – Walking to the park *(Section B · Real-life practice)*

On a map with scale $1 : 20\,000$, the distance from a school to a park is 4.5 cm.

a. Work out the real distance in metres.
b. Keira walks at 5 km/h. How many minutes does the walk take, to 1 decimal place?
c. The same walk is drawn on another map and measures 9 cm. Find the scale of this map in the form $1 : n$.
d. A pond in the park has a real area of 0.5 km². What is its area on the first map, in cm²?

Question 11

Question 11 – Exchange rates *(Section B · Real-life practice)*

A bank exchanges £1 for €1.16 when selling euros, and gives £0.84 for €1 when buying euros back. Calculator allowed.

a. Hana changes £250 into euros. How many euros does she get?
b. She spends €180 and changes the rest back into pounds. How many pounds does she receive?
c. How much has she lost compared with the £250 she started with?
d. What percentage of her original £250 is that loss? Give your answer to 1 d.p.

Question 12

Question 12 – Changing a price *(Section B · Real-life practice)*

A theatre ticket costs £40. Calculator allowed.

a. The price is increased by 15%. Find the new price.
b. A week later the price is reduced by 15% of the new price. Find the final price.
c. Show that the final price is lower than the original price.
d. By what percentage has the price changed overall? Give your answer to 1 decimal place.

Question 13

Question 13 – Simple interest *(Section B · Real-life practice)*

Ravi puts £800 into a savings account paying simple interest of 3.5% per year.

a. How much interest is paid each year?
b. How much interest does he earn in 4 years, and what is the total in the account?
c. The simple interest formula is $I = \dfrac{PRT}{100}$. Make T the subject.
d. How many years does it take to earn £210 in interest?

Question 14

Question 14 – Mixing concrete *(Section B · Real-life practice)*

Concrete is made from cement, sand and gravel in the ratio $1 : 2 : 4$ by volume. A builder needs 1.4 m³ of concrete.

a. How much of each material is needed?
b. Cement costs £9 per 0.1 m³ and sand £4 per 0.1 m³ and gravel £5 per 0.1 m³. Find the total cost.
c. What percentage of the concrete is gravel? Give your answer to 1 decimal place.
d. The builder has 0.5 m³ of sand and uses it all. How much concrete can he make?

Question 15

Question 15 – Ages and ratios *(Section C · Problem solving)*

The ages of Maya and her father are in the ratio $3 : 5$. In 6 years' time the ratio will be

$5 : 7$.

a. Write their ages now as $3k$ and $5k$ and write an equation using the ratio in 6 years' time.
b. Solve it to find k.
c. Find their ages now.
d. Check your answer in 6 years' time.

Question 16

Question 16 – Combining ratios *(Section C · Problem solving)*

Three charity collectors A, B and C collect money. The amount collected by A and B is in the ratio $2 : 3$, and the amount collected by B and C is in the ratio $4 : 5$.

a. Make the number for B the same in both ratios (use 12).
b. Write the combined ratio $A : B : C$.
c. The three collected £175 altogether. How much did each collect?
d. What fraction of the total did C collect?

Question 17

Question 17 – Percentage change chains *(Section C · Problem solving)*

Use multipliers to answer these questions.

a. What single percentage increase is equivalent to a 10% increase followed by a 20% increase?
b. £1200 earns 4% interest in year 1 and 2% in year 2. What is the total at the end, and the overall percentage increase?
c. A price rises by 25%. What percentage decrease brings it back to the original?
d. A population falls by 8% each year. After how many whole years is it less than 75% of the original?

Question 18

Question 18 – Alloys and percentages *(Section C · Problem solving)*

Alloy A is 20% copper by mass. Alloy B is 45% copper by mass. A jeweller melts 8 kg of alloy A with 12 kg of alloy B.

a. Work out the mass of copper in each alloy used.
b. Work out the total mass of copper and of the new alloy.
c. What percentage of the new alloy is copper?
d. How much of alloy B must be added to 8 kg of alloy A so that the new alloy is 40% copper?

Question 19

Question 19 – Blending tea *(Section C · Problem solving)*

A shop mixes 3 kg of tea costing £8 per kg with 2 kg of tea costing £13 per kg.

a. Work out the total cost of the mixture.
b. Work out the cost per kg of the mixture.
c. The shop wants a 30% profit. At what price per kg should it sell the blend?
d. A customer buys 450 g of the blend. How much does she pay, to the nearest penny?

Question 20

Question 20 – Challenge: changing the ratio *(Section D · Challenge)*

A drink contains orange juice and water in the ratio $2:3$. When 10 litres of water are added, the ratio of juice to water becomes $1:2$.

a. Write the amounts originally as $2k$ and $3k$ litres.
b. Form an equation using the new ratio and solve it.
c. How many litres of orange juice were there originally?
d. What was the total amount of drink at the end?