Maths GCSE Problem Solving Questions Workbook

Ratio

GRADES 4 – 6

MATHS·SCHOOL

Unitary ratios

EXAMPLE

Two local shops sell cupcakes at different prices.
Candy's Cakes sells 6 cupcakes for £5
Patty's Patisserie sells 4 cupcakes for £3.50
Which is better value? You must show all your working.

6 cupcakes £5.00

4 cupcakes £3.50

**Find the price of 1 cupcake**

Candy's £5.00 ÷ 6 = 83.3p
Patty's £3.50 ÷ 4 = 87.5p

Candy's Cakes offers the best value

**1** The price labels of freshly squeezed orange juice cartons are shown. Kevin is looking to buy 6 litres of this orange juice Which cartons should he buy so that he spends the least amount of money? You must show all your working.

1 litre £2.20

1.5 litres £2.80

2 litres £3.75

2 The prices of three different cereal boxes are shown. Which sized box offers the best value for money? You must show all your working.

300 g £1.50

500g £2.60

750g £3.50
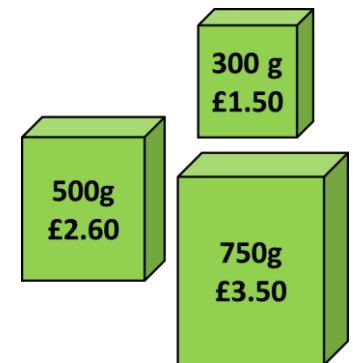
3 Chase wants to buy some containers to store his self-made jam. The cost of a container is dependent on its volume. Which sized container offers the best value for money? You must show all your working.

330ml 37p

700ml 65p

1 litre £1
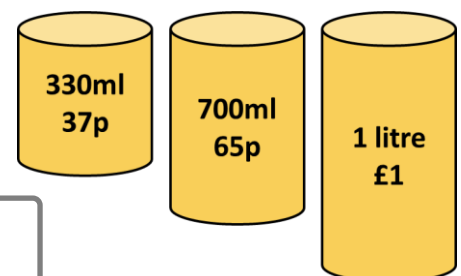
4 Paul and John try to book a band for a wedding. Paul finds a band that plays for 2 hours, charging £340. However, John finds a band that plays for 5 hours and charges £875. a. If they asked each band to play for 3 hours, who would be the better value? You must show all your working

EXAMPLE
Henry is saving some money in his piggy bank.

He saves 1p, 5p and 10p coins.
He has 30 x 1p coins and 75 x 5p coins
There are 120 coins in the jar.
Write the coins as a ratio in its simplest form of 1p : 5p : 10p coins;

$$120 - 30 - 75 = 15 \ (\textbf{number of 10p coins})$$

Ratio of coins is 30 : 75 : 15

$$= 2 : 5 : 1 \qquad (\textbf{Divide by 15})$$

1 James has a box of different coloured marbles.

He has four colours: blue, red, green, and yellow marbles.

He knows he has the same number of red and blue marbles, 30 yellow and 40 green
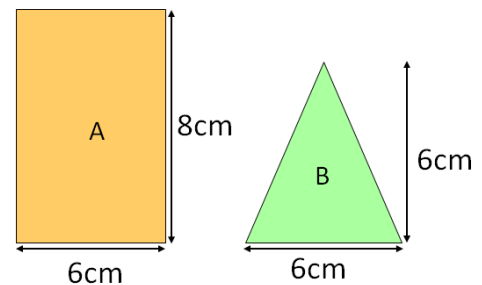
There are 120 marbles in the box.

Write the marbles as a ratio if its colours in its simplest form of blue : red : green : yellow;

2 Write as a ratio the area of shape A : area of shape B
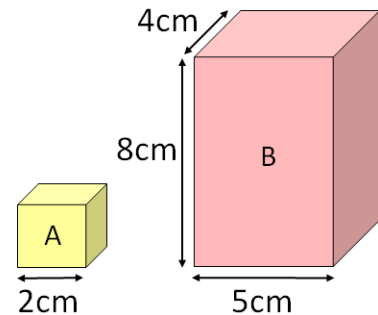
Give your answer in its simplest form.

A 8cm

6cm

B 6cm

6cm

3 Shape A is a cube and shape B a cuboid

Write as a ratio the volume of shape B : volume of shape A

Give your answer in its simplest form.

4cm

8cm B

A

2cm 5cm

Ratio

EXAMPLE

Terry is going to make chocolate brownies.
There are three ingredients, chocolate, sugar and butter,
mixed in the ratio 4 : 2 : 3 respectively.
How much of each ingredient will he need to make 900 g of mixture?

$900 \div (4 + 2 + 3)$
$900 \div 9 = 100$ (**1 part of ratio**)
Ingredients
$4 \times 100 = 400$
$2 \times 100 = 200$
$3 \times 100 = 300$

chocolate ....**400**.............. g

sugar ....**200**.............. g

butter ....**300**.............. g

1 Terry is going to make Daniel a chocolate birthday cake.

4 ingredients, chocolate, sugar, flour, and butter are mixed in the ratio 4:1:5:2 respectively.

How much of each ingredient will he need to make 720 g of cake mixture?

chocolate .... g   sugar .... g

flour ……….............................. g   butter .... g

2 The ratio of the number of boys to the number of girls in a school is 5:6

There are 96 girls in the school.

Work out the total number of students in the school.

3 Norman has £135

Oliver has £70

Peter has £35

Norman gives some money to Oliver and Peter.

The ratio of the amount of money Norman, Oliver and Peter is now is 2:2:1

How much money did Oliver give to Peter?

Ratio and fractions

> **EXAMPLE**
>
> A cinema sells small, medium and large popcorn.
> The ratio sold of small : medium : large is 3 : 5 : 2.
> What fraction of the sales are medium popcorn?
> Give your answer in its simplest form.
>
> $$3 + 5 + 2 = 10 \text{ (Use as denominator)}$$
>
> $$\text{Fraction sold} = \frac{5}{10} = \frac{1}{2}$$

1 A park has acorn, beech, and birch trees.

The number of trees is in the ratio acorn : beech : birch = 4 : 3 : 5

What fraction of the trees are beech?

Give your answer in its simplest form.

2 Playing cards in a pack are either red, black or picture cards

These are in the ratio red : black : picture = 5 : 5 : 3

What fraction of the cards are **NOT** picture cards?

Circle your answer. $\dfrac{5}{13}$ $\dfrac{10}{13}$ $\dfrac{3}{13}$ $\dfrac{3}{5}$

3 Angela, Bev, and Colin complete a triathlon relay race for charity.

Angela completes the 10km run, Bev the 30km cycle, and Colin the 2km swim

The ratio of the km completed going uphill to that going downhill by Angela is 3 : 2

The ratio of the km completed going uphill to that going downhill by Bev is 2 : 1

Between ALL of them what fraction of the race did the team spend going uphill?

4 Anna and Farrah share some prize money in the ratio 3 : 5

Anna gives half of her share to Zoe.

Farrah gives a tenth of her share to Zoe

What fraction of the money did Zoe receive?

Solutions

Page 1 – Unitary ratios

1. Kevin should buy the 1.5 litre cartons :

1 litre carton → £2.20 per litre

1.5 litre carton → £2.8 ÷ 1.5 = £1.867 per litre

2 litre carton → £3.75 ÷ 2 = £1.875 per litre

2. The 750g box offers the best value :

300g → 1.50 ÷ 6 = 25p per 50g

500g → 2.60 ÷ 10 = 26p per 50g

750g → 3.50 ÷ 15 = 23.3p per 50g

3. The 700ml container offers the best value :

330ml → 37 ÷ 33 = 1.12p per 10ml

700ml → 65 ÷ 70 = 0.93p per 10ml

1000ml → 100 ÷ 100 = 1p per 10ml

4. Paul's band :

Paul's band → 340 ÷ 2 = £170 per hour

John's band → 875 ÷ 5 = £175 per hour

Page 2 –Ratio

1. $5 : 5 : 8 : 6$

120 − 30 − 40 = 50 (number of red and blue)

50 ÷ 2 = 25 (25 red and 25 blue)

Ratio of marbles is $25 : 25 : 40 : 30$ (divisible by 5)

2. $8 : 3$

$6 \times 8 = 48\text{cm}^2$ (Area of shape A)

$6 \times 6 \times \frac{1}{2} = 18\text{cm}^2$ (Area of shape B)

Ratio of areas is $48 : 18$ (simplify)

3. $20 : 1$

$2 \times 2 \times 2 = 8\text{cm}^3$ (volume of shape A)

$5 \times 8 \times 4 = 160\text{cm}^3$ (volume of shape B)

Ratio of volumes is $160 : 8$ (simplify)

Page 3 – Ratio (Sharing)

1. Chocolate = 240g, Sugar = 60g,

Flour = 300g, Butter = 120g :

$720 \div (4 + 5 + 1 + 2) \rightarrow 720 \div 12 = 60$

$4 \times 60 = 240, \qquad 1 \times 60 = 60,$

$5 \times 60 = 300, \qquad 2 \times 60 = 120$

2. 176 students : $96 \div 6 = 16 \rightarrow 16 \times 11 = 176$

3. £13 : Total money = 135 + 70 + 35 = £240

$240 \div (2 + 2 + 1) = £240 \div 5 = £48$

£48 − £35 = £13

Page 4 – Ratio and Fractions

1. $\frac{1}{4}$: $4 + 3 + 5 = 12$, Fraction Beech $= \frac{3}{12}$ (simplify)

2. $\frac{10}{13}$: $5 + 5 + 3 = 13$, Fraction NOT green $= \frac{5+5}{13}$

3. $\frac{13}{21}$: Angela: $10 \div (3 + 2) \times 3 = 6$km

Bev: $30 \div (2 + 1) \times 2 = 20$km

Total distance = 10 + 30 + 2 = 42km

Total distance going uphill = 20 + 6 = 26km

Fraction going uphill $= \frac{26}{42}$

4. $\frac{1}{4}$: Anna → Zoe $= 3 \div 2 = 1.5$ parts

Farrah → Zoe $= 5 \div 10 = 0.5$ parts

Total $= 1.5 + 0.5 = 2 \rightarrow \frac{2}{8}$ parts

5