

Division in a given ratio

Starter

1. **(Review of last lesson)** There are 18 girls in a class of 34 class. Find the ratio of girls to boys in its simplest form.

Working: Number of boys = $34 - 18 = 16$
Ratio of girls to boys: $18 : 16$
Divide by 2: $9 : 8$

2. **(Review of last lesson)** Mo, Liz and Dee's heights are in the ratio 32 : 33 : 37. Mo is 144 cm tall. What is the combined height of the people?

Working: Mo has 32 parts so each part is worth $\frac{144}{32} = 4.5$
Liz's height = $33 \times 4.5 = 148.5$ cm
Dee's height = $37 \times 4.5 = 166.5$ cm
The combined height = $144 + 148.5 + 166.5 = 459$

Alternatively:

$$\frac{144}{32} = 4.5 \text{ then } 4.5(33 + 37) + 144 = 459 \text{ cm}$$

3. **(Review of previous material)** A work bonus is shared between the part-time and full-time staff according to the number of hours they work. Part-time staff work 20 hours a week and full-time staff work 35 hours a week. Calculate the bonus of both groups given that the difference between them was £405.

Working: Ratio is $20 : 35 \equiv 4 : 7$
So part-time could get $4x$ and full-time could get $7x$.
The difference is £405: $7x - 4x = 405$
 $3x = 405$
 $x = 135$

Part-time staff get $4x = 4 \times 135 = \text{£}540$.

Full-time staff get $7x = 7 \times 135 = \text{£}945$.

Alternatively:

Ratio is $20 : 35 \equiv 4 : 7$

Part-time staff get 4 parts and full-time staff get 7 parts.

The difference is 3 parts so $3 \text{ parts} \equiv \text{£}405$

$1 \text{ part} \equiv \text{£}135$

Part-time staff get 4 parts so $4 \times 135 = \text{£}540$.

Full-time staff get 7 parts so $7 \times 135 = \text{£}945$.

4. Divide £51 in the ratio 7 : 10.

Working: $7 + 10 = 17$ parts
Each part is worth $\frac{51}{17} = 3$
 7 parts = $7 \times 3 = 21$
 10 parts = $10 \times 3 = 30$
So £51 divided in the ratio 7 : 10 is £21 and £30.

Alternatively

The ratio is 7 : 10 so the quantities could be $7x$ and $10x$
 $7x + 10x = 51$,
 $17x = 51$
 $x = 3$
So $7x = 7 \times 3 = 21$ and $10x = 10 \times 3 = 30$
So £51 divided in the ratio 7 : 10 is £21 and £30.

- E.g. 1** Tangerine paint is made from yellow and red paint in the ratio 4 : 3. How much of each colour is needed to make 161 litres of tangerine paint?

Working: **Sum the numbers in the ratio:** Number of parts = $4 + 3 = 7$

1 part is worth $\frac{161}{7} = 23$
Yellow paint = $4 \times 23 = 92$ litres
Red paint = $3 \times 23 = 69$ litres

Alternatively

The ratio is 4 : 3 so the quantities could be $4x$ and $3x$
 $4x + 3x = 161$,
 $7x = 161$
 $x = 23$
Yellow paint = $4x = 4 \times 23 = 92$ litres
Red paint = $3x = 3 \times 23 = 69$ litres

- E.g. 2** The length and width of a rectangle are in the ratio 8 : 5. If the perimeter of the rectangle is 11.18 m, calculate the length and width of the rectangle.

Working: **Sum the numbers in the ratio:** Number of parts = $8 + 5 = 13$

1 part is worth $\frac{11.18}{13} = 0.86$ m
 8 parts = $8 \times 0.86 = 6.88$ m
 5 parts = $5 \times 0.86 = 4.3$ m

Alternatively

The ratio is 8 : 5 so the quantities could be $8x$ and $5x$
 $8x + 5x = 13x$,
 $13x = 11.18$
 $x = 0.86$
 8 parts = $8x = 8 \times 0.86 = 6.88$ m
 5 parts = $5x = 5 \times 0.86 = 4.3$ m

E.g. 3 Divide £684 in the ratio 5 : 3 : 4.

Working: *Sum the numbers in the ratio:* Number of parts = 5 + 3 + 4 = 12

$$1 \text{ part is worth } \frac{684}{12} = \text{£}57$$

$$5 \times 57 = \text{£}285$$

$$3 \times 57 = \text{£}171$$

$$4 \times 57 = \text{£}228$$

Alternatively

The ratio is 5 : 3 : 4 so the quantities could be $5x$, $3x$ and $4x$.

$$5x + 3x + 4x = 684$$

$$12x = 684$$

$$x = 57$$

$$5x = 5 \times 57 = \text{£}285$$

$$3x = 3 \times 57 = \text{£}171$$

$$4x = 4 \times 57 = \text{£}228$$

Repeated division by parts

E.g. 4 A man and woman share a bingo prize of £750 between them in the ratio of 1 : 4. The woman shares her part between herself, her mother and her daughter in the ratio 5 : 2 : 1. How much does her mother receive?

Working: Number of parts = 1 + 4 = 5
Each part is worth $\frac{750}{5} = 150$
Woman gets $4 \times 150 = 600$
Number of parts = 5 + 2 + 1 = 8
Each part is worth $\frac{600}{8} = 75$
Mother receives $2 \times 75 = \text{£}150$

E.g. 5 Lucy and Sarah share their stamp collection of 1560 stamps in the ratio 5 : 3. Lucy then shares her stamps with two other friends in the ratio 7 : 4 : 4, keeping more for herself. How many stamps do each of her friends receive?

Working: Number of parts = 5 + 3 = 8
Each part is worth $\frac{1560}{8} = 195$
Lucy gets $5 \times 195 = 975$
Number of parts = 7 + 4 + 4 = 15
Each part is worth $\frac{975}{15} = 65$
Each friend receives $4 \times 65 = 260$ stamps

E.g. 6 In a herd of x cattle, the ratio of the number of bulls to cows is 2 : 7. Find the number of bulls in the herd in terms of x .

Working:

$$\begin{aligned}\text{Number of parts} &= 2 + 7 = 9 \\ \text{Each part is worth} &= \frac{x}{9} \\ \text{Number of bulls} &= 2 \times \frac{x}{9} = \frac{2x}{9}\end{aligned}$$

E.g. 7* £345 is to be shared between John and Peter in the ratio of x : 11. If John is to receive £92, find x .

Working:

$$\begin{aligned}\text{Number of parts} &= x + 11 \\ \text{Each part is worth} &= \frac{345}{x + 11} \\ \text{John receives:} & \quad x \times \frac{345}{x + 11} = \frac{345x}{x + 11} \\ \text{John receives } \pounds 92: & \quad \frac{345x}{x + 11} = 92 \\ & \quad 345x = 92(x + 11) \\ & \quad 345x = 92x + 1012 \\ & \quad 253x = 1012 \\ & \quad x = 4\end{aligned}$$

Video: [Division in a given ratio](#)
Video: [Ratio - given one quantity](#)

[Solutions to Starter and E.g.s](#)

Exercise

9-1 class textbook: p37 M2.5 Qu 2, 5, 7, 8, 11, 13, 14
A*-G class textbook: p37 M2.5 Qu 6-8, 14-16
9-1 homework book: p11 M2.5 Qu 2, 4, 9-11
A*-G homework book: p8 M2.5 Qu 4-5, 7, 9