

Exercise walk-through

E1.11

Ratio and proportion

IGCSE Mathematics

You must be able to

- simplify a ratio and write it in the form $1 : n$
- divide a quantity in a given ratio, including a three-part ratio
- solve direct-proportion problems by finding the value of one unit first

1

The method

Method — Count the parts, find one part, then scale up

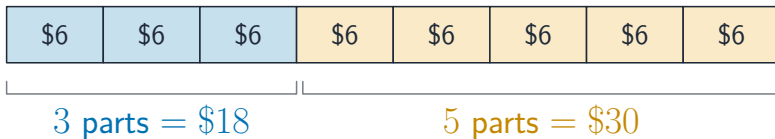
- **Simplify:** divide both sides by the HCF. $18 : 24 = 3 : 4$.
- **Share in a ratio:** to divide \$180 in the ratio $2 : 3 : 4$, there are $2 + 3 + 4 = 9$ parts, so one part is $180 \div 9 = \$20$, giving \$40, \$60 and \$80. **Check they add back to \$180.**
- **Direct proportion:** find ONE first. If 5 pens cost \$3.50, one pen costs \$0.70, so 8 pens cost \$5.60.
- **A ratio has no units** — both quantities must be in the same unit before you simplify.

Answer shapes (marked by **method marks** — M1 for a correct method, A1 for the correct answer): the line finding the value of one part, or of one item, is the method mark.

Method — Count the parts, find one part, then scale up

Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): the line finding...

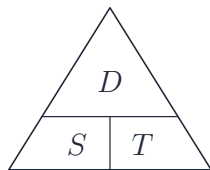
Share \$48 in the ratio 3 : 5 - $3 + 5 = 8$ parts, one part = $48 \div 8 = \$6$



A bar split into parts showing a quantity shared in a ratio

Method — Count the parts, find one part, then scale up

Answer shapes (marked by method marks — M1 for a correct method, A1 for the correct answer): the line finding...



cover the one
you want

$$S = \frac{D}{T} \quad (\text{cover } S: D \text{ over } T)$$

$$D = S \times T \quad (\text{cover } D: S \text{ next to } T)$$

$$T = \frac{D}{S} \quad (\text{cover } T: D \text{ over } S)$$

$$\text{cyclist: } 45 \text{ km in } 3 \text{ h } 45 \text{ min} = 3.75 \text{ h} \Rightarrow S = \frac{45}{3.75} = 12 \text{ km/h}$$

The speed, distance and time triangle

2

Practice

Practice 2.1 ■ 1 mark

Write the ratio $45 : 60$ in its simplest form.

Solution 2.1

Worked steps

- divide both by the HCF, 15

$$45 : 60 = \mathbf{3} : \mathbf{4}$$

B1

Practice 2.2 ■ 2 marks

Divide \$240 in the ratio 5 : 7.

Solution 2.2

Method: Count the parts, find one part, then scale up — p.4

Worked steps

■ total parts = $5 + 7 = 12$, so one part = $240 \div 12 = \$20$ **M1**

\$100 and \$140

A1

Practice 2.3 ■ 2 marks

Seven identical books cost \$31.50. Find the cost of 4 of these books.

Solution 2.3

Worked steps

■ one book costs $31.50 \div 7 = \$4.50$ **M1**

$$4 \times 4.50 = \$18.00$$

A1

3

Exam-style

Exam-style 3.1 ■ 4 marks

A recipe for 6 people uses 450 g of rice.

Exam-style 3.1 (a) ■ 2 marks

Find the mass of rice needed for 10 people.

Solution 3.1 (a)

Worked steps

■ rice per person = $450 \div 6 = 75$ g M1

$$10 \times 75 = \mathbf{750} \text{ g} \quad \text{A1}$$

Exam-style 3.1 (b) ■ 2 marks

A cook has 600 g of rice. Find the largest number of people she can serve.

Solution 3.1 (b)

Worked steps

$$\blacksquare 600 \div 75 \quad \text{M1}$$

$$= 8 \text{ people}$$

A1

Exam-style 3.2 ■ 4 marks

A bag contains red, blue and green counters in the ratio $3 : 5 : 4$.
There are 45 blue counters.

Exam-style 3.2 (a) ■ 2 marks

Find the total number of counters in the bag.

Solution 3.2 (a)

Method: Count the parts, find one part, then scale up — p.4

Worked steps

- blue is 5 parts, so one part = $45 \div 5 = 9$ counters **M1**
- total parts = $3 + 5 + 4 = 12$

$$12 \times 9 = 108$$

A1

Exam-style 3.2 (b) ■ 2 marks

Find how many more green counters than red counters there are.

Solution 3.2 (b)

Worked steps

■ the difference is $4 - 3 = 1$ part **M1**

$1 \times 9 = 9$ more green

A1