

E1.11 Ratio and proportion

Name: _____ Class: _____ Date: _____ **Total: 13 marks**

KEY WORDS ratio 比 • simplest form 最简形式 • direct proportion 正比例
• share in a ratio 按比例分配 • unitary method 单一法

Objective

Build the skills to answer Extended exam questions on **ratio and proportion** 比与比例 — writing a **ratio** 比 in its **simplest form** 最简形式, **dividing a quantity in a given ratio** 按比例分配, and using **direct proportion** 正比例 in context.

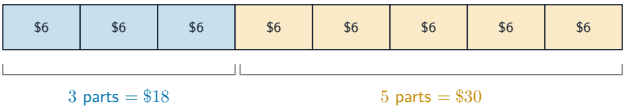
You must be able to:

- 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

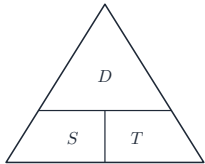
1 Worked examples

■ Count the parts, find one part, then scale up

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



Add the numbers in the ratio to get the total number of parts



cover the one
you want

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

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

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

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

Proportion in context: distance is directly proportional to time at constant speed

- **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.

2 Practice

2.1 Write the ratio 45 : 60 in its simplest form. [1]

2.2 Divide \$240 in the ratio 5 : 7. [2]

2.3 Seven identical books cost \$31.50. Find the cost of 4 of these books. [2]

3 Exam-style questions

3.1 A recipe for 6 people uses 450 g of rice.

- (a) Find the mass of rice needed for 10 people. [2]

- (b) A cook has 600 g of rice. Find the largest number of people she can serve. [2]

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

- (a) Find the total number of counters in the bag. [2]

- (b) Find how many more green counters than red counters there are. [2]

Solutions

Marking: **M1** a correct method, **A1** the correct answer.

Each answer shows the steps, then the **result**.

2.1

- divide both by the HCF, 15

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

2.2

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

$$\mathbf{\$100 \text{ and } \$140}$$

2.3

- one book costs $31.50 \div 7 = \$4.50$

$$4 \times 4.50 = \mathbf{\$18.00}$$

3.1

(a)

- rice per person = $450 \div 6 = 75$ g

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

(b)

- $600 \div 75$

$$= \mathbf{8 \text{ people}}$$

3.2

(a)

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

$$12 \times 9 = \mathbf{108}$$

(b)

- the difference is $4 - 3 = 1$ part

$$1 \times 9 = \mathbf{9 \text{ more green}}$$