

C1.11 Ratio and proportion

Name: _____ Class: _____ Date: _____

Total: 20 marks**KEY WORDS** scale 比例尺 • proportion 比例 • ratio 比 • simplest form 最简形式 • rate 比率

Objective

Use ratio and proportion to solve Core IGCSE Mathematics problems.

You must be able to:

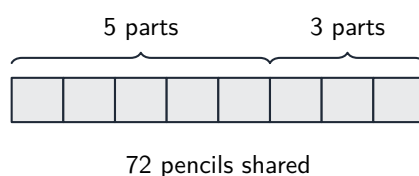
- Simplify ratios and divide a total into ratio parts
- Scale corresponding quantities consistently
- Compare unit values rather than package totals

1 Key knowledge and worked examples

■ Key knowledge: Ratio and proportion

Put quantities in the same units before simplifying a ratio. Divide all parts by their HCF. To share a total, add the ratio parts, find one part, then multiply. For a recipe or scale, use the same multiplier for every quantity. Best value means comparing costs for the same amount.

■ Worked example: Ratio and proportion



Share 72 pencils in the ratio 5 : 3.

- Total parts: $p = 5 + 3 = 8$.
- One part: $u = 72/8 = 9$ pencils.
- Shares: $A = 5u = 45$, $B = 3u = 27$; check $45 + 27 = 72$.
- A recipe for four using 300 g flour needs $F = 300 \times (6/4) = 450$ g for six.

■ Method check

A ratio describes parts of one total. Adding a fixed amount to only one component usually changes the ratio.

2 Practice

2.1 Simplify $24 : 36 : 60$. [2]

2.2 Write $1.5 \text{ m} : 60 \text{ cm}$ in simplest form. [2]

2.3 Share 56 coins in the ratio $3 : 4$. [2]

2.4 A recipe for five uses 200 g rice. How much is needed for eight? [2]

3 Exam-style questions

3.1 Apply the ratio and proportion methods below. Show working and include units where appropriate.

(a) Paint uses red and white in ratio $2 : 7$. Find the amounts in 27 litres. [2]

(b) Find the red paint needed with 14 litres of white. [2]

(c) A 3-litre tin costs 18 yuan; a 5-litre tin costs 28 yuan. Which is better value? Show the comparison. [2]

3.2 Orange squash is made from concentrate and water in ratio 2:5. A jug contains 840 ml.

(a) Find the volume of each ingredient. Then find how much water must be added to change the ratio to 1:4. [3]

(b) A recipe for 6 people needs 450 g of rice. Find the rice for 14 people and state the assumption behind proportional scaling. [3]

Solutions

Award method and answer marks as indicated; accept equivalent correct methods.

2.1

- Divide each part by 12: $2 : 3 : 5$.

2.2

- Convert to cm: $150 : 60$, then divide by 30: $5 : 2$.

2.3

- $u = 56/7 = 8$, so shares are $3u = \mathbf{24}$ and $4u = \mathbf{32}$.

2.4

- The scale multiplier is $8/5$: $R = 200(8/5) = \mathbf{320}$ g.

3.1

(a)

- $u = 27/(2 + 7) = 3$ litres; red **6 litres**, white **21 litres**.

(b)

- One part is $14/7 = 2$ litres, so red $R = 2(2) = \mathbf{4}$ litres.

(c)

- Unit costs: $c_3 = 18/3 = 6$, $c_5 = 28/5 = 5.6$ yuan per litre. **The 5-litre tin** is better value.

3.2

(a)

- Total parts $p = 2 + 5 = 7$; one part $u = 840/7 = 120$ ml.
- Concentrate **240 ml**, water **600 ml**.
- For ratio 1:4, water must be 960 ml, so add **360 ml**.

(b)

- Use $m_2 = m_1(n_2/n_1)$.
- $m_2 = 450(14/6) = \mathbf{1050}$ g.
- Assume equal portions of rice per person.