

Exercise walk-through

3.1.1

Ratio Models

AQA · GCSE · Mathematics

16. Ratios, equivalent proportions and mixtures · Foundation

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For 700 ml at 2:5, each part is 100 ml: concentrate 200 ml and water 500 ml. Concentrate:whole=2:7, while concentrate/water=2/5. Water/concentrate=5/2, a fraction greater than 1. Doubling both gives 400:1000=2:5. If concentrate is x and water y , the recipe requires $y=(5/2)x$, a straight line through the origin. For 300 ml concentrate, water is 750 ml and the total is 1050 ml. A batch with 200 ml concentrate and 600 ml water has ratio 1:3 and is weaker. To simplify 1.5 litres:500 ml, first write $1500:500=3:1$.

33. Direct and inverse proportional relationships · Higher

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For a given fabric cost $C=3L$, lengths 2,4,6 m cost 6,12,18 yuan: $C/L=3$. A 5-yuan fixed fee instead gives $C=5+3L$, which is linear but not directly proportional. For a given fixed-job model $t=24/w$, workers 2,4,6 need 12,6,4 hours, and $wt=24$ worker-hours. Doubling workers halves time. Higher construction: if y is directly proportional to x and $y=18$ at $x=6$, $k=18/6=3$, hence $y=3x$. If t is inversely proportional to w and $t=6$ at $w=4$, $k=tw=24$, hence $t=24/w$. These models assume a constant rate and exclude impossible negative worker counts.

50. Length, area and volume scale factors · Higher

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Enlarging a box from $2 \times 3 \times 4$ to $6 \times 9 \times 12$ multiplies lengths by 3. Its volume changes from 24 to 648, a factor of 27; a 2×3 face changes area from 6 to 54, a factor of 9. Length ratio 2:5 corresponds to area ratio 4:25 and volume ratio 8:125. If similar shapes have areas 20 and 80 cm^2 , the larger-to-smaller length factor is $\sqrt{(80/20)}=2$. If similar solids have volumes 16 and 128 cm^3 , $k=\sqrt[3]{8}=2$. Higher: triangles with the same acute angle have equal opposite/hypotenuse ratios; doubling both lengths leaves $\sin\theta$ unchanged.

Exercises 2.1·2.3

2.1 (Foundation) Find concentrate in a 700 ml mixture at concentrate:water=2:5.

2.2 (Foundation) Find the numerator of water/concentrate in lowest terms.

2.3 (Foundation) For $y=(5/2)x$, find y when $x=300$.

3 Exam-style questions

Exercises 2.1·2.3

2.1 (Foundation) Find concentrate in a 700 ml mixture at concentrate:water=2:5.

2.1 $700/(2+5) \times 2 = 200$ ml.

2.2 (Foundation) Find the numerator of water/concentrate in lowest terms.

2.2 Water/concentrate = $500/200 = 5/2$.

2.3 (Foundation) For $y = (5/2)x$, find y when $x = 300$.

3 Exam-style questions

2.3 Multiply the concentrate by $5/2$: $300 \times 2.5 = 750$.

Exercise 3.1

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Adding 100 ml to both shares always preserves a mixture ratio.

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3.1 False. Shares 200 ml and 500 ml have ratio 2:5. Adding 100 ml to each gives $300:600=1:2$, which is different.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.