



KS3.M-R11 Proportional Reasoning Problem Set

Calculators not allowed · about 80 minutes

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** A recipe for one tray of flapjacks uses oats and syrup in the ratio 5:2. For two trays, how many parts of oats and syrup are needed? Give the answer as parts and then state the simplified ratio for the two trays.

(2)

- 2** A map uses a scale where 1 cm represents 3 km. Measure the real distance represented by 7 cm on the map.

(2)

- 3** Write 0.35 as a fraction in its simplest form, then give it as a percentage.

(2)

- 4** A school orders 84 identical pens. They are packed in boxes that each hold pens in the ratio of red:blue:green = 3:2:1. How many pens of each colour are in the whole order?

(3)

- 5** A shop reduces the price of a jumper by 20%. The original price was 45 pounds. Work out the sale price.

(2)

- 6** A runner completes a 10 km route in 50 minutes. What is their average speed in km/h? Give your answer to one decimal place.

(3)

- 7** Three friends share a takeaway in the ratio 2:3:4. The total bill is 54 pounds. How much does the friend with 3 parts pay?

(2)

- 8** A student increases the ingredients for a cake by a scale factor of 2.5. The original recipe uses 240 g of flour. How much flour is needed now? Give your answer in grams.

(3)

- 9** A lemonade recipe uses sugar and water in the ratio 1:7. If 4 litres of lemonade are needed, how many litres of sugar are required? (Assume the ratio parts add to the total volume.)

(3)

- 10** A garden centre sells potting compost in 3 sizes. The masses are in the ratio 4:6:9. If the smallest bag is 4 kg, what is the mass of the largest bag?

(3)

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- 11** A computer game applies a 15% discount then adds 5% VAT to the discounted price. If the original price is 40 pounds, work out the final price after discount and VAT. Give your answer to the nearest penny.

(2)

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- 12** A mechanic charges labour and parts in the ratio 7:3. If a job costs 280 pounds in total, how much is charged for parts? Show your working.

(3)

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- 13** A photographer prints photos in sizes A and B in the ratio $A:B = 5:8$. She printed 65 photos in total. How many of each size were printed?

(3)

- 14** To make a diluted solution, a scientist mixes concentrate and water in the ratio 1:12. If she needs 780 ml of the diluted solution, how much concentrate should she use? Give your answer in ml.

(3)

- 15** A car uses fuel at a rate of 6.5 litres per 100 km. How many litres are needed for a 275 km journey? Give your answer to one decimal place.

(4)

- 16** A classroom has a ratio of boys to girls of 7:5. After 3 boys leave and 2 girls join, the ratio becomes 4:3. How many pupils were in the class originally?

(4)

- 17** A baker mixes flour and water in the ratio 9:4. He needs at least 36 kg of mixture. What is the least whole number of kilograms of flour he must use?

(3)

- 18** Stretch: A painting mixture uses pigments A, B and C in the ratio $A:B = 3:2$ and $B:C = 5:6$. Find the ratio $A:B:C$. Then, if the painter needs 792 ml of pigment C, how much pigment A is required?

(4)

Mark scheme · KS3.M-R11 Proportional Reasoning Problem Set

Question 1

- **M1** Scale 5:2 by 2 to give parts 10 and 4
- **A1** Simplified ratio 5:2 or 10:4 or (5:2 stated as simplest)
- **Answer: Oats 10 parts, syrup 4 parts; ratio 5:2**

Question 2

- **M1** Scale method: 7×3 km
- **A1** 21 km cao
- **Answer: 21 km**

Question 3

- **M1** Convert decimal to fraction $35/100$ and simplify to $7/20$
- **A1** 35% or 35% cao
- **Answer: 7/20; 35%**

Question 4

- **M1** Find total parts $3+2+1 = 6$ and divide 84 by 6 to get one part = 14
- **M1** Multiply 14 by each part for method: red 42, blue 28, green 14
- **A1** Correct counts: 42 red, 28 blue, 14 green cao
- **Answer: 42 red, 28 blue, 14 green**

Question 5

- **M1** Calculate 20% of 45 or find 80%: $45 \times 0.2 = 9$ or $45 \times 0.8 = 36$
- **A1** 36 pounds cao
- **Answer: 36 pounds**

Question 6

- **M1** Convert 50 minutes to hours: $50/60 = 5/6$ h or 0.833... h
- **M1** Compute speed $10 / (50/60) = 10 \times 60/50 = 12$ km/h
- **A1** 12.0 km/h cao to one decimal place
- **Answer: 12.0 km/h**

Question 7

- **M1** Total parts $2+3+4 = 9$, one part = $54/9 = 6$
- **A1** 3 parts = 18 pounds cao
- **Answer: 18 pounds**

Question 8

- **M1** Multiply 240 by 2.5: $240 \times 2.5 = 240 \times (5/2) = 120 \times 5 = 600$
- **M1** Method shown with correct arithmetic
- **A1** 600 g cao
- **Answer: 600 g**

Question 9

- **M1** Total parts $1+7 = 8$ so one part = $4/8 = 0.5$ litres
- **M1** Sugar is 1 part so 0.5 litres
- **A1** 0.5 litres cao
- **Answer: 0.5 litres**

Question 10

- **M1** Find scale factor: smallest corresponds to 4 parts = 4 kg so 1 part = 1 kg
- **M1** Largest 9 parts = $9 \times 1 = 9$ kg
- **A1** 9 kg cao
- **Answer: 9 kg**

Question 11

- **M1** Apply 15% discount: $40 \times 0.85 = 34.00$
- **A1** Add 5% VAT: $34.00 \times 1.05 = 35.70$ cao
- **Answer: 35.70 pounds**

Question 12

- **M1** Total parts $7+3 = 10$, one part = $280/10 = 28$
- **M1** Parts cost $3 \times 28 = 84$
- **A1** 84 pounds cao
- **Answer: 84 pounds**

Question 13

- **M1** Total parts $5+8 = 13$, one part = $65/13 = 5$
- **M1** Calculate $A = 5 \times 5 = 25$ and $B = 8 \times 5 = 40$
- **A1** 25 A-size, 40 B-size cao
- **Answer: 25 A-size, 40 B-size**

Question 14

- **M1** Total parts $1+12 = 13$, one part = $780/13 = 60$
- **M1** Concentrate is 1 part so 60 ml
- **A1** 60 ml cao
- **Answer: 60 ml**

Question 15

- **M1** Method: fuel = $6.5/100 \times 275$ or $(275/100) \times 6.5$
- **M1** Compute $275 \times 6.5 = 1787.5$ then divide by 100 = 17.875
- **M1** Round to one decimal place shown method
- **A1** 17.9 litres cao to one decimal place
- **Answer: 17.9 litres**

Question 16

- **M1** Set up: let multiplier be k so boys = $7k$, girls = $5k$; after change boys $7k-3$, girls $5k+2$
- **M1** Equation $(7k-3)/(5k+2) = 4/3$ or $3(7k-3) = 4(5k+2)$
- **M1** Solve: $21k-9 = 20k+8$ gives $k = 17$
- **A1** Total pupils originally = $7k + 5k = 12k = 12 \times 17 = 204$ cao
- **Answer: 204**

Question 17

- **M1** Flour:water = 9:4 so water = $4/9$ of flour; total = flour + $4/9$ flour = $13/9$ flour, and $13/9$ flour ≥ 36
- **M1** So flour $\geq 36 \times 9/13 = 24.92\dots$; the least whole number of kg of flour meeting this is 25 (24 kg gives total 34.7 kg, below 36 kg)
- **A1** 25 kg cao
- **Answer: 25 kg**

Question 18

- **M1** Combine ratios: $A:B = 3:2$ and $B:C = 5:6$; make B equal by scaling: for B common multiply A:B by 5 gives 15:10, and B:C by 2 gives 10:12
- **M1** State combined ratio $A:B:C = 15:10:12$
- **M1** Find one part value: C corresponds to 12 parts so one part = $792/12 = 66$
- **A1** $A = 15 \times 66 = 990$ ml cao
- **Answer: $A:B:C = 15:10:12$; pigment A = 990 ml**