3.1 Ratio, Proportion and Rates of Change: Test Pack

Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Simplify the ratio 42 : 56 fully.

(1)

2 A jar contains 8 red counters and 12 blue counters.

(a) Write the ratio of red counters to blue counters in its simplest form. **(1)**

(b) What fraction of the counters in the jar are red? Give your answer in its simplest form. **(1)**

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3 A liquid has a density of 11.1 g/cm^3. It has a mass of 55.5 g. Work out its volume.

(3)

4 A liquid has a density of 10.4 g/cm^3. It has a mass of 124.8 g. Work out its volume.

(3)

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5 A tap fills a container at a rate of 15 litres per minute. How long does it take to put 240 litres into the container?

(2)

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6 A cyclist travels 18 km at an average speed of 72 km/h. How long does the journey take? Give your answer in hours and minutes.

(3)

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7 Amir types 264 words in 11 minutes. At this rate, how long will it take him to type 1320 words?

(3)

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8 Ria earns £438.90 for 38 hours of work. Work out her hourly rate of pay.

(2)

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9 Ben is paid £9.60 per hour. He works 32 hours in a week. How much is he paid?

(2)

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10 The exchange rate is £1 = $1.28.

(a) Convert £250 to dollars. **(1)**

(b) Convert $192 to £. Give your answer to the nearest penny. **(2)**

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11 Shampoo A costs £2.75 for 250 ml. Shampoo B costs £4.20 for 400 ml. Which shampoo is better value for money? You must show your working.

(3)

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12 A metal block has a mass of 540 g and a volume of 60 cm³.

(a) Calculate the density of the metal in g/cm^3. **(1)**

(b) A second block made from the same metal has a volume of 85 cm³. Calculate its mass. **(2)**

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13 A water tank is filled at a constant rate. After 4 minutes it contains 60 litres of water. After 10 minutes it contains 150 litres of water.

(a) Find the rate at which the tank is being filled, in litres per minute. **(2)**

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(b) Find how much water was in the tank at the start, when time = 0 minutes. **(2)**

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14 A map has a scale of 1 : 25000.

(a) The distance between two villages on the map is 8.4 cm. Calculate the real-life distance in kilometres. **(2)**

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(b) A field has an area of 12 cm² on the map. Calculate the real-life area of the field in km^2. **(3)**

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15 Nadia is baking and uses flour, sugar and butter in the ratio 5 : 2 : 3 by mass. She has 600 g of flour, 300 g of sugar and 150 g of butter, and cannot buy any more of any ingredient. Find the maximum total mass of mixture she can make, and find how much of each ingredient will be left over.

(6)

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Mark scheme · 3.1 Ratio, Proportion and Rates of Change: Test Pack

Question 1

3 : 4 cao — **B1**

Answer: **3 : 4**

Question 2

(a) 2 : 3 cao — **B1**

(a) Answer: **2 : 3**

(b) 2/5 cao oe — **B1**

(b) Answer: **2/5**

Question 3

volume = mass ÷ density — **M1**

55.5 ÷ 11.1 — **M1**

5 cm³ cao — **A1**

Answer: **5 cm^3**

Question 4

volume = mass ÷ density — **M1**

124.8 ÷ 10.4 — **M1**

12 cm³ cao — **A1**

Answer: **12 cm^3**

Question 5

240 ÷ 15 — **M1**

16 minutes cao — **A1**

Answer: **16 minutes**

Question 6

18 ÷ 72 — **M1**

converts the decimal hours to minutes — **M1**

15 minutes cao — **A1**

Answer: **15 minutes**

Question 7

264 ÷ 11 = 24 words per minute — **M1**

1320 ÷ 24 — **M1**

55 minutes cao — **A1**

Answer: **55 minutes**

Question 8

£438.90 ÷ 38 — **M1**

£11.55 cao — **A1**

Answer: **£11.55**

Question 9

£9.60 x 32 — **M1**

£307.20 cao — **A1**

Answer: **£307.20**

Question 10

(a) $320 cao — **B1**

(a) Answer: **$320**

(b) 192 / 1.28 (correct method) — **M1**

(b) £150.00 cao — **A1**

(b) Answer: **£150.00**

Question 11

Shampoo A: £1.10 per 100 ml (or equivalent unit price) — **M1**

Shampoo B: £1.05 per 100 ml (or equivalent unit price) — **M1**

Shampoo B is better value, since it is cheaper per 100 ml, ft from both M marks — **A1**

Answer: **Shampoo B is better value (£1.05 per 100 ml vs £1.10 per 100 ml)**

Question 12

(a) 9 g/cm^3 cao — **B1**

(a) Answer: **9 g/cm^3**

(b) 9 x 85 (correct method, ft from part a) — **M1**

(b) 765 g cao — **A1**

(b) Answer: **765 g**

Question 13

(a) (150-60)/(10-4) (correct method for rate of change/gradient) — **M1**

(a) 15 litres per minute cao — **A1**

(a) Answer: **15 litres per minute**

(b) 60 - 4 x 15 (correct method, ft from part a) — **M1**

(b) 0 litres cao — **A1**

(b) Answer: **0 litres**

Question 14

(a) 8.4 x 25000 = 210000 cm (correct method) — **M1**

(a) 2.1 km cao — **A1**

(a) Answer: **2.1 km**

(b) Area scale factor = 25000^2 = 625000000 (correct squaring of length scale) — **M1**

(b) 12 x 625000000 = 7500000000 cm² (correct application to map area) — **M1**

(b) 0.75 km² cao oe awrt — **A1**

(b) Answer: **0.75 km^2**

Question 15

Expresses amounts used as 5x (flour), 2x (sugar), 3x (butter) for some x — **M1**

Finds the maximum x allowed by each ingredient: x≤120 (flour), x≤150 (sugar), x≤50 (butter) — **M1**

Correctly identifies butter as the limiting ingredient, x = 50 — **A1**

Calculates masses used: flour = 250 g, sugar = 100 g, butter = 150 g — **M1**

Total mass of mixture = 500 g cao — **A1**

Leftover: flour = 350 g, sugar = 200 g, butter = 0 g, ft — **A1**

Answer: **Total mixture = 500 g (250 g flour, 100 g sugar, 150 g butter used). Leftover: 350 g flour, 200 g sugar, 0 g butter**

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