



## 3.5H Ratio: Higher Tier Practice

EDEXCEL Edexcel 1MA1 · Calculator allowed · about 75 minutes

Total Marks

Name: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Answer ALL questions. Show all your working.**

- 1** Simplify the ratio 84 : 126.

(Total for Question 1 is 1 mark)

- 2** A model yacht club has 18 wooden hulls and 30 plastic hulls. The wooden:plastic ratio is 3 : n.  
Work out n.

(Total for Question 2 is 2 marks)

- 3** Sana is making cordial. The recipe uses lemon juice, water and sugar in the ratio 2 : 7 : 1. She needs to make 1.8 litres of cordial in total.  
Work out how much water (in litres) she should use. Give your answer to 2 decimal places.

(Total for Question 3 is 3 marks)

- 4** Three friends share the prize money in the ratio 4 : 3 : k. The first two receive a total of 140 pounds and the third receives 40 pounds more than the second.  
Find k and the total prize money.

(Total for Question 4 is 4 marks)

- 5 A map uses a scale so that 1 cm represents 4 km. On the map two towns are 7.5 cm apart. Another town X is such that the ratio of real distances from the first town to the second and from the first town to X is 5 : 8. Work out the distance from the first town to town X in kilometres.

(Total for Question 5 is 4 marks)

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- 6 In triangle ABC, point D is on AC such that  $AD : DC = 2 : 3$ . Show that BD divides the triangle into two regions (triangles ABD and DBC) whose areas are in the ratio 2 : 3. (You may assume triangles with equal heights have areas proportional to their bases.)

(Total for Question 6 is 5 marks)

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- 7 A chemical solution is made by mixing liquid P and liquid Q in the ratio 7 : 3. Liquid Q costs 1.50 pounds per litre and liquid P costs 2.40 pounds per litre. Mia needs 18 litres of the mixture and wants to minimise cost. Work out the total cost of the 18 litres of mixture. Give your answer to the nearest penny.

(Total for Question 7 is 6 marks)

**8** Two variables  $x$  and  $y$  are inversely proportional. When  $x = 6$ ,  $y = 10$ .

(a) Find  $y$  when  $x = 15$ .

(b) Express  $y$  in terms of  $x$  and show that if  $x$  is tripled then  $y$  is divided by 3.

(c) A scientist adjusts  $x$  and  $y$  so that their product is increased by 50 percent from the original product at  $x = 6$ ,  $y = 10$ . Find the new value of  $x$  if  $y$  is reduced by 20 percent from its original value. Give your answer to 2 decimal places.

(a) Find  $y$  when  $x = 15$ . (3)

(b) Express  $y$  in terms of  $x$  and show that if  $x$  is tripled then  $y$  is divided by 3. (4)

(c) The original product  $xy$  is increased by 50 percent.  $y$  is reduced by 20 percent from its original value. Find the new  $x$ . Give your answer to 2 decimal places. (8)

(Total for Question 8 is 15 marks)

## Mark scheme · 3.5H Ratio: Higher Tier Practice

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### Question 1

- **B1** 2 : 3 cao
- **Answer:** 2 : 3

### Question 2

- **M1** identify common factor: divide both parts by 6 or scale 18:30 to 3:x
- **A1** 5 cao
- **Answer:** 5

### Question 3

- **M1** find total parts  $2+7+1 = 10$  and method to get amount per part:  $1.8 / 10$  or equivalent
- **M1** multiply water parts  $7 * (1.8/10)$  or  $7/10 * 1.8$
- **A1** 1.26 cao to 2 dp
- **Answer:** 1.26 litres

### Question 4

- **M1** let parts be 4,3,k; use second and third relation:  $k\text{-part} = 3\text{-part} + 40$  implies  $(k/4) * \text{firstPartScale?}$  or better set unit value  $x$  so amounts  $4x, 3x, kx$  and use  $kx = 3x + 40$
- **M1** from  $kx = 3x + 40$  get  $(k - 3)x = 40$ ; also  $4x + 3x = 140$  so  $7x = 140$  hence  $x = 20$
- **A1**  $k - 3 = 40/x = 40/20 = 2$  so  $k = 5$
- **A1** total  $= (4+3+5)x = 12 * 20 = 240$  pounds cao
- **Answer:**  $k = 5$ , total prize money = 240 pounds

### Question 5

- **M1** convert map distance to real distance:  $7.5 \text{ cm} * 4 \text{ km/cm} = 30 \text{ km}$
- **M1** use ratio 5:8 so scale factor for X distance  $= 8/5$  of 30 km or set unit  $= 30/5 = 6 \text{ km}$
- **M1** compute distance  $= 6 * 8 = 48 \text{ km}$
- **A1** 48 km cao
- **Answer:** 48 km

### Question 6

- **M1** recognise that triangles ABD and DBC share vertex B and have bases AD, DC on the same straight line AC, so they share the same perpendicular height from B to AC
- **M1** state that triangles with equal heights have areas proportional to their base lengths
- **A1**  $\text{area(ABD)} : \text{area(DBC)} = AD : DC = 2 : 3$
- **M1** verify with a worked example, e.g. coordinates  $A=(0,0)$ ,  $C=(5,0)$ ,  $B=(0,3)$ ,  $D=(2,0)$ :  $\text{area ABD} = 3$ ,  $\text{area DBC} = 4.5$ , ratio  $3:4.5 = 2:3$
- **A1** conclude BD divides the triangle into two regions with areas in ratio 2 : 3 cao
- **Answer:** 2 : 3

### Question 7

- **M1** find total parts  $7+3 = 10$  and amount per part  $= 18/10 = 1.8$  litres
- **M1** find litres of P  $= 7 * 1.8 = 12.6 \text{ L}$  and Q  $= 3 * 1.8 = 5.4 \text{ L}$
- **M1** find cost contributions: cost P  $= 12.6 * 2.40$ , cost Q  $= 5.4 * 1.50$
- **M1** compute cost P  $= 30.24$  and cost Q  $= 8.10$
- **A1** sum  $= 38.34$  cao to nearest penny
- **C1** clear presentation: show all steps and final answer 38.34 pounds
- **Answer:** 38.34 pounds

### Question 8

- (a) **M1** use inverse proportion:  $xy = k$ , find  $k = 6 \times 10 = 60$  then  $y = 60/15$
- (a) **A1** 4 cao
- (a) **B1** answer stated as 4 with working
- **(a) Answer: 4**
- (b) **M1** substitute  $k = 60$  to give  $y = 60/x$
- (b) **M1** replace  $x$  by  $3x$  to get  $y_{\text{new}} = 60/(3x) = (60/x)/3$
- (b) **A1** conclude  $y$  is divided by 3
- (b) **B1** clear algebraic statement  $y = 60/x$  and demonstration  $y_{\text{new}} = y/3$
- **(b) Answer:  $y = 60/x$ , tripling  $x$  gives  $y_{\text{new}} = 60/(3x) = y/3$**
- (c) **M1** original product  $k = 60$ ; increased by 50% gives new product  $k_{\text{new}} = 1.5 \times 60 = 90$
- (c) **M1**  $y$  reduced by 20%:  $y_{\text{new}} = 0.8 \times \text{original } y = 0.8 \times 10 = 8$
- (c) **M1** use  $x_{\text{new}} \times y_{\text{new}} = k_{\text{new}}$  so  $x_{\text{new}} = k_{\text{new}} / y_{\text{new}}$
- (c) **M1** substitute values  $x_{\text{new}} = 90 / 8$
- (c) **A1** 11.25 cao
- (c) **C1** give answer to 2 dp = 11.25 and show clear working
- (c) **SC1** special case: if candidate uses fractional manipulation and gets  $90/8 = 11.25$
- (c) **B1** final answer stated with units if required
- **(c) Answer: 11.25**