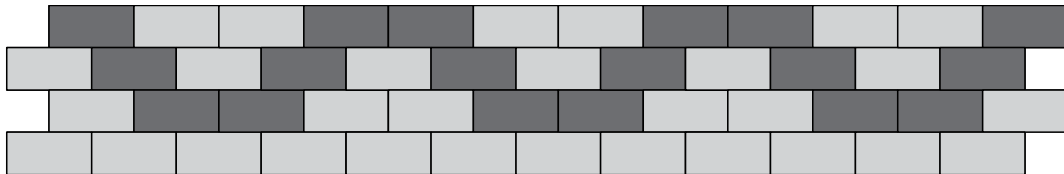


## OCR 05 Ratio, Proportion and Rates of Change (Foundation)

1. A long brick wall is made up of light and dark bricks in a repeating pattern as shown below. Write the ratio of light bricks to dark bricks in its simplest form.



2. Write the fraction of the wall in question 1 that is made up of dark bricks.
3. Write £1.50 : 60p as a ratio in its simplest form.
4. You are given that  $y \propto x$  and that when  $x = 10$ ,  $y = 25$ . Work out  $y$  when  $x = 4$ .
5. Robert has a scale model of a jet. His model has a scale of 1 : 48. The wingspan of the real jet is 10 m. Work out the wingspan of Robert's model, giving your answer to the nearest cm.
6. Share £45 in the ratio 5 : 1 : 3.
7. A builder makes concrete using 1 part cement, 3 parts sand and 3 parts aggregate. The builder uses 60 kg of cement. How much concrete does she make?
8. Given that  $y \propto \frac{1}{x}$ , complete the table.

$x$	10	20	
$y$	5		100

9. This conversion graph can be used to change between litres and gallons. Use this graph to convert 8 gallons to litres, giving your answer correct to 1 decimal place.



10. Which **two** of these equations represent directly proportional relationships between  $x$  and  $y$ ?

A:  $y = 2x + 1$       B:  $y = \frac{2}{x}$       C:  $y = \frac{1}{2}x$   
 D:  $y = 2x$       E:  $y = 2 - x$       F:  $y = 2x^2$

11. Kieran and Amar are sharing out  $\pounds x$  in the ratio  $a : b$ . To work out his share, Amar correctly calculates  $\frac{2}{5} \times \pounds 80 = \pounds 32$ . What is the ratio  $a : b$  in which they are sharing the money?

12. Jamie calculates a table of values for a relationship where  $y$  is directly proportional to  $x$ . His table is shown below, but he has made one error. Identify this error.

$x$	10	20	40
$y$	30	60	90

13. Kate's shop is having a sale. Kate initially discounts all items by 30%. On the final day of the sale, she offers a further 20% discount off the **current** sale price of each item. Explain why Kate **cannot** claim it is a "half-price sale".

14. Beatrice has  $\pounds 1000$  she wants to put in a savings account for three years. She has a choice of two accounts.

- Account A: 10% compound interest paid annually
- Account B: compound interest paid annually: 5% in the first year, 10% in the second, then 15% in the third.

Explain which account Beatrice should choose to maximise her investment.

15. Mitchell has a digital photo that he wants printed. He can either choose a 7 inches by 5 inches print or an 8 inches by 6 inches print. The photo Mitchell wants to print is 1024 pixels by 768 pixels. By converting the two print sizes and Mitchell's photo to a ratio in the form  $n : 1$ , work out which of the two sizes of print can show Mitchell's photo without it being cropped or stretched.

16. Two angles,  $x$  and  $y$ , form a straight line. The ratio of  $x : y$  is  $2 : 7$ . Work out the size of the larger angle.

17. A recipe for 8 vanilla cupcakes needs 120 g of flour. Matthew wants to make as many cupcakes as he can. He has plenty of the other ingredients, but has just 100 g of flour. What is the greatest number of cupcakes that Matthew can make?

18. In Saudi Arabia the currency is the Saudi riyal. The Saudi riyal is fixed to the US dollar, so 1 US dollar will always be worth 3.75 Saudi riyals. Ben has  $\pounds 100$  he wants to convert into Saudi riyals. On the day he does this,  $\pounds 1 = 1.25$  US dollars. Work out how many Saudi riyals Ben will get.

19. The Brighton to London bike ride is 54 miles. Olivia and Tom cycled the distance with their average speeds in the ratio  $3 : 2$ . Olivia finished in a time of 3 hours. Work out how long it took Tom.

20. Ewan, Bella and Liz, share some money in the ratio  $3 : 3 : 5$ . Liz gets  $\pounds 14$  **more** than Ewan. How much money does Bella get?

**Answers**

1. Light : dark = 10 : 6 = 5 : 3

2.  $\frac{3}{8}$

3. 150p : 60p = 5 : 2

4.  $y = kx$

$25 = k \times 10$

$2.5 = k$

When  $x = 4$ ,  $y = 2.5 \times 4 = 10$

5.  $10 \div 48 = 0.208 \text{ m} = 21 \text{ cm}$

6.  $\text{£}45 \div 9 = \text{£}5$  each part. Therefore  $\text{£}25 : \text{£}5 : \text{£}15$ .

7.  $1 : 3 : 3 = 60 \text{ kg} : 180 \text{ kg} : 180 \text{ kg}$ , which makes  $60 + 180 + 180 = 420 \text{ kg}$  of concrete.

8.

x	10	20	0.5
y	5	2.5	100

9. 1.3 gallons = 6 litres, so 1 gallon =  $\frac{6}{1.3}$  litres

8 gallons =  $\frac{6}{1.3} \times 8 = 36.9$  litres

10. C and D

11. 3 : 2

12. The relationship for the first two columns is  $y = 3x$ , but there is a different relationship in the third column. In the third column the  $y$  value should be 120 or the  $x$  value should be 90.13. The total discount offered is not 50%. For example, a £100 item costs £70 in the initial sale. Taking a further 20% (£14) off leaves £56. This is a 44% discount, not 50%. (Alternatively,  $0.7 \times 0.8 = 0.56$  which is a 44% discount.)

14. A:  $\text{£}1000 \times 1.1^3 = \text{£}1331$

B:  $\text{£}1000 \times 1.05 \times 1.1 \times 1.15 = \text{£}1328.25$ , so Account A is better.

15.  $7 : 5 = 1.4 : 1$

$8 : 6 = 1.\dot{3} : 1$

$1024 : 768 = 1.\dot{3} : 1$

So the 8 : 6 print would show Mitchell's photo without it being cropped or stretched.

16.  $180^\circ \div 9 = 20^\circ$ , so  $y = 7 \times 20 = 140$ .

17. 1 cupcake uses 15 g flour.  $100 \div 15 = 6\frac{2}{3}$ , so he can make 6 cupcakes at most.

18.  $\text{£}100 \times 1.25 = \$125$ .  $\$125 \times 3.75 \approx 468$  riyals.

19. Olivia's average speed =  $54 \div 3 = 18$  mph.

Ratio of Olivia's speed : Tom's speed is  $3 : 2 = 18 : 12$ , so Tom's speed is 12 mph.

Tom takes  $54 \div 12 = 4.5$  hours.

20. Liz gets 2 parts more than Ewan, so each part is  $\text{£}14 \div 2 = \text{£}7$ .

Bella gets 3 parts so  $3 \times \text{£}7 = \text{£}21$ .

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Assessment Objective	Qu.	Topic	R	A	G
AO1	1	Find the ratio of quantities in the form $a : b$ and simplify			
AO1	2	Interpret a ratio as a fraction of a whole			
AO1	3	Find the ratio of quantities in the form $a : b$ and simplify			
AO1	4	Calculate with formal proportionality notation			
AO1	5	Calculate one quantity from another given the ratio of the two quantities			
AO1	6	Split a quantity into three parts given the ratio of the parts			
AO1	7	Determine the total of three parts given the ratio of the parts			
AO1	8	Calculate with formal inverse proportionality notation			
AO1	9	Extrapolate with a conversion graph			
AO1	10	Know that if $y = \frac{k}{x}$ , then $y$ is proportional to $x$			
AO2	11	Interpret a ratio as a fraction of a whole			
AO2	12	Know that if $y = kx$ , then $y$ is proportional to $x$			
AO2	13	Explain the result of repeated percentage decrease			
AO2	14	Interpret compound interest			
AO2	15	Calculate with ratios in the form $n : 1$			
AO3	16	Solve a problem using ratio of parts			
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