

GCSE Foundation Mathematics

Practice Test 3: Ratio, Proportion, and Rates of Change

Instructions:

Answer all questions. Show your working clearly.

Calculators may be used unless stated otherwise.

Time allowed: 90 minutes

Section A: Basic Ratios

1. Simplify these ratios:

- (a) 10 : 15
- (b) 18 : 24
- (c) 32 : 48
- (d) 14 : 21 : 35

2. Write these ratios in the form 1 : n :

- (a) 2 : 16
- (b) 4 : 24
- (c) 5 : 35
- (d) 3 : 21

3. Write these ratios in the form n : 1:

- (a) 18 : 3
- (b) 28 : 4
- (c) 35 : 5
- (d) 24 : 6

4. Express these as ratios:

- (a) 75p to £2.25
- (b) 80cm to 2.4m
- (c) 20 minutes to 3 hours
- (d) 350g to 2.1kg

5. A jar contains purple and orange sweets in the ratio 2 : 9. If there are 18 purple sweets, how many orange sweets are there?

Section B: Sharing in Ratios

6. Share these amounts in the given ratios:
- (a) £63 in the ratio 2 : 7
 - (b) £180 in the ratio 3 : 5 : 7
 - (c) £320 in the ratio 5 : 3
 - (d) £480 in the ratio 4 : 6 : 8
7. Kate and Luke share £108 in the ratio 4 : 5. How much does each person get?
8. Five friends share the cost of a concert ticket package totalling £75. Amy pays £12, Beth pays £15, Carl pays £18, Dana pays £20, and Ed pays the rest. What is the ratio of their payments?
9. A concrete mixture uses cement, gravel, and water in the ratio 5 : 3 : 1. If 450kg of cement is used, find the amounts of gravel and water needed.
10. The angles in a quadrilateral are in the ratio 3 : 4 : 5 : 6. Find the size of each angle.
11. A fertilizer blend uses nitrogen, phosphorus, and potassium in the ratio 4 : 1 : 3. How much of each element is needed to make 160kg of fertilizer?

Section C: Direct Proportion

12. If 9 bananas cost £1.80, how much do 15 bananas cost?
13. 6 metres of wire cost £9. Find the cost of:
- (a) 8 metres of wire
 - (b) 3.5 metres of wire
 - (c) 12.5 metres of wire
14. A scooter travels 240 miles on 12 litres of petrol. How far can it travel on:
- (a) 8 litres of petrol
 - (b) 18 litres of petrol
 - (c) 15 litres of petrol
15. 12 gardeners can plant a field in 5 days. How long would it take:
- (a) 8 gardeners to plant the field
 - (b) 20 gardeners to plant the field
 - (c) 15 gardeners to plant the field
16. p is directly proportional to q . When $q = 8$, $p = 32$. Find:
- (a) The value of p when $q = 12$
 - (b) The value of q when $p = 80$
 - (c) The constant of proportionality
17. The cost of water is directly proportional to the number of units used. If 200 units cost £28, find the cost of 350 units.

Section D: Inverse Proportion

18. It takes 9 machines 4 hours to produce a batch. How long would it take:
- (a) 6 machines to produce the batch
 - (b) 12 machines to produce the batch
 - (c) 18 machines to produce the batch
19. r is inversely proportional to s . When $s = 6$, $r = 20$. Find:
- (a) The value of r when $s = 15$
 - (b) The value of s when $r = 24$
 - (c) The constant of proportionality
20. The time for a trip is inversely proportional to the speed. At 50 mph, a trip takes 3 hours. How long would the trip take at:
- (a) 75 mph
 - (b) 25 mph
 - (c) 60 mph
21. A reservoir can be drained by 5 valves in 6 hours. How long would it take to drain using:
- (a) 3 valves
 - (b) 10 valves
 - (c) 15 valves

Section E: Scale Factors and Maps

22. A map has a scale of 1 : 30000. Find the real distance if the map distance is:
- (a) 8 cm
 - (b) 12.5 cm
 - (c) 18 cm
 - (d) 4.5 cm
23. A model helicopter is built to a scale of 1 : 48. If the real helicopter is 14.4m long, how long is the model?
24. On a map with scale 1 : 15000, two schools are 10cm apart. What is the actual distance between the schools in:
- (a) metres
 - (b) kilometres
25. A poster is enlarged by a scale factor of 2.5. If the original poster is 20cm by 16cm, find the dimensions of the enlargement.
26. A circle is enlarged by scale factor 5. If the original circle has an area of 16 cm^2 , what is the area of the enlargement?
27. A pentagon has sides of 4cm, 6cm, 8cm, 5cm, and 7cm. It is enlarged by scale factor 3. Find:
- (a) The lengths of the sides of the enlargement
 - (b) The perimeter of the enlargement
 - (c) The perimeter of the original pentagon
 - (d) The ratio of the areas (enlarged : original)

Section F: Speed, Distance, and Time

28. Calculate the missing values:

- (a) Speed = 80 mph, Time = 2.25 hours, Distance = ?
- (b) Distance = 420 km, Time = 5 hours, Speed = ?
- (c) Distance = 630 miles, Speed = 90 mph, Time = ?
- (d) Speed = 18 m/s, Time = 12 seconds, Distance = ?

29. A ferry travels 150 miles in 2 hours 30 minutes. Calculate its average speed.

30. A walker travels at an average speed of 4 mph. How far does the walker travel in:

- (a) 3 hours 15 minutes
- (b) 90 minutes
- (c) 2 hours 45 minutes

31. A truck journey of 480 miles takes 8 hours. The first 300 miles are completed in 5 hours. Find:

- (a) The average speed for the whole journey
- (b) The average speed for the first part
- (c) The average speed for the second part

32. Convert these speeds:

- (a) 36 km/h to m/s
- (b) 25 m/s to km/h
- (c) 65 mph to km/h (use 1 mile = 1.6 km)
- (d) 108 km/h to mph

Section G: Density and Other Rates

33. Calculate the missing values using $\text{Density} = \frac{\text{Mass}}{\text{Volume}}$:

- (a) Mass = 320g, Volume = 40 cm³, Density = ?
- (b) Density = 4.2 g/cm³, Volume = 35 cm³, Mass = ?
- (c) Mass = 168g, Density = 2.4 g/cm³, Volume = ?
- (d) Density = 6.5 g/cm³, Mass = 390g, Volume = ?

34. A plastic block has a volume of 120 cm³ and a mass of 156g. Calculate its density.

35. Copper has a density of 8.9 g/cm³. What is the mass of a copper pipe with volume 45 cm³?

36. Calculate these rates:

- (a) A pump empties a 84-litre tank in 7 minutes. Find the rate in litres per minute.
- (b) A machine produces 420 bottles in 6 minutes. Find the rate in bottles per minute.
- (c) A farm harvests 2700 apples in 9 hours. Find the rate in apples per hour.

37. Milk flows from a dispenser at a rate of 8 litres per minute. How long will it take to fill:

- (a) A 96-litre container
- (b) A 180-litre tank
- (c) A 60-litre jug

38. The membership of a club increases at a rate of 320 people per year. If the current membership is 18,400, what will the membership be in:
- (a) 3 years
 - (b) 6 years
 - (c) 12 years

Section H: Problem Solving

39. A recipe for 10 people uses 500g flour, 250g butter, and 125g sugar. Adapt the recipe for:
- (a) 16 people
 - (b) 4 people
 - (c) 25 people
40. The ratio of fiction to non-fiction books in a library is 7 : 5. If there are 350 fiction books, find:
- (a) The number of non-fiction books
 - (b) The total number of books
41. A helicopter uses 18 litres of fuel to travel 120 km. How much fuel is needed to travel 200 km?
42. Two quantities u and v are such that v is inversely proportional to the cube of u . When $u = 2$, $v = 54$. Find the value of v when $u = 3$.
43. A model building is built to a scale of 1 : 150. If the height of the real building is 75m, find the height of the model in centimetres.
44. Three partners divide expenses in the ratio 6 : 4 : 5. If the total expenses are £90,000, how much does each partner pay?
45. A cleaning solution contains detergent and water in the ratio 3 : 7. If there are 210ml of detergent, find:
- (a) The amount of water
 - (b) The total volume of the solution
46. A plane flies from Paris to Rome, a distance of 1100 km, in 2 hours. On the return journey, it takes 2.5 hours due to headwinds. Find:
- (a) The average speed from Paris to Rome
 - (b) The average speed from Rome to Paris
 - (c) The average speed for the whole round trip

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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stepupmaths.co.uk**