GCSE Foundation Mathematics
Practice Test 4: 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) $14 : 21$

   (b) $20 : 25$

   (c) $36 : 54$

   (d) $16 : 24 : 32$

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

   (a) $6 : 42$

   (b) $4 : 32$

   (c) $2 : 18$

   (d) $8 : 56$

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

   (a) $22 : 2$

   (b) $30 : 5$

   (c) $42 : 6$

   (d) $56 : 8$

4. Express these as ratios:

   (a) 65p to £1.95

   (b) 90cm to 1.8m

   (c) 35 minutes to 2.5 hours

   (d) 450g to 1.8kg

5. A bag contains white and black beads in the ratio $6 : 11$. If there are 42 white beads, how many black beads are there?

Section B: Sharing in Ratios

6. Share these amounts in the given ratios:
   (a) £91 in the ratio 6 : 7
   (b) £240 in the ratio 4 : 5 : 6
   (c) £450 in the ratio 7 : 8
   (d) £560 in the ratio 3 : 4 : 7
7. Oliver and Sophia share £120 in the ratio 7 : 8. How much does each person get?
8. Six students share the cost of a field trip totalling £120. Alex pays £18, Bella pays £22, Carlos pays £16, Diana pays £25, Eva pays £20, and Finn pays the rest. What is the ratio of their payments?
9. A metal alloy uses tin, zinc, and lead in the ratio 7 : 2 : 3. If 280g of tin is used, find the amounts of zinc and lead needed.
10. The exterior angles of a pentagon are in the ratio 4 : 5 : 6 : 7 : 8. Find the size of each exterior angle.
11. A soil mixture uses peat, sand, and loam in the ratio 2 : 3 : 5. How much of each component is needed to make 200kg of soil mixture?

Section C: Direct Proportion

12. If 11 pears cost £2.75, how much do 16 pears cost?
13. 8 metres of cable cost £12. Find the cost of:
    (a) 12 metres of cable
    (b) 5.5 metres of cable
    (c) 14.5 metres of cable
14. A bicycle travels 180 miles on 9 litres of equivalent fuel. How far can it travel on:
    (a) 15 litres of fuel
    (b) 6 litres of fuel
    (c) 21 litres of fuel
15. 15 cleaners can finish a building in 4 days. How long would it take:
    (a) 10 cleaners to finish the building
    (b) 20 cleaners to finish the building
    (c) 12 cleaners to finish the building
16. w is directly proportional to z. When $z = 12$, $w = 48$. Find:
    (a) The value of w when $z = 18$
    (b) The value of z when $w = 100$
    (c) The constant of proportionality
17. The cost of heating is directly proportional to the number of therms used. If 240 therms cost £36, find the cost of 400 therms.

Section D: Inverse Proportion

18. It takes 8 printers 3 hours to complete a job. How long would it take:
    (a) 6 printers to complete the job
    (b) 12 printers to complete the job
    (c) 24 printers to complete the job

19. x is inversely proportional to y. When $y = 9$, $x = 16$. Find:
    (a) The value of x when $y = 12$
    (b) The value of y when $x = 18$
    (c) The constant of proportionality

20. The time for a delivery is inversely proportional to the speed. At 40 mph, a delivery takes 6 hours. How long would the delivery take at:
    (a) 48 mph
    (b) 32 mph
    (c) 60 mph

21. A construction site can be cleared by 7 bulldozers in 8 hours. How long would it take to clear the site using:
    (a) 4 bulldozers
    (b) 14 bulldozers
    (c) 28 bulldozers

Section E: Scale Factors and Maps

22. A map has a scale of $1 : 60000$. Find the real distance if the map distance is:
    (a) 5 cm
    (b) 8.5 cm
    (c) 14 cm
    (d) 3.2 cm

23. A model rocket is built to a scale of $1 : 25$. If the real rocket is 75m long, how long is the model?

24. On a map with scale $1 : 80000$, two cities are 6cm apart. What is the actual distance between the cities in:
    (a) metres
    (b) kilometres

25. A diagram is reduced by a scale factor of 0.6. If the original diagram is 30cm by 25cm, find the dimensions of the reduction.

26. A hexagon is enlarged by scale factor 6. If the original hexagon has an area of 18 cm^2, what is the area of the enlargement?

27. A rhombus has diagonals of 10cm and 16cm. It is enlarged by scale factor 2.5. Find:
    (a) The lengths of the diagonals of the enlargement
    (b) The area of the original rhombus
    (c) The area of the enlargement
    (d) The ratio of the enlarged area to the original area

Section F: Speed, Distance, and Time

28. Calculate the missing values:
    (a) Speed = 65 mph, Time = 4.5 hours, Distance = ?
    (b) Distance = 480 km, Time = 6 hours, Speed = ?
    (c) Distance = 720 miles, Speed = 80 mph, Time = ?
    (d) Speed = 22 m/s, Time = 18 seconds, Distance = ?
29. A yacht travels 120 miles in 4 hours 20 minutes. Calculate its average speed.
30. A horse travels at an average speed of 12 mph. How far does the horse travel in:
    (a) 2 hours 20 minutes
    (b) 50 minutes
    (c) 3 hours 45 minutes
31. A motorcycle journey of 360 miles takes 6 hours. The first 216 miles are completed in 3.6 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) 90 km/h to m/s
    (b) 30 m/s to km/h
    (c) 75 mph to km/h (use 1 mile = 1.6 km)
    (d) 144 km/h to mph

Section G: Density and Other Rates

33. Calculate the missing values using Density = $\frac{\text{Mass}}{\text{Volume}}$:
    (a) Mass = 280g, Volume = 35 cm^3, Density = ?
    (b) Density = 3.6 g/cm^3, Volume = 45 cm^3, Mass = ?
    (c) Mass = 252g, Density = 4.2 g/cm^3, Volume = ?
    (d) Density = 5.4 g/cm^3, Mass = 324g, Volume = ?
34. A ceramic tile has a volume of 90 cm^3 and a mass of 198g. Calculate its density.
35. Aluminum has a density of 2.7 g/cm^3. What is the mass of an aluminum sheet with volume 80 cm^3?
36. Calculate these rates:
    (a) A fountain fills a 72-litre pool in 8 minutes. Find the rate in litres per minute.
    (b) A factory packages 360 items in 5 minutes. Find the rate in items per minute.
    (c) A vineyard produces 3600 bottles in 12 hours. Find the rate in bottles per hour.
37. Gas flows from a cylinder at a rate of 6 litres per minute. How long will it take to empty:
    (a) A 108-litre cylinder

(b) A 240-litre tank

(c) A 78-litre container

38. The enrollment at a college increases at a rate of 280 students per year. If the current enrollment is 16,800, what will the enrollment be in:

    (a) 4 years

    (b) 7 years

    (c) 15 years

Section H: Problem Solving

39. A recipe for 12 people uses 480g flour, 240g butter, and 160g sugar. Adapt the recipe for:

    (a) 18 people

    (b) 8 people

    (c) 30 people

40. The ratio of hardcover to paperback books in a bookstore is $3 : 8$. If there are 240 paperback books, find:

    (a) The number of hardcover books

    (b) The total number of books

41. A boat uses 24 litres of fuel to travel 160 km. How much fuel is needed to travel 280 km?

42. Two quantities c and d are such that d is inversely proportional to the fourth power of c. When $c = 2$, $d = 80$. Find the value of d when $c = 4$.

43. A model bridge is built to a scale of $1 : 250$. If the span of the real bridge is 125m, find the span of the model in centimetres.

44. Four friends divide restaurant costs in the ratio $5 : 6 : 7 : 8$. If the total cost is £130, how much does each friend pay?

45. A sports drink contains electrolytes and water in the ratio $1 : 9$. If there are 540ml of water, find:

    (a) The amount of electrolytes

    (b) The total volume of the drink

46. A helicopter flies from Berlin to Vienna, a distance of 550 km, in 1.5 hours. On the return journey, it takes 2 hours due to weather conditions. Find:

    (a) The average speed from Berlin to Vienna

    (b) The average speed from Vienna to Berlin

    (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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