GCSE Foundation Mathematics
Practice Test 5: 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) $16 : 20$
   (b) $27 : 36$
   (c) $40 : 60$
   (d) $12 : 18 : 24$

2. Write these ratios in the form $1 : n$:
   (a) $7 : 49$
   (b) $3 : 27$
   (c) $5 : 40$
   (d) $9 : 63$

3. Write these ratios in the form $n : 1$:
   (a) $36 : 4$
   (b) $49 : 7$
   (c) $64 : 8$
   (d) $54 : 9$

4. Express these as ratios:
   (a) 55p to £1.65
   (b) 70cm to 2.1m
   (c) 40 minutes to 2 hours
   (d) 600g to 2.4kg

5. A pack contains silver and gold tokens in the ratio $8 : 5$. If there are 40 silver tokens, how many gold tokens are there?

Section B: Sharing in Ratios

6. Share these amounts in the given ratios:
   (a) £104 in the ratio 5 : 8
   (b) £270 in the ratio 3 : 6 : 9
   (c) £560 in the ratio 4 : 3
   (d) £630 in the ratio 5 : 7 : 9
7. Ryan and Zoe share £140 in the ratio 2 : 5. How much does each person get?
8. Seven workers share overtime pay totalling £168. Alice gets £18, Bob gets £24, Chris gets £30, Diane gets £21, Eric gets £27, Frank gets £15, and Grace gets the rest. What is the ratio of their payments?
9. A plastic compound uses polymer, additive, and filler in the ratio 8 : 1 : 3. If 320g of polymer is used, find the amounts of additive and filler needed.
10. The interior angles of a hexagon are in the ratio 5 : 6 : 7 : 8 : 9 : 10. Find the size of each interior angle.
11. A compost mix uses leaves, grass, and kitchen waste in the ratio 5 : 2 : 3. How much of each material is needed to make 300kg of compost?

Section C: Direct Proportion

12. If 13 mangoes cost £3.25, how much do 20 mangoes cost?
13. 9 metres of rope cost £15. Find the cost of:
    (a) 15 metres of rope
    (b) 6.5 metres of rope
    (c) 21.5 metres of rope
14. A quad bike travels 210 miles on 14 litres of fuel. How far can it travel on:
    (a) 10 litres of fuel
    (b) 22 litres of fuel
    (c) 18 litres of fuel
15. 18 painters can decorate a hotel in 7 days. How long would it take:
    (a) 14 painters to decorate the hotel
    (b) 21 painters to decorate the hotel
    (c) 9 painters to decorate the hotel
16. a is directly proportional to b. When $b = 15$, $a = 45$. Find:
    (a) The value of a when $b = 22$
    (b) The value of b when $a = 75$
    (c) The constant of proportionality
17. The cost of phone calls is directly proportional to the number of minutes used. If 320 minutes cost £48, find the cost of 500 minutes.

Section D: Inverse Proportion

18. It takes 10 loaders 5 hours to move cargo. How long would it take:
    (a) 8 loaders to move the cargo
    (b) 15 loaders to move the cargo
    (c) 25 loaders to move the cargo

19. e is inversely proportional to f. When $f = 12$, $e = 18$. Find:
    (a) The value of e when $f = 16$
    (b) The value of f when $e = 24$
    (c) The constant of proportionality

20. The time for a voyage is inversely proportional to the speed. At 35 mph, a voyage takes 8 hours. How long would the voyage take at:
    (a) 40 mph
    (b) 28 mph
    (c) 56 mph

21. A warehouse can be loaded by 6 forklifts in 9 hours. How long would it take to load using:
    (a) 9 forklifts
    (b) 18 forklifts
    (c) 4 forklifts

Section E: Scale Factors and Maps

22. A map has a scale of 1 : 75000. Find the real distance if the map distance is:
    (a) 7 cm
    (b) 11.5 cm
    (c) 16 cm
    (d) 4.8 cm

23. A model airplane is built to a scale of 1 : 32. If the real airplane is 19.2m long, how long is the model?

24. On a map with scale 1 : 50000, two airports are 9cm apart. What is the actual distance between the airports in:
    (a) metres
    (b) kilometres

25. A blueprint is enlarged by a scale factor of 1.8. If the original blueprint is 35cm by 28cm, find the dimensions of the enlargement.

26. A triangle is enlarged by scale factor 7. If the original triangle has an area of 20 cm^2, what is the area of the enlargement?

27. A parallelogram has sides of 12cm and 18cm with height 15cm. It is enlarged by scale factor 1.5. Find:
    (a) The lengths of the sides of the enlargement
    (b) The height of the enlargement
    (c) The area of the original parallelogram
    (d) The area of the enlargement

Section F: Speed, Distance, and Time

28. Calculate the missing values:
    (a) Speed = 55 mph, Time = 3.8 hours, Distance = ?
    (b) Distance = 560 km, Time = 7 hours, Speed = ?
    (c) Distance = 810 miles, Speed = 90 mph, Time = ?
    (d) Speed = 28 m/s, Time = 15 seconds, Distance = ?
29. A submarine travels 84 miles in 3 hours 30 minutes. Calculate its average speed.
30. A jogger travels at an average speed of 6 mph. How far does the jogger travel in:
    (a) 2 hours 40 minutes
    (b) 75 minutes
    (c) 4 hours 30 minutes
31. A van journey of 540 miles takes 9 hours. The first 324 miles are completed in 5.4 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) 108 km/h to m/s
    (b) 35 m/s to km/h
    (c) 85 mph to km/h (use 1 mile = 1.6 km)
    (d) 126 km/h to mph

Section G: Density and Other Rates

33. Calculate the missing values using Density = $\frac{\text{Mass}}{\text{Volume}}$:
    (a) Mass = 360g, Volume = 45 cm^3, Density = ?
    (b) Density = 2.8 g/cm^3, Volume = 55 cm^3, Mass = ?
    (c) Mass = 315g, Density = 3.5 g/cm^3, Volume = ?
    (d) Density = 4.8 g/cm^3, Mass = 384g, Volume = ?
34. A glass ornament has a volume of 75 cm^3 and a mass of 195g. Calculate its density.
35. Lead has a density of 11.3 g/cm^3. What is the mass of a lead weight with volume 60 cm^3?
36. Calculate these rates:
    (a) A drain empties a 126-litre tank in 9 minutes. Find the rate in litres per minute.
    (b) A scanner processes 480 documents in 8 minutes. Find the rate in documents per minute.
    (c) A poultry farm produces 4800 eggs in 16 hours. Find the rate in eggs per hour.
37. Juice flows from a dispenser at a rate of 9 litres per minute. How long will it take to fill:
    (a) A 135-litre container
    (b) A 270-litre tank
    (c) A 99-litre jug

38. The traffic through a tunnel increases at a rate of 420 vehicles per year. If the current traffic is 22,800 vehicles annually, what will the traffic be in:

    (a) 5 years

    (b) 8 years

    (c) 12 years

Section H: Problem Solving

39. A recipe for 14 people uses 560g flour, 280g butter, and 140g sugar. Adapt the recipe for:

    (a) 21 people

    (b) 10 people

    (c) 35 people

40. The ratio of mystery to romance novels in a library is $4 : 9$. If there are 360 romance novels, find:

    (a) The number of mystery novels

    (b) The total number of novels

41. A snowmobile uses 30 litres of fuel to travel 180 km. How much fuel is needed to travel 420 km?

42. Two quantities g and h are such that h is inversely proportional to the square root of g. When $g = 4$, $h = 32$. Find the value of h when $g = 16$.

43. A model castle is built to a scale of $1 : 180$. If the height of the real castle is 54m, find the height of the model in centimetres.

44. Five siblings share inheritance money in the ratio $6 : 7 : 8 : 9 : 10$. If the total inheritance is £200,000, how much does each sibling receive?

45. A hair dye contains color and developer in the ratio $2 : 5$. If there are 350ml of developer, find:

    (a) The amount of color

    (b) The total volume of the mixture

46. A ferry travels from Dover to Calais, a distance of 42 km, in 1.5 hours. On the return journey, it takes 1.75 hours due to currents. Find:

    (a) The average speed from Dover to Calais

    (b) The average speed from Calais to Dover

    (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

For more resources and practice materials, visit:
stepupmaths.co.uk