GCSE Foundation Mathematics
Practice Test 6: Geometry and Measures

Instructions:
Answer all questions. Show your working clearly.
Calculators may be used unless stated otherwise.
Time allowed: 90 minutes

Section A: Angles

1. Classify these angles as acute, obtuse, or reflex:

    (a) 74°

    (b) 167°

    (c) 298°

    (d) 31°

    (e) 219°

    (f) 86°

2. Find the missing angles:

    (a) Two angles on a straight line are 109° and $x°$. Find x.

    (b) Three angles around a point are 132°, 84°, and $y°$. Find y.

    (c) Two angles are vertically opposite. One angle is 116°. Find the other angle.

3. In a triangle, two angles are 43° and 76°. Find the third angle.

4. The angles in a triangle are in the ratio 4 : 5 : 9. Find the size of each angle.

5. Find the missing angles in these triangles:

    (a) An isosceles triangle with base angles of $x°$ and vertex angle of 80°

    (b) An equilateral triangle (all angles equal)

    (c) A right-angled triangle with one angle of 17°

Section B: Polygons and Angle Rules

6. Find the sum of interior angles for:

    (a) A heptagon (7 sides)

    (b) A nonagon (9 sides)

    (c) An undecagon (11 sides)

    (d) A 20-sided polygon

7. Find the size of each interior angle in:

   (a) A regular heptagon

   (b) A regular undecagon

   (c) A regular 20-sided polygon

   (d) A regular octagon

8. Find the size of each exterior angle in:

   (a) A regular heptagon

   (b) A regular undecagon

   (c) A regular 20-sided polygon

   (d) A regular nonagon

9. A regular polygon has an exterior angle of $20°$. How many sides does it have?

10. In a quadrilateral, three angles are $67°$, $124°$, and $83°$. Find the fourth angle.

11. A regular polygon has an interior angle of $156°$. Find:

   (a) The exterior angle

   (b) The number of sides

Section C: Properties of Shapes

12. State the properties of these quadrilaterals:

   (a) Trapezium (sides, angles)

   (b) Rectangle (sides, angles, diagonals)

   (c) Parallelogram (sides, angles, diagonals)

   (d) Rhombus (sides, angles, diagonals)

13. How many lines of symmetry do these shapes have?

   (a) Regular dodecagon

   (b) Parallelogram

   (c) Regular heptagon

   (d) Isosceles trapezium

   (e) Regular triangle

   (f) Arrow (kite-like shape)

14. What is the order of rotational symmetry for:

   (a) Regular dodecagon

   (b) Regular heptagon

   (c) Parallelogram

   (d) Regular triangle

15. Name these 3D shapes:

   (a) 1 hexagonal base and 6 triangular faces

   (b) 2 decagonal faces and 10 rectangular faces

   (c) 12 pentagonal faces and 20 hexagonal faces

(d) 1 circular face and 1 curved surface to a point

(e) 6 rectangular faces forming a box

16. How many faces, edges, and vertices do these shapes have?

   (a) Decagonal prism

   (b) Hexagonal pyramid

   (c) Dodecahedron (12 pentagonal faces)

   (d) Octahedron (8 triangular faces)

Section D: Transformations

17. Describe the transformation that maps:

   (a) Shape A to Shape B (enlargement scale factor $\frac{1}{4}$, centre origin)

   (b) Shape B to Shape C (rotation 45° clockwise about origin)

   (c) Shape C to Shape D (reflection in line $x = -1$)

   (d) Shape D to Shape E (translation 7 units left, 5 units down)

18. A point P(9, 8) is transformed. Find the image coordinates after:

   (a) Reflection in the x-axis

   (b) Reflection in the y-axis

   (c) Reflection in the line $y = x$

   (d) Translation by vector $\begin{pmatrix} -6 \\ 7 \end{pmatrix}$

19. A pentagon has vertices at A(4, 8), B(8, 8), C(10, 4), D(6, 0), and E(2, 4). Find the coordinates after:

   (a) Rotation 90° clockwise about the origin

   (b) Enlargement scale factor $\frac{3}{4}$, centre origin

   (c) Translation by vector $\begin{pmatrix} -5 \\ 6 \end{pmatrix}$

20. A shape is enlarged by scale factor $\frac{5}{6}$. If the original area is 72 cm^2, what is the new area?

21. Shape A is enlarged to Shape B with scale factor $\frac{3}{5}$. If Shape A has a perimeter of 35 cm, what is the perimeter of Shape B?

Section E: Perimeter and Area

22. Calculate the perimeter of these shapes:

   (a) Rectangle: length 23 cm, width 14 cm

   (b) Square: side length 19 cm

   (c) Triangle: sides 17 cm, 19 cm, 23 cm

   (d) Regular heptagon: side length 8 cm

23. Calculate the area of these shapes:

   (a) Rectangle: length 26 cm, width 17 cm

   (b) Square: side length 21 cm

    (c) Triangle: base 28 cm, height 13 cm

    (d) Parallelogram: base 19 cm, height 11 cm

24. Calculate the area and circumference of circles with:

    (a) Radius 11 cm

    (b) Diameter 24 cm

    (c) Radius 8.5 cm

    (d) Diameter 34 cm

25. A rectangular nature reserve is 75 m long and 48 m wide. Find:

    (a) The perimeter

    (b) The area

    (c) The cost of boundary fencing at £35 per metre

    (d) The cost of conservation work at £7 per m^2

26. Find the area of these compound shapes:

    (a) A rectangle 24 cm by 16 cm with two squares of side 3 cm removed from opposite corners

    (b) A cross shape made from two rectangles: 20 cm by 6 cm and 8 cm by 18 cm overlapping

    (c) Three-quarters of a circle with radius 10 cm attached to a triangle with base 20 cm and height 15 cm

Section F: Volume and Surface Area

27. Calculate the volume of these prisms:

    (a) Cuboid: length 18 cm, width 13 cm, height 11 cm

    (b) Cube: side length 13 cm

    (c) Triangular prism: triangular face area 42 cm^2, length 14 cm

    (d) Cylinder: radius 9 cm, height 16 cm

28. Calculate the surface area of:

    (a) Cube: side length 12 cm

    (b) Cuboid: length 20 cm, width 15 cm, height 11 cm

    (c) Cylinder: radius 8 cm, height 15 cm

29. A cylindrical brewery tank has radius 6 m and height 12 m. Find:

    (a) The volume in m^3

    (b) The volume in litres (1 m^3 = 1000 litres)

    (c) The curved surface area

    (d) The total surface area

30. A cube has volume 1728 cm^3. Find:

    (a) The side length

    (b) The surface area

31. A rectangular shipping container is 40 m long, 18 m wide, and 5 m high. Find:

    (a) The volume of cargo it can hold

    (b) The area of the floor

    (c) The area of the four walls

Section G: Pythagoras' Theorem

32. Use Pythagoras' theorem to find the missing side in these right-angled triangles:

    (a) Two shorter sides are 21 cm and 28 cm. Find the hypotenuse.
    (b) Hypotenuse is 61 cm, one side is 60 cm. Find the other side.
    (c) Two shorter sides are 33 cm and 44 cm. Find the hypotenuse.
    (d) Hypotenuse is 85 cm, one side is 84 cm. Find the other side.

33. A guy rope of length 13 m is attached from the top of a 12 m mast to the ground. How far from the base of the mast does the rope reach?

34. A rectangle has length 48 cm and width 14 cm. Find the length of its diagonal.

35. Find the distance between these pairs of points:

    (a) (0, 0) and (21, 28)
    (b) (7, 11) and (19, 16)
    (c) (-5, 8) and (7, 23)

36. A right-angled triangle has legs of length x cm and $(x + 11)$ cm, and hypotenuse $(x + 61)$ cm. Find the value of x.

37. Determine whether these triangles are right-angled:

    (a) Sides 21 cm, 72 cm, 75 cm
    (b) Sides 18 cm, 24 cm, 32 cm
    (c) Sides 39 cm, 80 cm, 89 cm
    (d) Sides 35 cm, 84 cm, 91 cm

Section H: Problem Solving

38. A circular amphitheatre has radius 12 m. A stage area of width 4 m surrounds the amphitheatre. Find:

    (a) The area of the amphitheatre
    (b) The area of the stage
    (c) The total area including the stage

39. A regular 18-sided polygon has perimeter 108 cm. Find:

    (a) The length of each side
    (b) Each interior angle
    (c) Each exterior angle

40. A cylindrical grain silo has radius 11 cm and height 30 cm. Find:

    (a) How much grain it can store (volume)
    (b) The area of steel needed to construct it (surface area)
    (c) The cost of steel at £0.08 per cm^2

41. Triangle MNO is isosceles with MN = MO. Angle NMO = 15°. Find angles MNO and MON.

42. A regular octagon and a circle have the same area. If the octagon has side length 9 cm, find the radius of the circle (use approximation for octagon area).

43. A triangle has vertices at A(6, 9), B(18, 9), and C(12, 25). Find:

    (a) The length of each side
    (b) The perimeter
    (c) The area
    (d) Whether the triangle is right-angled

44. A cone has base radius 15 cm and slant height 25 cm. Find:

    (a) The vertical height
    (b) The volume
    (c) The curved surface area

45. A factory floor is 18 m by 15 m. Hexagonal tiles with side length 25 cm are used to cover the floor. Approximately how many tiles are needed? (Use hexagon area $2.6 \times \text{side}^2$)

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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