GCSE Foundation Mathematics
Practice Test 9: 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) 76°
   (b) 143°
   (c) 329°
   (d) 53°
   (e) 241°
   (f) 88°
2. Find the missing angles:
   (a) Two angles on a straight line are 156° and x°. Find x.
   (b) Three angles around a point are 167°, 89°, and y°. Find y.
   (c) Two angles are vertically opposite. One angle is 142°. Find the other angle.
3. In a triangle, two angles are 52° and 73°. Find the third angle.
4. The angles in a triangle are in the ratio $1 : 4 : 7$. 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 86°
   (b) An equilateral triangle (all angles equal)
   (c) A right-angled triangle with one angle of 37°

Section B: Polygons and Angle Rules

6. Find the sum of interior angles for:
   (a) A pentagon (5 sides)
   (b) An enneagon (9 sides)
   (c) A 13-sided polygon
   (d) A 30-sided polygon

7. Find the size of each interior angle in:
   (a) A regular pentagon
   (b) A regular enneagon
   (c) A regular 13-sided polygon
   (d) A regular 30-sided polygon
8. Find the size of each exterior angle in:
   (a) A regular pentagon
   (b) A regular enneagon
   (c) A regular 13-sided polygon
   (d) A regular 30-sided polygon
9. A regular polygon has an exterior angle of 36°. How many sides does it have?
10. In a quadrilateral, three angles are 85°, 107°, and 91°. Find the fourth angle.
11. A regular polygon has an interior angle of 171°. Find:
    (a) The exterior angle
    (b) The number of sides

Section C: Properties of Shapes

12. State the properties of these quadrilaterals:
    (a) Square (sides, angles, diagonals)
    (b) Kite (sides, angles)
    (c) Isosceles trapezium (sides, angles, diagonals)
    (d) Rhombus (sides, angles, diagonals)
13. How many lines of symmetry do these shapes have?
    (a) Regular heptagon
    (b) Square
    (c) Regular dodecagon
    (d) Kite
    (e) Rectangle
    (f) Regular triangle
14. What is the order of rotational symmetry for:
    (a) Regular heptagon
    (b) Regular dodecagon
    (c) Square
    (d) Regular triangle
15. Name these 3D shapes:
    (a) 1 heptagonal base and 7 triangular faces
    (b) 2 pentagonal faces and 5 rectangular faces
    (c) 20 triangular faces meeting at 12 vertices

(d) 2 parallel circular faces and 1 curved surface

(e) 4 triangular faces meeting at 4 vertices

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

(a) Octagonal prism

(b) Nonagonal pyramid

(c) Cube

(d) Square-based pyramid

Section D: Transformations

17. Describe the transformation that maps:

(a) Shape A to Shape B (enlargement scale factor $\frac{3}{7}$, centre origin)

(b) Shape B to Shape C (rotation 90° anticlockwise about origin)

(c) Shape C to Shape D (reflection in line $y = 2$)

(d) Shape D to Shape E (translation 11 units right, 8 units down)

18. A point P(18, 24) 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 $\begin{pmatrix} -11 \\ 7 \end{pmatrix}$

19. A heptagon has vertices at A(7, 14), B(14, 14), C(18, 7), D(14, 0), E(7, 0), F(3, 7), and G(7, 10). Find the coordinates after:

(a) Rotation 270° clockwise about the origin

(b) Enlargement scale factor $\frac{4}{7}$, centre origin

(c) Translation by vector $\begin{pmatrix} -9 \\ 5 \end{pmatrix}$

20. A shape is enlarged by scale factor $\frac{5}{8}$. If the original area is 192 cm^2, what is the new area?

21. Shape A is enlarged to Shape B with scale factor $\frac{3}{8}$. If Shape A has a perimeter of 120 cm, what is the perimeter of Shape B?

Section E: Perimeter and Area

22. Calculate the perimeter of these shapes:

(a) Rectangle: length 38 cm, width 21 cm

(b) Square: side length 29 cm

(c) Triangle: sides 25 cm, 27 cm, 31 cm

(d) Regular hexagon: side length 13 cm

23. Calculate the area of these shapes:

(a) Rectangle: length 42 cm, width 23 cm

(b) Square: side length 31 cm

(c) Triangle: base 38 cm, height 19 cm

(d) Parallelogram: base 29 cm, height 16 cm

24. Calculate the area and circumference of circles with:

(a) Radius 17 cm

(b) Diameter 36 cm

(c) Radius 14.5 cm

(d) Diameter 46 cm

25. A rectangular tennis court is 105 m long and 68 m wide. Find:

(a) The perimeter

(b) The area

(c) The cost of boundary fencing at £52 per metre

(d) The cost of court surfacing at £15 per m^2

26. Find the area of these compound shapes:

(a) A rectangle 36 cm by 22 cm with two squares of side 6 cm removed from opposite corners

(b) A T-shape made from two rectangles: 30 cm by 12 cm and 14 cm by 24 cm overlapping

(c) Five-sixths of a circle with radius 16 cm attached to a trapezium with parallel sides 32 cm and 20 cm, height 14 cm

Section F: Volume and Surface Area

27. Calculate the volume of these prisms:

(a) Cuboid: length 29 cm, width 19 cm, height 16 cm

(b) Cube: side length 17 cm

(c) Triangular prism: triangular face area 63 cm^2, length 20 cm

(d) Cylinder: radius 14 cm, height 22 cm

28. Calculate the surface area of:

(a) Cube: side length 19 cm

(b) Cuboid: length 32 cm, width 23 cm, height 17 cm

(c) Cylinder: radius 13 cm, height 21 cm

29. A cylindrical grain silo has radius 12 m and height 21 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 4913 cm^3. Find:

(a) The side length

(b) The surface area

31. A rectangular hangar is 65 m long, 28 m wide, and 12 m high. Find:

(a) The volume of space it contains

(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 30 cm and 40 cm. Find the hypotenuse.

    (b) Hypotenuse is 85 cm, one side is 77 cm. Find the other side.

    (c) Two shorter sides are 42 cm and 56 cm. Find the hypotenuse.

    (d) Hypotenuse is 105 cm, one side is 84 cm. Find the other side.

33. A support wire of length 20 m is attached from the top of an 18 m telecommunications mast to the ground. How far from the base of the mast does the wire reach?

34. A rectangle has length 60 cm and width 20 cm. Find the length of its diagonal.

35. Find the distance between these pairs of points:

    (a) (0, 0) and (30, 40)

    (b) (11, 17) and (23, 22)

    (c) (-8, 13) and (4, 28)

36. A right-angled triangle has legs of length x cm and $(x + 17)$ cm, and hypotenuse $(x + 83)$ cm. Find the value of x.

37. Determine whether these triangles are right-angled:

    (a) Sides 30 cm, 72 cm, 78 cm

    (b) Sides 24 cm, 32 cm, 40 cm

    (c) Sides 48 cm, 64 cm, 80 cm

    (d) Sides 36 cm, 48 cm, 60 cm

Section H: Problem Solving

38. A circular pond has radius 18 m. A gravel path of width 5 m surrounds the pond. Find:

    (a) The area of the pond

    (b) The area of the path

    (c) The total area including the path

39. A regular 36-sided polygon has perimeter 252 cm. Find:

    (a) The length of each side

    (b) Each interior angle

    (c) Each exterior angle

40. A cylindrical water tower has radius 17 cm and height 45 cm. Find:

    (a) How much water it can hold (volume)

    (b) The area of metal needed to construct it (surface area)

    (c) The cost of metal at £0.18 per cm^2

41. Triangle VWX is isosceles with VW = VX. Angle WVX = 26°. Find angles VWX and VXW.

42. A regular decagon and a circle have the same area. If the decagon has side length 18 cm, find the radius of the circle (use decagon area $7.7 \times \text{side}^2$).

43. A triangle has vertices at A(12, 18), B(24, 18), and C(18, 33). 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 24 cm and slant height 40 cm. Find:

    (a) The vertical height

    (b) The volume

    (c) The curved surface area

45. A school courtyard is 35 m by 26 m. Hexagonal tiles with side length 50 cm are used to pave the area. Approximately how many tiles are needed? (Use hexagon area $\approx 2.6 \times \text{side}^2$)

Answer Space

Use this space for your working and answers.

END OF TEST

Total marks: 100

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