Constructions and Tilings

Standard difficulty · 20 questions · 40 marks · Time: 28 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. An angle of 60° is bisected. Each part is:
(a) 60° **(b)** 30° **(c)** 150° **(d)** 120°

2. The perpendicular bisector of a 34 cm line segment meets it at a point. How far is that point from each end?
(a) 17 cm **(b)** 34 cm **(c)** 8.5 cm **(d)** 18 cm

3. The perpendicular bisector of a line segment:
(a) cuts it into two unequal parts **(b)** is parallel to it
(c) cuts it into two equal halves at 90° **(d)** meets it at 45°

4. Each interior angle of a regular 18-sided polygon is:
(a) 170° **(b)** 20° **(c)** 161° **(d)** 160°

5. How many squares can fit around one point without overlapping?
(a) 6 **(b)** 5 **(c)** 4 **(d)** 3

6. A regular hexagon is drawn inside a circle of radius 12 cm, with its corners on the circle. Its perimeter is:
(a) 72 cm **(b)** 36 cm **(c)** 78 cm **(d)** 144 cm

7. Bisecting a 70° angle gives two angles of:
(a) 35° each **(b)** 20° and 50° **(c)** 70° each **(d)** 140° each

8. Can regular 19-sided polygons alone cover a floor with no gaps or overlaps?
(a) Only if two colours are used **(b)** Yes
(c) Only if they are large **(d)** No

Section B — Short answer — 8 × 2 = 16 marks

9. An angle of 60° is bisected, and then one of the halves is bisected again. What are the sizes of the smallest angles?

10. How many square tiles of side 50 cm cover a floor 6 m by 4 m?

11. Find each interior angle of a regular octagon. Can such shapes tile a floor on their own?

12. A regular hexagon is constructed in a circle of radius 17 cm. What is its side and its perimeter? Into how many equilateral triangles can it be split from the centre?

13. Can two regular hexagons and two equilateral triangles fit together around one point with no gap or overlap? Show the angle sum.

14. P lies on the perpendicular bisector of AB, and PA = 39 cm. What is PB? Why?

15. A ray bisects ∠XYZ, making two angles of 49° each. Find ∠XYZ, and say what kind of angle it is.

16. A regular hexagon of side 2 cm is split into 6 equilateral triangles from its centre. What is the perimeter of each triangle and of the hexagon?

Section C — Word problems — 4 × 4 = 16 marks

17. A hall 15 m by 15 m is tiled with square tiles of side 60 cm. How many tiles are needed, and what do they cost at Rs 74 each?

18. Rohan draws an angle of 140°, bisects it, and then bisects one of the halves. What three angles are now marked at the vertex?

19. Two houses are 638 m apart along a straight road. A well is to be dug on the road, equally far from both houses. How far is it from each house? If a lamp post is placed off the road but still equally far from both houses, where must it be?

20. A floor pattern has four equilateral triangles at a corner. How many regular hexagons are needed to fill the rest of the 360° around that corner?

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Answer key

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Q	Answer	Working
1	**(b) 30°**	60° ÷ 2
2	**(a) 17 cm**	34 ÷ 2
3	**(c) cuts it into two equal halves at 90°**	—
4	**(d) 160°**	180° × 16 ÷ 18
5	**(c) 4**	4 × 90° = 360°, exactly 360°
6	**(a) 72 cm**	each side equals the radius: 6 × 12
7	**(a) 35° each**	—
8	**(d) No**	each angle is 180° × 17 ÷ 19, which does not divide 360° exactly
9	**15°**	60° ÷ 2 ÷ 2
10	**96 tiles**	600 ÷ 50 = 12 along, 400 ÷ 50 = 8 across
11	**135°; no**	180° × 6 ÷ 8; 360° ÷ 135° = not a whole number
12	**17 cm; 102 cm; 6**	the side of the hexagon equals the radius
13	**Yes, 360°**	triangle 60°, square 90°, pentagon 108°, hexagon 120°, octagon 135°, 12-gon 150°
14	**39 cm**	every point on the perpendicular bisector is equally far from A and B
15	**98°; obtuse**	2 × 49°
16	**6 cm; 12 cm**	each triangle has three sides of 2 cm
17	**625 tiles; Rs 46,250**	1500 ÷ 60 = 25; 1500 ÷ 60 = 25; 25 × 25 = 625
18	**70°, 35°, 35°**	140° ÷ 2 = 70°; ÷ 2 again = 35°
19	**319 m; on the perpendicular bisector of the road between them**	equally far from two points means on their perpendicular bisector
20	**1**	the shapes used take 240°; the gap 120° ÷ 120° = 1