

Mensuration

Important Formulae

Circle:

1. Diameter, $D = 2r$
2. Area = πr^2 sq. units
3. Circumference = $2\pi r$ units

Square:

4. Area = a^2 sq. units
5. Perimeter = $4a$ units
6. Diagonal, $d = \sqrt{2} a$ units

Rectangle:

7. Area = $l \times b$ sq. units
8. Perimeter = $2(l+b)$ units
9. Diagonal, $d = \sqrt{l^2 + b^2}$ units

Scalene Triangle:

10. Area = $\sqrt{s(s-a)(s-b)(s-c)}$ sq. units; $s = (a+b+c)/2$
11. Perimeter = $(a+b+c)$ units

Isosceles Triangle:

12. Area = $\frac{b}{4}\sqrt{4a^2 - b^2}$ sq units
13. Perimeter = $2a + b$ units

b = base length; a = equal side length

Equilateral Triangle:

$$14. \text{Area} = \frac{\sqrt{3}}{4} a^2 \text{ sq. units}$$

$$15. \text{Perimeter} = 3a \text{ units}$$

a = side of the triangle

Right-angled triangle:

$$16. \text{Area} = \left(\frac{1}{2}\right)b \times h \text{ sq. units}$$

$$17. \text{Perimeter} = b + h + \text{hypotenuse}$$

$$18. \text{Hypotenuse} = \sqrt{b^2 + h^2} \text{ units}$$

Cuboid:

$$19. \text{Volume} = (\text{Cross section area} \times \text{height}) = l \times b \times h \text{ cubic units}$$

$$20. \text{Lateral Surface Area (LSA)} = 2[(l+b)h] \text{ sq. units}$$

$$21. \text{Total surface area (TSA)} = 2(lb+bh+hl) \text{ sq. units}$$

$$22. \text{Length of the diagonals} = \sqrt{l^2 + b^2 + h^2} \text{ units}$$

Cube:

$$23. \text{Volume} = a^3 \text{ cubic units}$$

$$24. \text{LSA} = 4a^2 \text{ sq. units}$$

$$25. \text{TSA} = 6a^2 \text{ sq. units}$$

$$26. \text{Length of diagonal} = a\sqrt{3} \text{ units}$$

Sphere:

$$27. \text{Volume} = \left(\frac{4}{3}\right)\pi r^3 \text{ cubic units}$$

$$28. \text{Surface Area} = 4\pi r^2 \text{ sq. units}$$

$$29. \text{If } R \text{ and } r \text{ are the external and internal radii of a spherical shell, then its Volume} = \frac{4}{3}[R^3 - r^3] \text{ cubic units}$$

Hemisphere:

30. Volume = $(2/3)\pi r^3$ cubic units

31. TSA = $3\pi r^2$ sq. units

Cylinder:

32. Volume = $\pi r^2 h$ cubic units

33. Curved surface Area (CSA) (excludes the areas of the top and bottom circular regions) = $2\pi r h$ sq. units

34. TSA = Curved Surface Area + Areas of the top and bottom circular regions = $2\pi r h + 2\pi r^2 = 2\pi r[r+h]$ sq. units

Cone:

35. Volume = $(1/3)\pi r^2 h$ cubic Units

36. Slant Height of cone, $l = \sqrt{r^2 + h^2}$ units

37. CSA = $\pi r l$ sq. units

38. TSA = $\pi r(r+l)$ sq. units

Model 1: Basic 2D and 3D Mensuration

1. The ratio between the perimeter and the breadth of a rectangle is 5:1. If the area of the rectangle is 216 Sq cm, what is the length of the rectangle?



- 1) 16 cm 2) 18 cm 3) 24 cm 4) 12 cm 5) None of these

2. Length and breadth of a rectangle are in the ratio 5: 3. If its perimeter is 840 m, what is the area of the rectangle?

- 1) 2400 sq m 2) 2000 sq m 3) 24,000 sq m
4) 16,000 sq m 5) None of these

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10. How many square pieces of 5 cm side can be cut off a rectangular tin plate 15 cm long and 10 cm wide?

- 1) 15 2) 5 3) 10 4) 6 5) None of these

Model 2: Fencing/Carpeting the given Plot

11. A fence is to be drawn around a circular ground of radius 7 m. What will be the total expenditure if the cost of fencing is ₹ 120 per meter?



- 1) ₹ 5640 2) ₹ 2520 3) ₹ 5280 4) ₹ 5520 5) None of these

12. The length of a rectangular plot is 20 m more than its breadth. If the cost of fencing the plot at ₹ 26.50/m is ₹ 5300, what is the length of the plot (in m)?

- 1) 40 2) 50 3) 120 4) 60 5) None of these

13. The floor of a rectangular auditorium of length 40 feet and breadth 28 feet is to be covered with a wall to wall carpet. Find the total cost, if the carpet costs ₹ 72 per sq ft and the pasting charge is ₹ 6 per sq ft?



- 1) ₹ 65640 2) ₹ 85920 3) ₹ 87360 4) ₹ 56440 5) None of these

14. What will be the cost of gardening 1 m broad boundary around a rectangular plot having perimeter of 340 m at the rate of ₹ 10 per sq m?

- 1) ₹ 1700 2) ₹ 3400 3) ₹ 3440 4) ₹ 3000 5) None of these

Model 3: Footpath/Jogging Track/Garden around the given Plot

15. A rectangular park of length 20 m and breadth 18 m is to be bounded by a 2 m wide jogging



track from outside. What will be the area of the track?

- 1) 168 sq m 2) 200 sq m 3) 240 sq m 4) 160 sq m 5) None of these

16. A rectangular area having length and breadth equals to 12 m and 8 m respectively is to be bounded by 50 cm broad garden from outside. What is the total area of the garden?

- 1) 25 m 2) 21 m 3) 10 m 4) 15 m 5) None of these

17. The outer circumference of a circular track is 220 m. Find the cost of leveling the track at the rate of 50 paise/sq m, if the track is 7m wide everywhere?



- 1) ₹ 564 2) ₹ 693 3) ₹ 612 4) ₹ 564 5) None of these

18. A park square in shape has a 3 m wide road inside it running along its sides. The area occupied by the road is 1764 sq m. What is the perimeter along the outer edge of the road?

- 1) 576 m 2) 600 m 3) 640 m 4) 320 m 5) None of these

Model 4: Problems on Lateral/Curved Surface Area

19. All the four lateral walls and the ceiling of a room of length 12 ft, breadth 10 ft and height 8 ft are to be painted. Find the total cost if the cost of painting is ₹ 15 per sq ft and the doors and windows occupy 40 sq ft of area



- 1) ₹ 1720 2) ₹ 6480 3) ₹ 6440 4) ₹ 3960 5) None of these

20. The height and length of a wall of a room is 6 m and 4 m respectively. If the rate of painting is ₹ 75 per sq m, then what will be the total cost if three walls (having no windows and doors) are to be painted?

- 1) ₹ 5100 2) ₹ 5400 3) ₹ 4800 4) ₹ 5200 5) None of these

21. What is the approximate area of canvas required to make a conical tent of radius 30 feet and height 18 feet?



- 1) 2400 sq ft 2) 3300 sq ft 3) 6600 sq ft 4) 1440 sq ft 5) None of these

Model 5: Proportionality of Volume

22. A metal sphere of diameter 16 cm is melt and small balls of radius 2 cm each are cast from the molten form. How many such small balls will be formed?



- 1) 4 2) 8 3) 64 4) 16 5) None of these

23. A large sphere of diameter 18 cm is melt and cast into small balls of radius 3 cm each. How many small balls will be formed?

- 1) 3 2) 9 3) 27 4) 81 5) None of these

24. Find the number of bricks each measuring 25 cm × 12.5 cm × 7.5 cm required to construct a wall 12 m long, 5 m high and 0.25 m thick, while the sand and cement mixture occupies 5% of the total volume of wall



- 1) 5880 2) 6080 3) 5600 4) 6440 5) None of these

25. Three cubes of sides 3 cm, 4 cm and 5 cm respectively are merged together to form a single large cube. What is the side of the cube so formed?

- 1) 12 cm 2) 6 cm 3) 24 cm 4) 60 cm 5) None of these

Model 6: Complex 2D and 3D Mensuration

26. Squares of side 4 cm each are cut from each of the corners of a rectangular cardboard of length 20 cm and breadth 16 cm. What will be the perimeter of the remaining portion of the cardboard?



- 1) 72 cm 2) 64 cm 3) 24 cm 4) 36 cm 5) None of these

27. The length and breadth of the floor of the room are 20 feet and 10 feet respectively. Square tiles of 2 feet length of different colors are to be laid on the floor. Black tiles are laid in the first row on all sides. If white tiles are laid in one-third of the remaining and blue tiles in the rest, how many blue tiles will be there?

- 1) 16 2) 24 3) 32 4) 48 5) None of these

28. A pit of length 8 ft, breadth 5 ft and depth 4 ft is made in a rectangular field of length 34 ft and breadth 20 ft. The earth dug out of the pit is uniformly spread on the remaining area of the field. What will be the increase in level of the remaining area?



- 1) 4 ft 2) 0.5 ft 3) 2.5 ft 4) 0.25 ft 5) None of these

29. In a square area having sides equal to 5 m, one has to plant mango trees. The distance between two consecutive trees should be 1 m. What will be the total number of trees in that area?

- 1) 25 2) 20 3) 36 4) 30 5) None of these

30. A rectangular plot has length 18 m and breadth 12 m. Poles are to be fixed on its perimeter. If the distance between two consecutive poles be 1 m, how many such poles are required?

- 1) 58 2) 60 3) 56 4) 64 5) None of these

Answers

1 - 2	2 - 5	3 - 1	4 - 2	5 - 3	6 - 3	7 - 4	8 - 4	9 - 3	10 - 4
11 - 3	12 - 4	13 - 3	14 - 3	15 - 1	16 - 2	17 - 2	18 - 2	19 - 2	20 - 2
21 - 2	22 - 3	23 - 3	24 - 2	25 - 2	26 - 1	27 - 1	28 - 4	29 - 3	30 - 2

Additional Examples

1. A rectangular garden is 100 m×80 m. There is a path along the garden and just outside it.



Width of the path is 10m. The area of the path is_

- a) 1900 sq m b) 2400 sq m c) 3660 sq m d) 4000 sq m

2. If a wire is bent into the shape of a square, then the area of the square so formed is 81 cm².



When the wire is rebent into a semicircular shape, when then the area (in cm²) of the semicircle will be (Take $\pi = \frac{22}{7}$)

- a) 22 b) 44 c) 77 d) 154

3. The diameters of two circles are the side of a square and the diagonal of the square. The



ratio of the areas of the smaller circle and the larger circle is

- a) 1:2 b) 1:4 c) $\sqrt{2}:\sqrt{3}$ d) $1:\sqrt{2}$

4. An equilateral triangle of side 6 cm has its corners cut off to form a regular hexagon. Area



(in cm^2) of this regular hexagon will be

- a) $3\sqrt{3}$ b) $3\sqrt{6}$ c) $6\sqrt{3}$ d) $\frac{5\sqrt{3}}{2}$

5. The areas of three consecutive faces of a cuboid are 12 cm^2 , 20 cm^2 and 15 cm^2 , then the volume (in cm^3) of the cuboid is



- a) 3600 b) 100 c) 80 d) 60

6. Three circles of radius a , b , c touch each other externally. The area of the triangle formed by joining their centres is



- a) $\sqrt{(a+b+c)abc}$ b) $(a+b+c)\sqrt{ab+bc+ca}$
c) $\sqrt{ab+bc+ca}$ d) None of the above

7. A sphere of diameter 6 cm is dropped in a right circular cylindrical vessel partly filled with water. The diameter of the cylindrical vessel is 12 cm. If the sphere is just completely submerged in water, then the rise of water level in the cylindrical vessel is



- a) 2 cm b) 1 cm c) 3 cm d) 4 cm

8. Water is flowing at the rate of 5 km/hr through a pipe of diameter 14 cm into a rectangular tank which is 50 m long, 44 m wide. The time taken, in hours, for the rise in the level of water in the tank to be 7 cm is



- a) 2 b) $1\frac{1}{2}$ c) 3 d) $2\frac{1}{2}$

9. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water (in litres) will fall into the sea in a minute?



- a) 4,00,000 b) 40,00,000 c) 40,000 d) 4,000



10. At each corner of a triangular field of sides 26 cm, 28 cm, 30 cm, a cow is tethered by a rope of length 7 m. The area (in m^2) ungrazed by the cows is
- a) 336 b) 259 c) 154 d) 77
11. A man walking at a speed of 4km/h crosses a square field diagonally in 3 minutes. The area of the field (in m^2) is
- a) 4×10^4 b) 2×10^4 c) 2.5×10^4 d) 4.4×10^4
12. The volume of a cube to the right is x and its surface area is x . What is the length of an edge of the cube?
- a) 4 b) 6 c) 10 d) 36
13. A unit square is circumscribed about a circle. If the circumference of the circle is $q\pi$ what is the value of q ?
- a) π b) 2 c) 0 d) 1
14. The area of an equilateral triangle is inscribed in a circle of radius cm is
- a) 176 b) $576\sqrt{3}$ c) 482 d) $48\sqrt{3}$
15. A rectangular cube of edge 16cm is immersed completely in a rectangular vessel containing water. If the dimensions of the base of vessel are 25cm x 16cm, find the rise in water level.
- a) 11.25cm b) 16.42cm c) 10.24cm d) 12.41cm
16. The length, breadth and height of a cuboid are in ratio 5:4:2. What is the lateral surface area of the cuboid if the length of the longest diagonal that fits in the cuboid is $15\sqrt{5}$ cm?
- a) 900 b) $600\sqrt{2}$ c) 482 d) $48\sqrt{3}$

17. The base of a right prism is an equilateral triangle with side 7m and height 24m. Find its volume.
 a) 550m^3 b) 571m^3 c) 509m^3 d) 536m^3
18. The ratio between the length and the breadth of a rectangular park is 3:2. If a man cycling along the boundary of the park at the speed of 12 km/hr completes one round in 8 minutes, then the area of the park (in sq. m) is:
 a) 15360 b) 153600 c) 30720 d) 307200
19. Find the costs of carpeting a square room of side 8 meters with carpet at the rate of ₹44 per meter square?
 a) 2816 b) 2832 c) 3264 d) 3248
20. The length of a rope by which a horse must be tethered so that it may be allowed to graze over an area of 784 m^2 is
 a) 18.44 m b) 13.69 m c) 15.8 m d) 22.31 m

Answers

1 - d	2 - c	3 - a	4 - c	5 - d	6 - a	7 - b	8 - a	9 - b	10 - b
11 - b	12 - c	13 - b	14 - d	15 - b	16 - c	17 - a	18 - c	19 - b	20 - a