

CHAPTER 7

MENSURATION (Continued)

SURFACE AREAS AND VOLUMES

KEY POINTS

1. $c = 2\pi r$ where $c \rightarrow$ circumference of the circle π be taken as $22/7$ or 3.14 (app.) and ' r ' be the radius of the circle.
2. Area of circle $= \pi r^2$ where ' r ' is the radius of the circle.
3. Area of Semi circle $= \frac{\pi r^2}{2}$.
4. Area enclosed by two concentric circles

$$= \pi (R^2 - r^2)$$

$$= \pi (R + r) (R - r); R > r$$

where ' R ' and ' r ' are radii of two concentric circles.

5. The arc length ' l ' of a sector of angle ' θ ' in a circle of radius ' r ' is given by

$$l = \frac{\theta}{360^\circ} \times (\text{circumference of the circle})$$

$$= \frac{\theta}{360^\circ} \times 2\pi r$$

$$l = \frac{\theta}{180^\circ} \times \pi r$$

6. If the arc subtends an angle θ , then area of the corresponding sector is $\frac{\theta}{360^\circ} \times \pi r^2$.

7. Angle described by minute hand in 60 minutes = 360° . Angle described by minute hand in 1 minute = $\left(\frac{360^\circ}{60}\right) = 6^\circ$.
8. Total Surface area of cube of side a units = $6a^2$ units.
9. Volume of cube of side a units = a^3 cubic units.
10. Total surface area of cuboid of dimensions l , b and $h = 2(l \times b + b \times h + h \times l)$ square units.
11. Volume of cuboid of dimensions l , b and $h = l \times b \times h$ cubic units.
12. Curved surface area of cylinder of radius r and height $h = 2\pi rh$ square units.
13. Total surface area of cylinder of radius r and height $h = 2\pi r (r + h)$ square units.
14. Volume of cylinder of radius r and height $h = \pi r^2 h$ cubic units.
15. Curved surface area of cone of radius r height h and slant height $l = \pi rl$ square units where $l = \sqrt{r^2 + h^2}$.
16. Total surface area of cone = $\pi r (l + r)$ sq. units.
17. Volume of cone = $\frac{1}{3} \pi r^2 h$ units.
18. Total curved surface area of sphere of radius r units = $4\pi r^2$ sq. units.
19. Curved surface area of hemisphere of radius r units = $2\pi r^2$ sq. units.
20. Total surface area of hemisphere of radius r units = $3\pi r^2$ sq. units.
21. Volume of sphere of radius r units = $\frac{4}{3} \pi r^3$ cubic units.
22. Volume of hemisphere of radius r units = $\frac{2}{3} \pi r^3$ cubic units.
23. Curved surface of frustum = $\pi l (r + R)$ sq. units, where l slant height of frustum and radii of circular ends are r and R .

24. Total surface area of frustum = $\pi l (r + R) + \pi(r^2 + R^2)$ sq. units.

25. Volume of Frustum = $\frac{1}{3} \pi h (r^2 + R^2 + rR)$ cubic units.

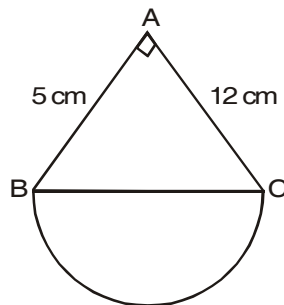
MULTIPLE CHOICE QUESTIONS

- Find the area of circle whose diameter is 'd'
 - $2pd$
 - $\frac{\pi d^2}{4}$
 - $p.d$
 - pd^2
- If the circumference and area of a circle are numerically equal then what is the radius of the circle equal to
 - $r = 1$
 - $r = 7$
 - $r = 2$
 - $r = c$
- The radius of a circle is 7 cm. What is the perimeter of the semi circle?
 - 36 cm
 - 14 cm
 - 7p
 - 14p
- The radius of two circles are 13 cm and 6 cm respectively. What is the radius of the circle which has circumference equal to the sum of the circumference of two circles?
 - 19p
 - 19 cm
 - 25 cm
 - 32 cm
- The circumference of two circles are in the ratio 4 : 5 what is the ratio of the areas of these circles.
 - 4 : 5
 - 16 : 25
 - 64 : 125
 - 8 : 10
- The area of an equilateral triangle is $\sqrt{3} \text{ m}^2$ its one side is
 - 4 m
 - $3\sqrt{3} \text{ m}$
 - $\frac{3\sqrt{3}}{4} \text{ m}$
 - 2 m

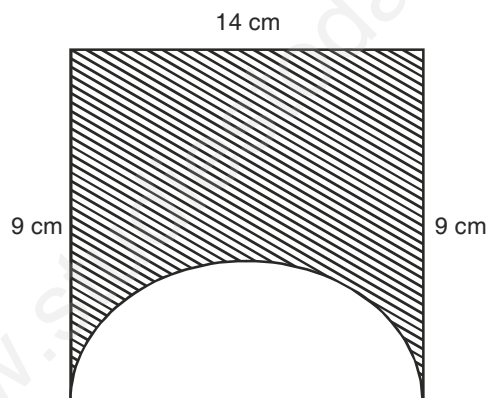
7. The volume of a cuboid is 440 cm^3 . The area of its base is 66 cm^2 . What is its height?
- (a) $\frac{40}{3} \text{ cm}$ (b) $\frac{20}{3} \text{ cm}$
(c) 440 cm (d) 66 cm
8. Volume of two cubes is in the ratio of $8 : 125$. The ratio of their surface areas is
- (a) $8 : 125$ (b) $2 : 5$
(c) $4 : 25$ (d) $16 : 25$
9. If the perimeter of a sector is 'l' and radius is 'r' then the area of the sector is
- (a) $l \cdot r$ (b) $l \cdot r^2$
(c) $\frac{lr^2}{2}$ (d) $l^2 \cdot r$
10. An arc of a circle is of length $5\pi \text{ cm}$ and the section it bounds has an area of $10\pi \text{ cm}^2$. Then the radius of circle is :
- (a) 2 cm (b) 4 cm
(c) $2\sqrt{2} \text{ cm}$ (d) 8 cm
11. Three cubes each of side 'a' are joined from end to end to form a cuboid. The volume of the new cuboids :
- (a) a^2 (b) $3a^3$
(c) a^3 (d) $6a^3$
12. A wire is in the form of a circle of radius 7 cm . It is bent into a square the area of the square is :
- (a) 11 cm^2 (b) 121 cm^2
(c) 154 cm^2 (d) 44 cm^2

SHORT ANSWER TYPE QUESTIONS

13. The volume and surface area of a sphere are numerically equal. Find the radius of the sphere.
14. Find the perimeter of the figure in which a semicircle is drawn on BC as diameter. $\angle BAC = 90^\circ$.

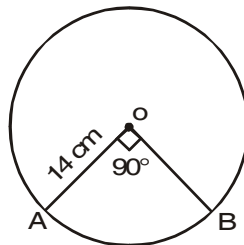


15. Find the area of shaded region in the figure.

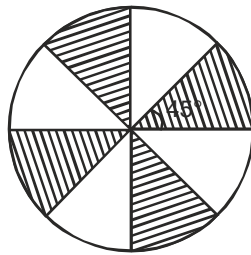


16. The numerical difference between circumference and diameter is 30 cm. What is the radius of the circle?
17. What is the perimeter of a sector of angle 45° of a circle with radius 7 cm.
18. From each vertex of trapezium a sector of radius 7 cm has been cut off. Write the total area cut off.
19. Write the ratio of the areas of two sectors having angles 120° and 90° .
20. How many cubes of side 4 cm can be cut from a cuboid measuring $(16 \times 12 \times 8)$.

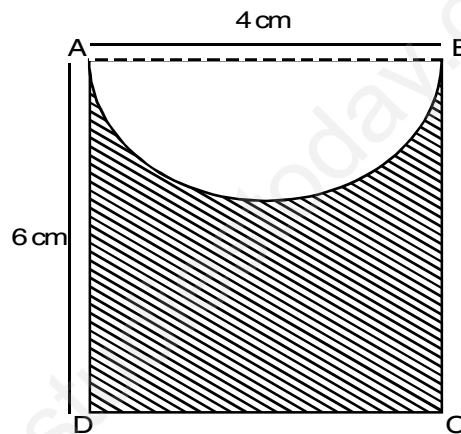
21. The diameter and height of a cylinder and a cone are equal. What is the ratio of their volume.
22. A cylinder, a cone and a hemisphere are of equal base and have the same height. What is the ratio in their volumes?
23. A bicycle wheel makes 5000 revolutions in moving 10 km. Write the perimeter of wheel.
24. The sum of the radius of the base and the height of a solid cylinder is 15 cm. If total surface area is 660 cm^2 . Write the radius of the base of cylinder.
25. Find the height of largest right circular cone that can be cut out of a cube whose volume is 729 cm^3 .
26. What is the ratio of the areas of a circle and an equilateral triangle whose diameter and a side of triangle are equal.
27. If the circumference of the circle exceeds its diameter by 30 cm. What is the diameter of the circle
28. The length of an arc of a circle of radius 12 cm is 10π cm. Write the angle measure of this arc.
29. The cost of fencing a circular field at the rate of Rs. 10 per meter is Rs. 440. What is the radius of the circular field?
30. Find the perimeter of the protactor if its diameter is 14 cm.
31. A path of 5 m is build round the circular park of radius 15m. Find the area of the path.
32. The radii of two circles are 4 cm and 3 cm respectively. Find the radius of a circle having area equal to the sum of the areas of the circles.
33. In the figure find length of arc AB if 'O' is the centre of the circle and radius is 14 cm. $\left(\pi = \frac{22}{7}\right)$



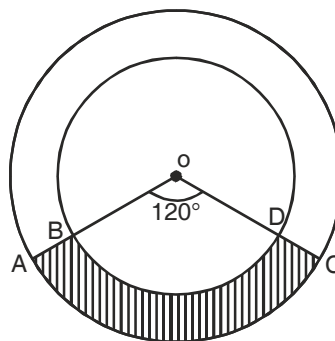
34. ABC is an equilateral triangle of side 30m. A Cow is tied at vertex A by means of 10m long rope. What is the area the Cow can graze in?
35. Find the area of the four blades of same size of radius 20 cm and central angle 45° of a circular fan.



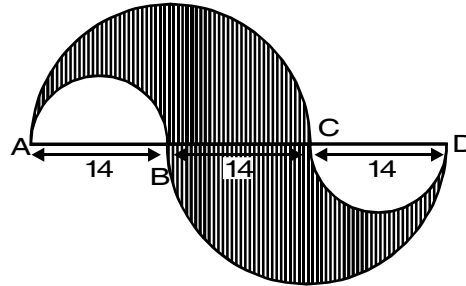
36. Find the perimeter of the shaded region.



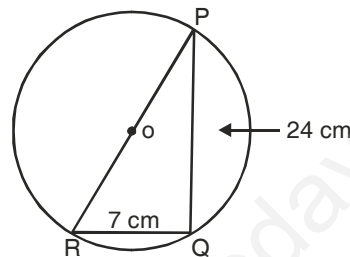
37. Two concentric circle with centre 'O' and radius 7 cm and 14 cm. If $\angle AOC = 120^\circ$ what is the area of shaded region?



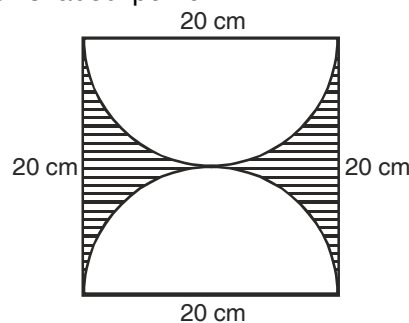
38. Find the perimeter of the shaded portion.



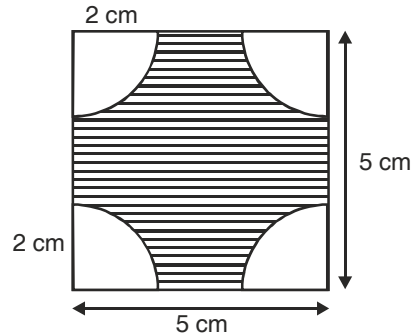
39. Find the circumference of the circle with centre 'O'.



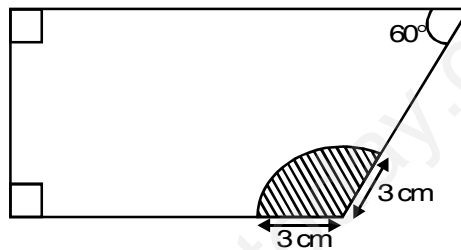
40. The radius of two circles are in the ratio 3 : 4 and sum of the areas of two circles is equal to the area of third circle. What is the radius of third circle. If the radius of first is 6 cm.
41. What is the area of the largest triangle that can be inscribed in a semicircle of radius r cm.
42. A piece of wire 20 cm long is bent into an arc of a circle subtending an angle of 60° at the centre then what is the radius of the circle?
43. The minute hand of a clock is $\sqrt{12}$ cm long. What is the area described by the minute hand between 8.00 a.m to 8.05 a.m.?
44. Find the area of shaded portion.



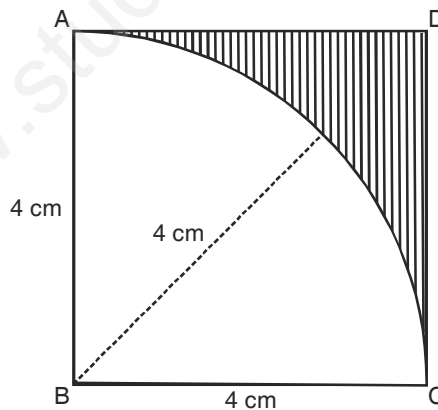
45. Find the area of shaded portion.



46. In the figure find the area of sector.



47. ABCD is a square kite of side 4 cm. What is the area of the shaded portion.



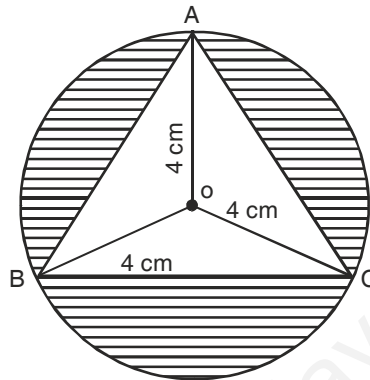
48. The volume of cube is $8a^3$. Find its surface area.
49. The length of a diagonal of a cube is 17.32 cm. Find the volume of cube (use $\sqrt{3} = 1.732$).

50. Three cubes of the same metal, whose edges are 6, 8, 10 cm are melted and formed into a single cube. Find the diagonal of the single cube.

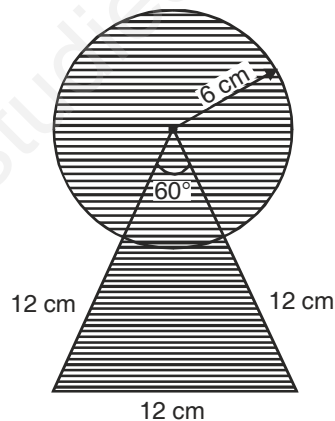
LONG ANSWER TYPE QUESTIONS

51. The height of frustum is 4 cm and the radii of two bases are 3 cm and 6 cm respectively. Find the slant height of the frustum.
52. Volume of right circular cylinder is 448π cm³ height of cylinder is 7cm. Find the radius.
53. If lateral surface area of a cube is 64 cm². What is its edge?
54. The area of a rhombus is 24 cm² and one of its diagonal is 8 cm. What is other diagonal of the rhombus?
55. What is the length of the largest rod that can be put in a box of inner dimensions 30cm, 24 cm and 18 cm?
56. Curved surface area of a cylinder is 16π cm², radius is 4cm, then find its height.
57. 50 circular plates each of equal radius of 7 cm are placed one over the other to form a cylinder. Find the height and volume of the cylinder if thickness of plate is $\frac{1}{2}$ cm.
58. A well of diameter 2m is dug 14 m deep. Find the volume of the earth dug out.
59. A largest sphere is carved out of a cube of side 7 cm. Find the radius.
60. If the semi vertical angle of a cone of height 3 cm is 60°. Find its volume.
61. Find the edge of cube if volume of the cube is equal to the volume of cuboid of dimensions (8 × 4 × 2) cm.
62. Find the volume of cone of height 2h and radius r.
63. Is it possible to have a right circular cylinder closed at both ends, whose flat area is equal to its total curve surface.
64. In a shower, there is 5 cm rain falls. Find in cubic meter the volume of water that falls on 2 hectares of ground. (1 hectare = 10000 m²).

65. A boiler is in the form of a cylinder 2m long with hemispherical ends each of 2m diameter. Find the volume of the boiler.
66. In figure, $\triangle ABC$ is equilateral triangle. The radius of the circle is 4 cm. Find the area of shaded portion.

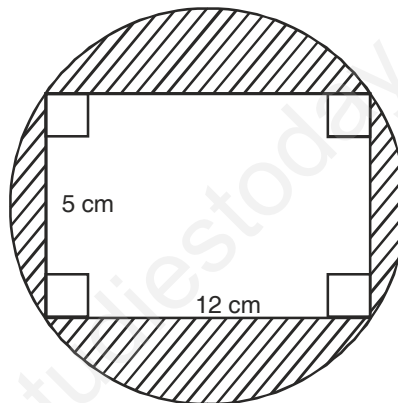


67. Find the area of Shaded portion.

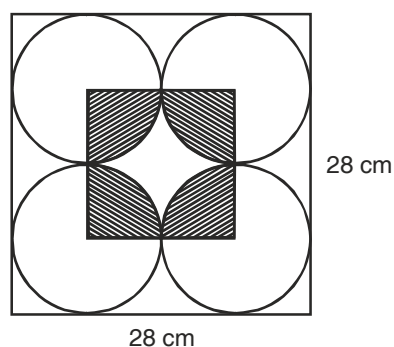


68. Four Cows are tied with a rope of 7 cm at four corners of a quadrilateral field of unequal sides. Find the total area grazed.
69. A solid consists of a right circular cylinder with a right circular cone at the top. The height of cone is 'h' cm. The total volume of the solid is 3 times the volume of the cone. Find the height of the cylinder.

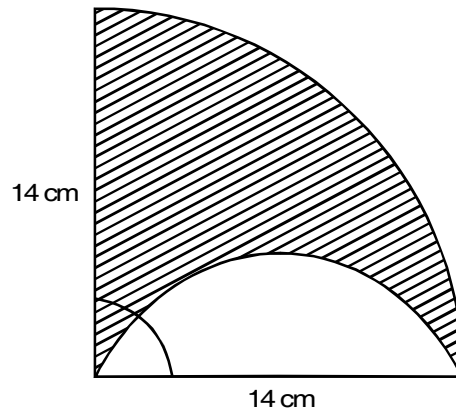
70. A cylindrical vessel of 36 cm height and 18 cm radius of the base is filled with sand. The sand is emptied on the ground and a conical heap of sand is formed. The height of conical heap is 27 cm. Find the radius of base of sand.
71. The radii of circular ends of bucket are 5.5 cm and 15.5 cm and its height is 24 cm. Find the surface area of bucket.
72. Water flows out through a circular pipe whose internal diameter is 2 cm at the rate of 6m/sec. into a cylindrical tank. If radius of base of the tank is 60 cm. How much will the level of the water rise in half an hour?
73. In the figure along side. Find the area of the Shaded portion.



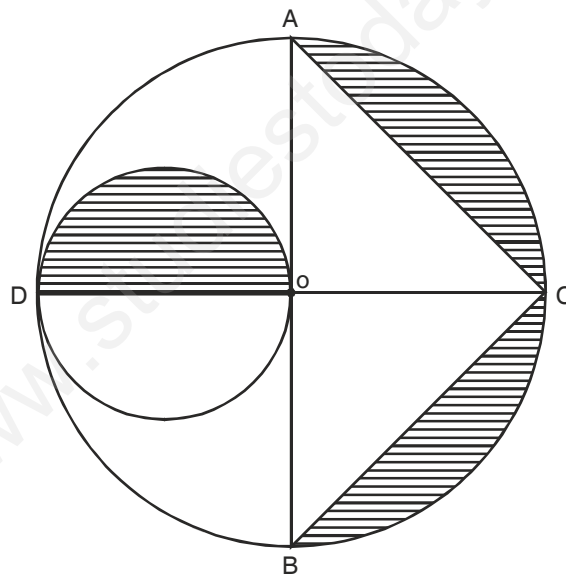
74. Find the shaded area.



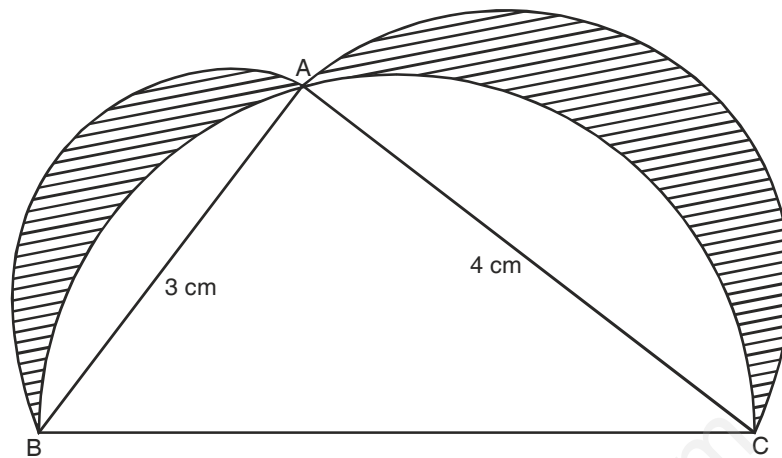
75. Find the shaded area, in the figure.



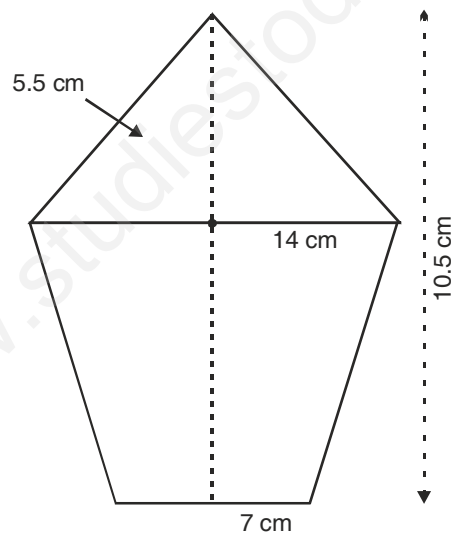
76. AB and CD are two perpendicular diameters and $CD = 8$ cm find the area of Shaded portion.



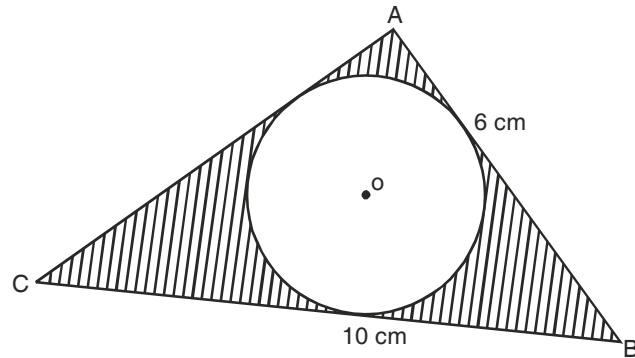
77. In the adjoining figure ABC is a right angled triangle, right angled at A. Semi circles are drawn on AB, AC and BC as diameters. Find the area of shaded portion.



78. A toy is in the form of a cone mounted on a cone frustum. If the radius of the top and bottom are 14 cm and 7 cm and the height of cone and toy are 5.5 cm and 10.5 cm respectively. Find the volume of toy adj. fig.



79. In the adjoining figure, ABC is a right angled triangle at A. Find the area of Shaded region if $AB = 6$ cm, $BC = 10$ cm and O is the centre of the incircle of $\triangle ABC$ (take $\pi = 3.14$).



ANSWERS

- | | |
|-----------------------|-------------------------|
| 1. b | 2. c |
| 3. a | 4. b |
| 5. b | 6. d |
| 7. b | 8. c |
| 9. c | 10. b |
| 11. b | 12. b |
| 13. 3 units | 14. $37\frac{3}{7}$ cm. |
| 15. 49 cm^2 | 16. 14 cm |
| 17. 19.5 cm | 18. 154 cm^2 |
| 19. 4 : 3 | 20. 24 |
| 21. 3 : 1 | 22. 3 : 1 : 2 |
| 23. 2 m | 24. 7 cm |
| 25. 27 cm | 26. $\pi : \sqrt{3}$ |
| 27. 14 cm | 28. 150° |

- | | |
|---|---|
| 29. 7 m | 30. 36 cm |
| 31. 550 m ² | 32. 5 cm |
| 33. 22 cm | 34. $\frac{50}{3} \pi \text{m}^2$ |
| 35. 200 π | 36. (16 + π) cm |
| 37. 154 cm ² | 38. 42 π |
| 39. 25 π | 40. 10 cm |
| 41. r ² | 42. $\frac{60}{\pi} \text{cm}$ |
| 43. π cm | 44. 86 cm ² |
| 45. (25 - 4 π) cm ² | 46. 3 π cm ² |
| 47. (16 - 4 π) cm ² | 48. 24 a ² |
| 49. 1000 cm ³ | 50. 12 $\sqrt{3}$ cm |
| 51. 5 cm | 52. 8 cm |
| 53. 4 cm | 54. 6 cm |
| 55. 30 $\sqrt{2}$ cm | 56. 2 cm |
| 57. 25 cm; 3850 cm ³ | 58. 44 m ³ |
| 59. 3.5 cm | 60. 27 π |
| 61. 4 cm | 62. $\frac{2}{3} \pi \cdot r^2 \cdot h$ |
| 63. Yes, when r = h | 64. 1000 m ³ |
| 65. 10 $\frac{10}{21}$ cm ² | 66. 29.46 cm ³ |
| 67. $\left(\frac{660}{7} + 36\sqrt{3} \right) \text{cm}^2$ | 68. 154 cm ² |

69. $\frac{2}{3}h$.

70. 36 cm

71. 1716 cm^2

72. 3 m

73. $\frac{1019}{14} \text{ cm}^2$

74. 154 m^2

75. 77 cm^2

76. $\frac{108}{7} \text{ cm}^2$

77. 6 cm^2

78. 2926 cm^3

79. 11.44 cm^2 .

[Hint : Join O to A, B and C.

area of $\triangle ABC$ = area of $\triangle OAB$ + area of $\triangle OBC$ + area of $\triangle OAC$

$$= \frac{1}{2} AB \times r + \frac{1}{2} \times BC \times r + \frac{1}{2} AC \times r$$

$$\Rightarrow (r = 2 \text{ cm})]$$