Mensuration

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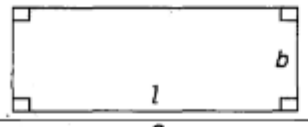
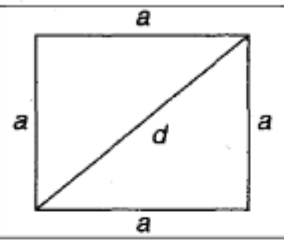
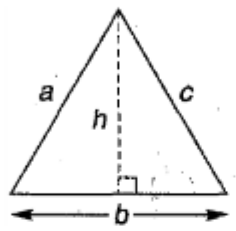
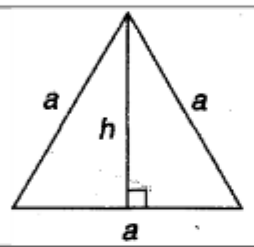
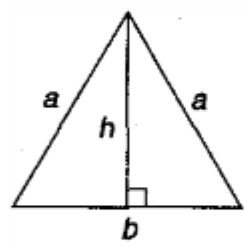
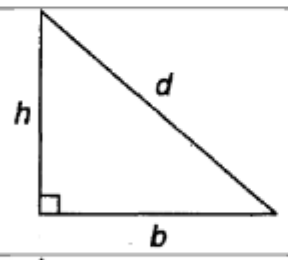
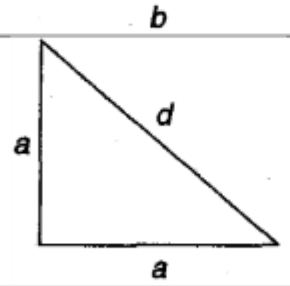
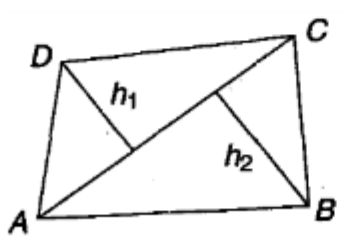
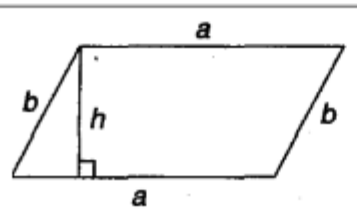
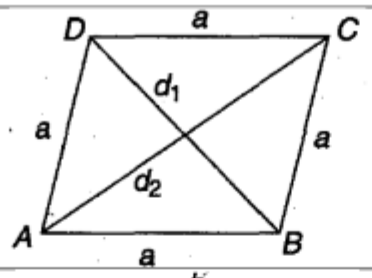
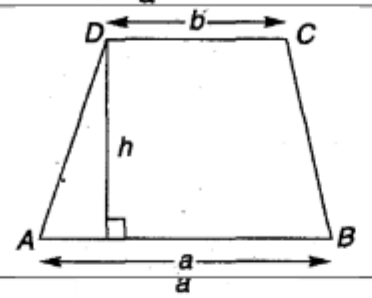
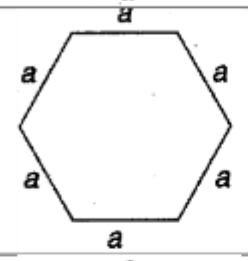
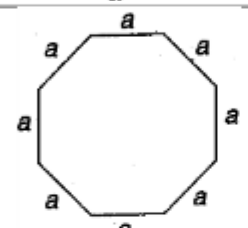
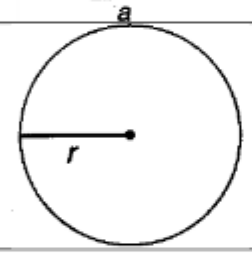
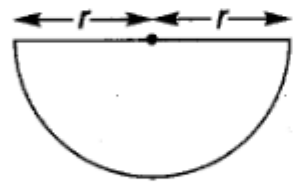
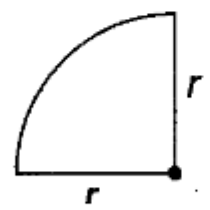
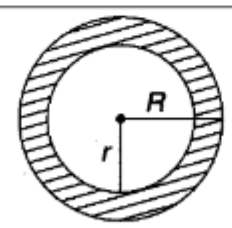
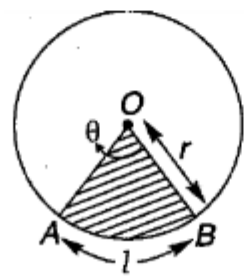
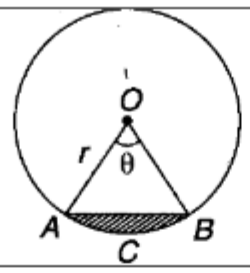
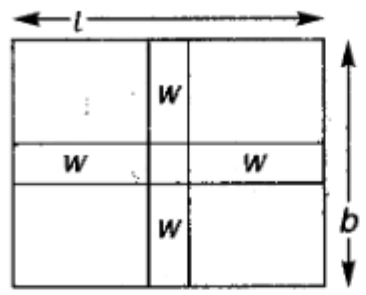
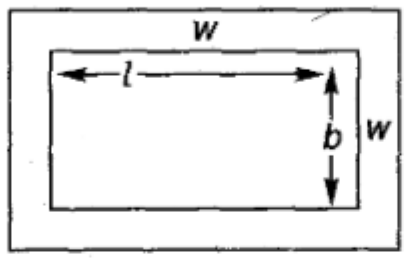
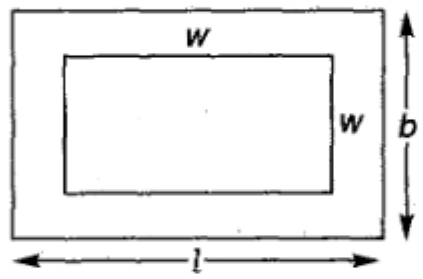
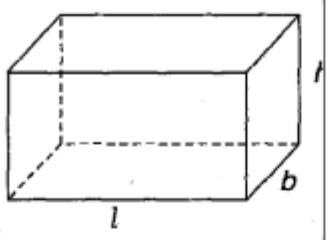
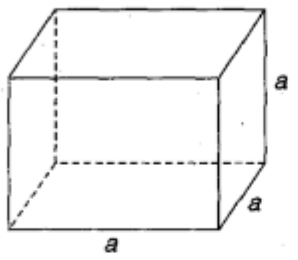
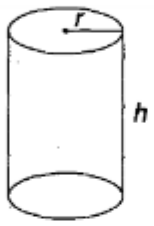
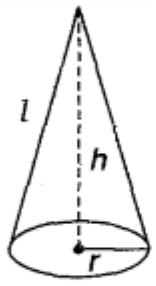
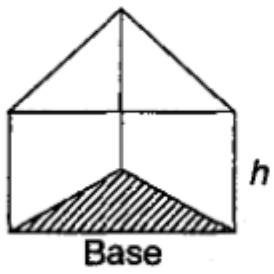
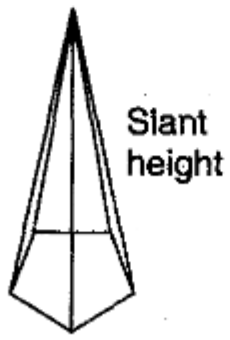
Mensuration

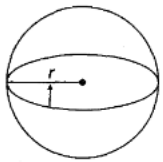
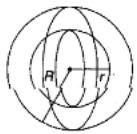
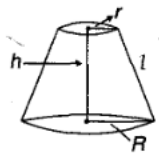
S. No	Name	Figure	Nomenclature	Area	Perimeter
1.	Rectangle		$l \rightarrow length$ $b \rightarrow breadth$	$l \times b = lb$	$2l + 2b$ $= 2(l + b)$
2.	Square		$a \rightarrow side$ $d \rightarrow diagonal$ $d = a\sqrt{2}$	$(i)\ a \times a = a^2$ $(ii)\ \frac{d^2}{2}$	$a + a + a + a$ $= 4a$
3.	Triangle (Scalene)		a, b and c three sides of triangle and s the semi perimeter, where $s = \left(\frac{a+b+c}{2}\right)$ b is the base and h is the altitude of triangle	$(i)\frac{1}{2} \times b \times h$ $(ii)\ \sqrt{s(s-a)(s-b)(s-c)}$ (Hero's formula)	$a + b + c = 2s$
4.	Equilateral triangle		$a \rightarrow side$ $h \rightarrow height\ or\ altidue$ $h = \frac{\sqrt{3}}{2}a$	$(i)\frac{1}{2} \times a \times h$ $(ii)\frac{\sqrt{3}}{4}\ a^2$	$3a$
5.	Isosceles triangle		$a \rightarrow equal\ sides$ $b \rightarrow base$ $h \rightarrow height\ or\ altitude$ $h = \frac{\sqrt{4a^2 - b^2}}{2}$	$(i)\ \frac{1}{2} \times b \times h$ $(ii)\ \frac{1}{4} \times b \times \sqrt{4a^2 - b^2}$	$2a + b$
6.	Right angled triangle		$b \rightarrow base$ $h \rightarrow altitude/height$ $d \rightarrow diagonal$ $d = \sqrt{b^2 + h^2}$	$\frac{1}{2} \times b \times h$	$b + h + d$
7.	Isosceles right angled triangle		$a \rightarrow equal\ sides$ $d \rightarrow diagonal$ $d = a\sqrt{2}$	$\frac{1}{2}a^2$	$2a + d$
8.	Quadrilateral		AC is the diagonal and h_1, h_2 are the altitudes on AC from the vertices D and B respectively	$\frac{1}{2} \times AC \times (h_1 + h_2)$	$AB + BC + CD$ $+ AD$
9.	Parallelogram		a and b are sides adjacent to each other. $h \rightarrow$ distance between the	$a \times h$	$2(a + b)$

			parallel sides		
10.	Rhombus		$a \rightarrow$ each equal side of rhombus d_1 *and* d_2 are the diagonals $d_1 \rightarrow BD$ $d_2 \rightarrow AC$	$\frac{1}{2} \times d_1 \times d_2$	$4a$
11.	Trapezium		a *and* b are parallel sides to each other and h is the perpendicular distance between parallel sides	$\left(\frac{a+b}{2}\right) \times h$	$AB + BC + CD + AD$
12.	Regular hexagon		$a \rightarrow$ each of the equal side	$\frac{3\sqrt{3}}{2}a^2$	$6a$
13.	Regular octagon		$a \rightarrow$ each of equal side	$2a^2(1+\sqrt{2})$	$8a$
14.	Circle		$r \rightarrow$ radius of the circle $\pi = \frac{22}{7}$ $= 3.1416\ (approx)$	πr^2	$2\pi r$ (called as circumference)
15.	Semicircle		$r \rightarrow$ radius of the circle	$\frac{1}{2}\pi r^2$	$\pi r + 2r$
16.	Quadrant		$r \rightarrow$ radius	$\frac{1}{4}\pi r^2$	$\frac{1}{2}\pi r + 2r$
17.	Ring or circular path (shaded region)		$R \rightarrow$ outer radius $r \rightarrow$ inner radius	$\pi(R^2 - r^2)$	$(outer) \rightarrow 2\pi R$ $(inner) \rightarrow 2\pi r$
18.	Sector of a circle		$O \rightarrow$ centre of the circle $r \rightarrow$ radius $l \rightarrow$ length of the arc $\theta \rightarrow$ angle of the sector $l = 2\pi r\left(\frac{\theta}{360°}\right)$	$(i)\ \pi r^2\left(\frac{\theta}{360°}\right)$ $(ii)\ \frac{1}{2}r \times l$	$l + 2r$

19.	Segment of a circle		$\theta \rightarrow$ angle of the sector $r \rightarrow$ radius $AB \rightarrow$ chord $ACB \rightarrow$ arc of the circle	Area of segment ACB (minor segment) $= r^2\left(\frac{\pi\theta}{360°} - \frac{sin\theta}{2}\right)$	$2r\left[\frac{\pi\theta}{360°} + \sin\left(\frac{\theta}{2}\right)\right]$
20.	Pathways running across the middle of a rectangle		$l \rightarrow length$ $b \rightarrow breadth$ $w \rightarrow$width of the path (road)	$(l + b - w)w$	$2(l + b) - 4w = 2[l + b - 2w]$
21.	Outer pathways		$l \rightarrow length$ $b \rightarrow breadth$ $w \rightarrow$widthness of the path	$(l + b + 2w)2w$	$(inner) \rightarrow 2(l + b)$ $(outer) \rightarrow 2(l + b + 4w)$
22.	Inner path		$l \rightarrow length$ $b \rightarrow breadth$ $w \rightarrow$widthness of the path	$(l + b - 2w)2w$	$(inner) \rightarrow 2(l + b)$ $(outer) \rightarrow 2(l + b - 4w)$

Solids

S. No	Name	Figure	Nomenclature	Volume	Curved/Lateral Surface area	Total surface Area
1.	Cuboid		$l \rightarrow$ length $b \rightarrow$ breadth $h \rightarrow$ height	lbh	$2(l+b)h$	$2(lb+bh+hl)$
2.	Cube		$a \rightarrow$ edge/side	a^3	$4a^2$	$6a^2$
3.	Right circular cylinder		$r \rightarrow$ radius of base $h \rightarrow$ height of the cylinder	$\pi r^2 h$	$2\pi rh$	$2\pi r(h+r)$
4.	Right circular cone		$r \rightarrow$ radius $h \rightarrow$ height $l \rightarrow$ slant height $l = \sqrt{r^2+h^2}$	$\frac{1}{3}\pi r^2 h$	πrl	$\pi r(l+r)$
5.	Right triangular prism		–	*area of base* × *height*	*perimeter of base* × *height*	*lateral surface area* + 2 (*area of base*)
6.	Right pyramid		–	$\frac{1}{3}$ × area of the base × height	$\frac{1}{2}$ × perimeter of the base × slant height	Lateral surface area + area of the base

7.	Sphere		$r \rightarrow$ radius	$\frac{4}{3}\pi r^3$	–	$4\pi r^2$
8.	Hemisphere		$r \rightarrow$ radius	$\frac{2}{3}\pi r^3$	$2\pi r^2$	$3\pi r^2$
9.	Spherical Shell		$r \rightarrow$ inner radius $R \rightarrow$outer radius	$\frac{4}{3}\pi[R^3 - r^3]$	–	$4\pi[R^2 + r^2]$
10.	Frustum of a cone		–	$\frac{\pi}{3}h(r^2 + Rr + R^2)$	$\pi(r + R)l$	Lateral surface area $+ \pi[R^2 + r^2]$

Mensuration

Exercise – 01

1. A rectangular field has its length and breadth in the ratio of 16 : 9. If its perimeter is 750 cm. What is its area?
   (a) 7500cm² (b) 32400cm² (c) 14400cm² (d) 14000cm²

2. A rectangular field costs Rs. 110 for levelling at 50 paise per square metre. If the ratio of length : breadth is 11 : 5. Find the length of the field :
   (a) 16 m (b) 21 m (c) 22 m (d) none of these

3. Find the cost of paving a courtyard 316.8 m x 65 m with stones measuring 1.3 m x 1.1 m at Rs. 0.5 per stone :
   (a) Rs. 1440 (b) Rs. 7200 (c) Rs. 72,000 (d) none of these

4. If the length of a rectangular field is doubled and its breadth is halved *(i.e.,* reduced by 50%). What is percentage change in its area?
   (a) 0% (b) 10% (c) 25% (d) 33.33%

5. The expenses of carpeting a half of the floor were Rs. 759, but if the length had been 6 m less than it was, the expenses would have been Rs. 561. What is the length?
   (a) 21 m (b) 23 m (c) 45 m (d) 27 m

6. If a roll of paper 1 km long has area 1/25 hectare, how wide is the paper?
   (a) 4 m (b) 40 cm (c) 40 cm (d) 25 cm

7. If requires 90 g paint for painting a door 12 cm x 9 cm, how much paint is required for painting a similar door 4 cm x 3 cm?

(a) 30 g (b) 27 g (c) 10 g (d) 45 g

8. The number of square shaped tin sheets of side 25 cm that can be cut off from a square tin sheet of side 1 m, is:
(a) 4 (b) 40 (c) 16 (d) 400

9. The length of a rectangle is 2 cm more than its breadth. The perimeter is 48 cm. The area of the rectangle (in cm^2) is :
(a) 96 (b) 128 (c) 143 (d) 144

10. If the length of diagonal 60 of a square *ABCD* is 4.8 cm, the area of the square *ABCD* is :
(a) $9.6cm^2$ (b) $11.52cm^2$ (c) $12.52cm^2$ (d) $5.76cm^2$

11. The ratio of the area of a square to that of the square drawn on its diagonal is :
(a) 1 : 1 (b) 1 : 2 (c) 1 : 3 (d) 1 : 4

12. What is the area of the triangle whose sides are 84 m, 80 m and 52 m?
(a) 1620 sq. m (b) 2016 sq. m (c) 1818 sq. m (d) none of these

13. The sides of a triangle are 25 m, 39 m and 56 m respectively. Find the perpendicular distance from the vertex opposite to the side 56 m.
(a) 15 m (b) 16.5 m (c) 18.6 m (d) 21 m

14. A ladder is resting with one end in contact with the top of a wall of height 60 m and the other end on the ground is at a distance of 11 m from .the wall. The length of the ladder is :
(a) 61 m (b) 71 m (c) 87 m (d) none of these

15. If every side of a triangle is doubled, then -crease r area of the triangle is :
(a) 200% (b) 300% (c) 400% (d) none of these

16. If the altitude of an equilateral triangle is $2\sqrt{3}$, then its area is:
(a) $4\sqrt{3}\ cm^2$ (b) $12\sqrt{3}cm^2$ (c) $\frac{8}{\sqrt{3}}cm^2$ (d) None of these

17. The two adjacent sides of a parallelogram are 25 cm and 40 cm respectively. The altitude drawn on the longer side is 18 cm, then the area of the parallelogram is:
(a) $450cm^2$ (b) $720cm^2$ (c) 500 cm^2 (d) none of these

18. If the perimeter of a rhombus is 4p and lengths of ::s diagonals are a and b, then its area is :
(a) $\frac{a}{b}$ (b) $\frac{ab}{2}$ (c) ab/p (d) $p(a^2 + b^2)$

19. The ratio of the lengths of the diagonal of a rhombus is 2 : 5. Then, the ratio of the area of the rhombus to the square of the shorter diagonal:
(a) 5 : 4 (b) 5 : 2 (c) 2 : 5 (d) none of these

20. *ABCD* is a trapezium in which $AB||CD$ and $AB = 2CD$. If its diagonals intersect each other at 0, then ratio of areas of triangles *AOB* and COD is :
(a) 1 : 4 (b) 1 : 2 (c) 4 : 1 (d) 2 : 1

21. The cross-section of a canal is in the shape of a trapezium and the area of cross-section is 360 m^2. If the canal is 12 m wide at the top and 8 m wide at the bottom the depth of the canal is :
(a) 36 m (b) 180 m (c) 45 m (d) none of these

22. The area of a hexagon whose one side is 4 m, is
(a) $6\sqrt{3}m^2$ (b) $24\sqrt{3}$ m^2 (c) $42\sqrt{3}$ m^2 (d) 24 m^2

23. If the circumference of a circle is 704 cm, then its area is :
(a) 49324 m^2 (b) 39424 m^2 (c) 3672 cm^2 (d) 39424 cm^2

24. The inner circumference of a circular path around a circular lawn is 440 m. What is the radius of the outer circumference of the path, if the path is 14 m wide?
(a) 96 m (b) 84 m (c) 70 m (d) 88 m

25. The sum of the radius and the circumference of a circle is 51 cm. The area of the circle is :
(a) 151 cm (b) 152 cm (c) 154cm (d) data insufficient

26. The radius of a circle is increased by 2 cm from 5 cm to 7 cm. What is the percentage change in area of the circle?
(a) 96% (b) 35% (c) 70% (d) 74%

27. The area of a circular field is 124.74 hectares. The cost of fencing it at the rate of 80 paise per metre is :
(a) Rs. 3168 (b) Rs. 1584 (c) Rs. 1729 (d) none of these

Exercise – 02

1. The length of a rope by which a buffalo must be tethered so that she may be able to graze a grassy area of 2464sq. m is :
(a) 35 m (b) 27 m (c) 24 m (d) 28 m

2. If a piece of wire 25 cm long is bent into an arc of a circle subtending an angle of 75° at the centre, then the radius of the circle (in cm) is :
(a) $\frac{\pi}{120}$ (b) $\frac{60}{\pi}$ (c) 60π (d) none of these

3. The area of a minor sector subtending the central angle at the centre 40° is 8.25 cm^2. What is the area of the remaining part *(i.e.,* major sector) of the circle?
(a) 82.5 cm^2 (b) 74.25 cm^2 (c) 66 cm^2 (d) none of these

4. A rope by which a calf is tied is decreased from 23 m to 12 m. What is the decrease in area to be grazed by it?
(a) 1110m^2 (b) 1210 m^2 (c) 1120 m^2 (d) 1221 m^2

5. A wire is in the form of a circle of radius 42 m is cut and again bent in the form of a square. What is the diagonal of the square?
(a) 66 m (b) $66\sqrt{3}$ m (c) $66\sqrt{2}$ m (d) none of these

6. If the driving wheel of a bicycle makes 560 revolutions in travelling 1.1 km. Find the diameter of the wheel :
(a) 31.5cm (b) 30.5 cm (c) 62.5cm (d) none of these

7. A cube of metal, each edge of which measures 4 cm, weighs 400 kgs. What is the length of each edge of a cube of the same metal which weighs 3200 kg?
(a) 64 cm (b) 8 cm (c) 2 cm (d) none of these

8. The three co-terminus edges of a rectangular solid are 36 cm, 75 cm and 80 cm respectively. Find the edge of a cube which will be of the same capacity :
(a) 60 cm (b) 52 cm (c) 46 cm (d) none of these

9. A tank 10 m long' and 4 m wide is filled with water. How many litres of water must be drawn off to make the surface sink by 1 m. (1000 L = 1 cubic metre)
(a) 20 kilolitre (b) 40 kilolitre (c) 50 kilolitre (d) none of these

10. A lid of rectangular box of sides 39.5 cm by 9.-35 cm is sealed all around with tape such that there is an overlapping of 3.75 cm of the tape. What is the length of the tape used?
(a) 111.54cm (b) 101.45 cm (c) 110.45cm (d) none of these

11. The edge of a cube is increased by 100%, the surface of the cube is increased by :
(a) 100% (b) 200% (c) 300% (d) 400%

12. The length, breadth and height of box are 2 m, 1.5 m and 80 cm respectively. What would be the cost of canvas to cover it up fully, if one square metre of canvas costs Rs. 25.00?
(a) Rs. 260 (b) Rs. 290 (c) Rs. 285 (d) none of these

13. A room is 36 m long, 12 m wide and 10 m high. It has 6 windows, each 3 m x 2.5 m; one door 9.5 m x 6 m and one fire chimney 4 m x 4.5 m. Find the expenditure of papering its walls at the rate of 70 paise per metre, if the width of the paper is 1.2 m :
(a) Rs. 490 (b) Rs. 690 (c) Rs. 1000 (d) none of these

14. When each side of a cube is increased by 2 cm, the volume is increased by 1016 cm^3. Find the side of the cube. If each side of it is decreased by 2 cm, by how much will the volume decrease?
(a) 12 cm, 729 cm^3 (b) 8 cm, 512 cm^3 (c) 9 cm, 729 cm^3 (d) 12 cm, 728 cm^3

15. Three equal cubes are placed adjacently in a row. Find the ratio of the total surface area of the resulting cuboid to that of the sum of the total surface areas of the three cubes :
(a) 5 : 7 (b) 7 : 9 (c) 9 : 7 (d) none of these

16. A hollow square shaped tube open at both ends is made of iron. The internal square is of 5 cm side and the length of the tube is 8 cm. There are 192cm^3 of iron in the tube. Find its thickness:
(a) 2 cm (b) 0.5 cm (c) 1 cm (d) can't be determined

17. The length of longest pole that can be placed on the floor of a room is *12* m and the length of longest pole that can be placed in the room is 15 m. The height of the room is:
(a) 3m (b) 6 m (c) 9 m (d) none of these

18. The sum of length, breadth and depth of a cuboid is 12 cm and its diagonal is $5\sqrt{2}$ cm. Its surface area is:
(a) 152cm^2 (b) 94cm^2 (c) 108cm^2 (d) $60\sqrt{2}cm^2$

19. The volume of a wall, 3 times as high as it is broad and 8 times as long as it is high, is 36.864 m^3. The height of the wall is:
(a) 1.8m (b) 2.4m (c) 4.2 m (d) none of these

20. Find the height of the cylinder whose volume is 511 m^3 and the area of the base is 36.5 m^2 :
(a) 7 m (b) 10.5 m (c) 14 m (d) none of these

21. The lateral surface area of a cylinder is 1056 cm^2 and its height is 16 cm. What is its volume?
(a) 5566 cm^3 (b) 4455 cm^3 (c) 5544 cm^3 (d) none of these

22. The amount of concrete required to build a cylindrical pillar whose base has a perimeter of 8.8 m and whose curved surface area is 17.6 m^2 :
(a) 12.32m^3 (b) 12.23m^3 (c) 9.235 m^3 (d) 8.88 m^3

23. A right circular cylindrical tunnel of diameter 4 m and length 10 m is to be constructed from a sheet of iron. The area of the iron sheet required:
(a) $\frac{280}{\pi}$ (b) 40π (c) $80\,\pi$ (d) none of these

24. The ratio between curved surface area and total surface area is 2 : 3. If the total surface area be 924 cm^2, find the volume of the cylinder :
(a) 2156cm^3 (b) 1256cm^3 (c) 1265cm^3 (d) none of these

25. If the curved surface area of a cylinder is 1320 cm^2 and its base radius is 21 cm, then its total surface area is:
(a) 4092 cm^2 (b) 2409 cm^2 (c) 4920 cm^2 (d) none of these

26. The ratio between the radius of the base and the height of a cylindrical pillar is 3 : 4. If its volume is 4851 m^3, the curved surface area of the pillar is :
(a) 924m^2 (b) 1617m^2 (c) 425 m^2 (d) none of these

27. The radius of an-if on rod decreased to one-fourth. If its volume remains constant, the length will become:
(a) 2 times (b) 8 times (c) 4 times (d) 16 times

Exercise – 03

1. The total surface area of the cylinder is 2640m^2 and the sum of height and radius of base of cylinder is 30 m. What is the ratio of height and radius of the cylinder?
(a) 7 : 9 (b) 9 : 7 (c) 8 : 7 (d) 3 : 7

2. The ratio of heights of two cylinders is 3 : 2 and the ratio of their radii is 6 : 7. What is the ratio of their curved surface areas?
(a) 9 : 7 (b) 1 : 1 (c) 7 : 9 (d) 7 : 4

3. A conical vessel has a capacity of 15 L of milk. Its height is 50 cm and base radius is 25 cm. How much milk can be contained in a vessel in cylindrical form having the same dimensions as that of the cone?
(a) 15 L (b) 30 L (c) 45 L (d) none of these

4. The radius and height of a right circular cone are in the ratio of 5 :12. If its volume is $314\frac{2}{7}$ m^3, its Slant height is :
(a) 26 m (b) 19.5 m (c) 13m (d) none of them

5. The circumference of the base of a right circular cone is 220 cm^3 and its height 84 cm. The curved surface area of the cone is
(a) 20020 cm^2 (b) 2020 cm^2 (c) 2200cm^2 (d) 10010cm^2

6. The radii of two cones are equal and their slant heights are in the ratio 3 : 2. If the curved surface area of the. smaller cone is 300 cm^2, then the curved surface area of the bigger cone (in cm^2) is :
(a) 250 (b) 450 (c) 150 (d) 200

7. If the diameter of the base of right circular cone is equal to 8 cm and its slant height is 5 cm, then the area of its axial section is :
(a) 9cm^2 (b) 12cm^2 (c) 20 cm^2 (d) 40 cm^2

8. If the radius of the base is doubled, keeping the height constant, what is the ratio of the volume of the larger cone to the smaller cone?
(a) 2 : 1 (b) 3 : 1 (c) 4 : 1 (d) 4 : 3

9. A conical tent has 60° angle at the vertex. The ratio of its radius and slant height is :
(a) 3 : 2 (b) 1 : 2 (c) 1 : 3 (d) can't be determined

10. Water flows at the rate of 5 m per min from a cylindrical pipe 8 mm in diameter. How long will it take to fill up a conical vessel whose radius is 12 cm and depth 35 cm?
(a) 315s (b) 365s (c) 5 min (d) none of these

11. A spherical ball of lead 6 cm in radius is melted and recast into three spherical balls. The radii of two of these balls are 3 cm and 4"cm. What is the radius of the third sphere?
(a) 4.5 cm (b) 5 cm (c) 6 cm (d) 7 cm

12. A hemispherical bowl of internal radius 6 cm contain alcohol. This alcohol is to be filled into cylindrical shaped small bottles of diameter 6 cm and height 1 cm. How many bottles will be needed to empty the bowl?
(a) 36 (b) 27 (c) 16 (d) 4

13. If a hemispherical dome has an inner radius 21 cm then its volume (in m^3) is :
(a) 4910 m^3 (b) 18354 m^3 (c) 19404 m^3 (d) none of these

14. A sphere of radius 9 cm is dropped into a cylindrical vessel partly filled with water. The radius of the vessel is 12 cm. If the sphere is submerged completely, then the surface of the water rises by:
(a) 27.5 cm (b) 27 cm (c) 12 cm (d) 6.75 cm

15. If the height of a cone is half the radius of a sphere then the radius of the base of the cone, which has the same volume as a sphere of radius 7 cm is :
(a) 14 m (b) $\frac{14}{\sqrt{2}}$ cm (c) $14\sqrt{2}$ cm (d) none of these

16. The volume of a pyramid of base area 25 cm^2 and height 12 cm is:
(a) 200cm^3 (b) 100cm^3 (c) 400 cm^3 (d) 800 cm^3

Mensuration

Answers Key & Solutions

Solutions

Exercise – 01

1. Ans: b
Solution
$2(16x + 9x) = 750; l = 16x \text{ and } b = 9x$

2. Ans: c
Solution
Area $= \frac{110}{0.5} = 220\ sq.m$
And $11x \times 5x = 220$

3. Ans: b
Solution
Number of stones $= \frac{Area\ of\ courtyard}{Area\ of\ one\ stone} = 14400$
$Cost = Rate \times number\ of\ stones$
$= (0.5 \times 14400)$

4. Ans: a
Solution
Original area $= l \times b$
New area $= 2l \times \frac{b}{2} = l \times b$
Hence, no change

5. Ans: b
Solution
Rate $= \frac{759-561}{6} = Rs.33\ per\ metre$

6. Ans: b
Solution
$l \times b = \frac{1}{25} \times 10000 = 100 \times b$
$\Rightarrow \quad b = 0.4\ m$

7. Ans: c
Solution
$\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$
$\therefore \quad 90 \times \frac{1}{9} = 10\ g$ (*It depends upon area*)

8. Ans: c
Solution
$\frac{100 \times 100}{25 \times 25} = 16$ (*1 m = 100 cm*)

9. Ans: c
Solution
$2[(x + 2) + x] = 48 \Rightarrow x = 11\ cm$
$\therefore \quad (x + 2) = 13\ cm$

10. Ans: b
Solution
Area $= \frac{d^2}{2}; d \rightarrow diagonal$

11. Ans: b

Solution

$a^2 : (a\sqrt{2})^2 = 1 : 2$

12. Ans: a

Solution

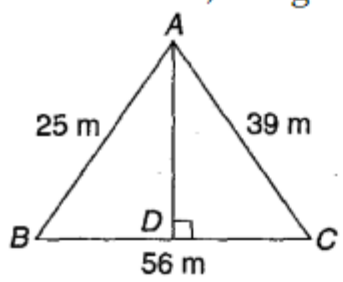
Use Hero's formula:

Area of scalene triangle $= \sqrt{s(s-a)(s-b)(s-c)}$

13. Ans: a

Solution

Find the area, using Hero's formula, then



Area $= \frac{1}{2} \times b \times h$

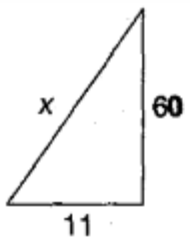
$= \frac{1}{2} \times 56 \times AD$

14. Ans: a

Solution

Use pythagorus theorem

$x^2 = (60)^2 + (11)^2$



$\left[\begin{matrix} Pythagorus\ theorem: \\ (Hypotenuse)^2 = (base)^2 + (height)^2 \end{matrix}\right.$

15. Ans: b

Solution

Area of triangle $= \frac{1}{2} \times b \times h$

Let initially area of triangle $= 1 \times 1 = 1\ unit$

Now, the area of triangle $= 2 \times 2 = 4\ unit$

Increase in area $= \frac{4-1}{1} \times 100 = 300\%$

(For your convenience assume any value of b and h.)

16. Ans: a

Solution

Height of an equilateral triangle $= \frac{\sqrt{3}}{2} \times side$

$\therefore \quad 2\sqrt{3} = \frac{\sqrt{3}}{2} \times side$

$\Rightarrow \quad Side = 4\ cm$

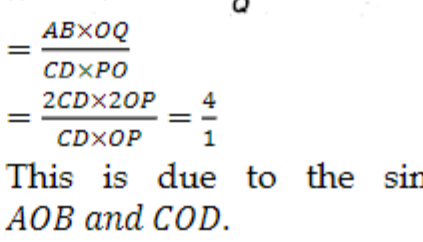
$\therefore$ Area of an equilateral triangle $= \frac{\sqrt{3}}{4} \times (side)^2$

$\frac{\sqrt{3}}{4} \times 4 \times 4 = 4\sqrt{3} cm^2$

17. Ans: b

Solution

Area $= 40 \times 10 = 720 cm^2$



18. Ans: b

Solution

Area of rhombus $= \frac{1}{2} \times product\ of\ diagonals$

$\frac{1}{2} \times a \times b = \frac{ab}{2}$

19. Ans: a

Solution

Area of rhombus $= \frac{1}{2} \times 2x \times 5x = \frac{10x^2}{2} = 5x^2$

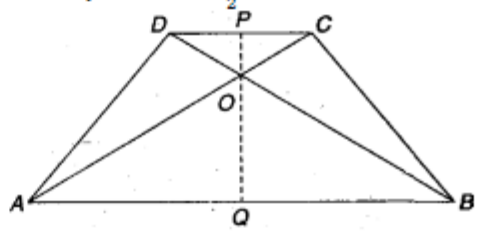
and square of the shorter diagonal $= (2x)^2 = 4x^2$

$\therefore \quad \frac{5x^2}{4x^2} = \frac{5}{4}$

20. Ans: c

Solution

$\frac{Area\ of\ \Delta AOB}{Area\ of\ \Delta COD} = \frac{\frac{1}{2} \times AB \times OQ}{\frac{1}{2} \times CD \times PO}$



$= \frac{AB \times OQ}{CD \times PO}$

$= \frac{2CD \times 2OP}{CD \times OP} = \frac{4}{1}$ $\left[\begin{matrix} \because & AB = 2CD \\ and & OQ = 2PO \end{matrix}\right]$

This is due to the similarity of triangles $AOB\ and\ COD$.

21. Ans: a

Solution

$\frac{1}{2} \times (12 + 8) \times h = 360$

$\Rightarrow \quad h = 36\ m$

22. Ans: b

Solution

$6 \times \frac{\sqrt{3}}{4} \times (Side)^2 = \frac{3\sqrt{3}}{2} (Side)^2$

$= \frac{3\sqrt{3}}{2} \times 4 \times 4 = 24\sqrt{3} m^2$

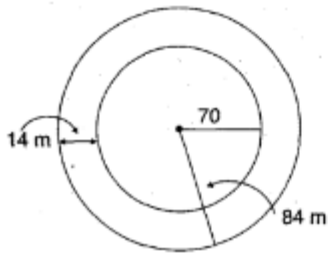
23. Ans: d

Solution

$2\pi r = 704 \Rightarrow r = 112$

$\therefore \quad \pi r^2 = \frac{22}{7} \times 112 \times 112 = 39424 cm^2$

24. Ans: b
Solution
$2\pi r = 440 \Rightarrow r = 70\ m$



$\therefore \quad R = 70 + 14 = 84\ m$

25. Ans: c
Solution
$r + 2\pi r = 51 \Rightarrow r\left(1 + \frac{44}{7}\right) = 51 \Rightarrow r = 7,$

Find area.

26. Ans: a
Solution
$\frac{New\ area}{Original\ area} = \frac{\pi \times 7 \times 7}{\pi \times 5 \times 5} = \frac{49}{25}$
Change in area $= \frac{24}{25} \times 100 = 96\%$

27. Ans: a
Solution
$\pi r^2 = 124.74\ hectare$
$\pi r^2 = 1247400\ m^2$
$\Rightarrow \quad r = 630\ m$
$\therefore \quad 2\pi r = 3960$
$\therefore \quad Cost = 3960 \times 0.8 = 3168$

Exercise – 02

1. Ans: d
Solution
$\pi r^2 = 2464 \Rightarrow r = 28\ m$

2. Ans: b
Solution
$2\pi \times R \times \frac{75}{360} = 25 \Rightarrow R = 60/\pi$

3. Ans: c
Solution
$\frac{40}{360} = \frac{1}{9} \ \therefore \frac{(360-40)}{360} = \frac{8}{9}$
$\therefore$ Area of major sector $= 8 \times 8.25 = 66 cm^2$

4. Ans: b
Solution
$\pi[23^2 - 12^2] = \frac{22}{7} \times [529 - 144] = 1210$

5. Ans: c
Solution
$r = 42 \ \therefore 2\pi r = 264 = 4a \Rightarrow a = 66$
$\therefore \quad d = a\sqrt{2} = 66\sqrt{2}$

6. Ans: c
Solution
Circumference $= \frac{1100}{560} = \frac{110}{56} = 2\pi r$
$\therefore \quad 2r = \frac{110}{56} \times \frac{7}{22} = \frac{5}{8} m = 62.5\ cm$

7. Ans: b
Solution
Volume of original cube = $(4)^3 = 64\ cm^3$
and its weight = 400 kg
Since weight of the larger cube is 8 times the weight of smaller cube. Hence, the volume of new cube will be 8 times the volume of smaller cube.
Hence volume of required cube = 8 x 64 = $(8)^3$
Edge of this cube = 8 cm

8. Ans: a
Solution
Volume of cube = Volume of cuboid
$a^3 = lbh$
$\Rightarrow \quad a^3 = 36 \times 75 \times 80 = 216000$
$\Rightarrow \quad a = 60\ cm$

9. Ans: b
Solution
Base area × height = Volume
$10 \times 4 \times 1 = 40 m^3$
But $1\ m^3 = 1000\ litre = 1\ kilolitre$
$\therefore \quad 40 m^3 = 40{,}000$ litre $= 40\ kilolitre$

10. Ans: b
Solution
Total length of tape $= 2(l + b) + 3.75$
$= 2(39.5 + 9.35) + 3.75$
$= 101.45\ cm$

11. Ans: c
Solution
Let each edge of smaller cube = $1\ m$
$\therefore$ Each edge of larger cube = $1\ m$
And Surface area of smaller cube $6 \times (1)^2 = 6 m^2$
$\therefore$ Surface area of larger cube $= 6 \times (2)^2 = 24\ m^2$
$\therefore$ % increase in surface area $= \frac{24-6}{6} \times 100 = 300\%$

Note: It can be determined by using variable e.g., x (edge of cube) instead of solving by assuming some numerals.

Alternatively: $\frac{S_2}{S_1} = \left(\frac{e_2}{e_1}\right)^2 \Rightarrow \frac{S_2}{S_1} = \frac{4}{1}$

$\therefore$ Percentage increase in surface area $= \frac{4-1}{1} \times 100 = 300\%$

Where S = surface area, $e = edge\ of\ cube$

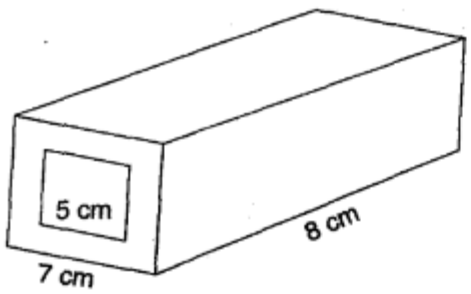
12. Ans: b
Solution
Surface area of the cuboid $= 2(lb + bh + hl) = 11.6m^3$
$\therefore$ $Cost\ of\ canvas = 11.6 \times 25 = Rs.290$

13. Ans: a
Solution
Area of 4 walls $= 2(36 + 12) \times 10 = 960m^2$
Total area of (windows + door + chimney) $= 120m^2$
$\therefore$ Net area for papering $= 960 - 120 = 840m^2$
$\therefore$ Length of required paper $= \frac{840}{1.2} = 700\ m$
Hence, cost of papering $= 700 \times 0.7 = Rs.490$

14. Ans: d
Solution
$(x + 2)^3 - x^3 = 1016$
$\Rightarrow$ $x = 12\ cm$
And $x^3 - (x - 2)^3 = (12)^2 = 728$

15. Ans: b
Solution
You can see the figure shown in the question number 15. Now let us consider that surface area of each face of the cube $1cm^3$.
$\therefore$ Total surface area of the cuboid $= 14cm^2$
And Total surface area of the 3 cubes $= 18\ cm^2$
Hence, required ratio $= 14 : 18 = 7 : 9$

16. Ans: c
Solution
Iron used in the tube = Difference in external and internal volumes of the tube



$\therefore$ $192 = 8x^2 - 8(5)^2$
$\Rightarrow$ $x = 7\ cm$

Hence, the thickness of the tube $= \frac{7-5}{2} = 1\ cm$

17. Ans: c
Solution
$\sqrt{l^2 + b^2} = 12 \Rightarrow l^2 + b^2 = 144$
And $\sqrt{l^2 + b^2 + h^2} = 15$
$\Rightarrow$ $l^2 + b^2 + h^2 = 225$
$\Rightarrow$ $h^2 = 81 \Rightarrow h = 9\ m$

18. (a) $152cm^2$ (b) $94cm^2$
(c) $108cm^2$
(d) $60\sqrt{2}cm^2$
Ans: b
Solution
$l + b + h = 12\ cm, \sqrt{l^2 + b^2 + h^2} = 5\sqrt{2}$
$\Rightarrow$ $l^2 + b^2 + h^2 = 50$
Now, $(l + b + h)^2 = l^2 + b^2 + h^2 + 2(lb + bh + hl)$
$\Rightarrow$ $144 = 50 + 2(lb + bh + hl)$
$\Rightarrow$ $2(lb + bh + hl) = 94\ cm^2$

19. Ans: b
Solution
$h : b = 3 : 1\ and\ l : h = 8 : 1$
$\Rightarrow$ $l : h : b = 24 : 3 : 1$
$\therefore$ $24x \times 3x \times x = 36.864$
$\Rightarrow$ $x^3 = 0.512 \Rightarrow x = 0.8$
$\therefore$ $h = 3x = 2.4\ m$

20. Ans: c
Solution
$h = \frac{511}{36.5} = 14\ m$

21. Ans: c
Solution
$2\pi rh = 1056\ cm^2$
$\Rightarrow$ $r = \frac{33}{\pi} cm$
$\therefore$ $\pi r^2 h = \pi \times \left(\frac{33}{\pi}\right)^2 \times 16$
$\Rightarrow$ Volume $= 5544\ cm^3$

22. Ans: a
Solution
$h = \frac{2\pi rh}{2\pi r} = \frac{17.6}{8.8} = 2\ m$
and $2\pi r = 8.8 \Rightarrow r = 1.4\ m$
$\therefore$ $\pi r^2 h = \frac{22}{7} \times (1.4)^2 \times 2 = 12.32m^3$

23. Ans: b
Solution
$2\pi rh = 2 \times \pi \times 2 \times 10 = 40\pi m^2$

24. Ans: a
Solution

$\frac{2\pi rh}{2\pi r(h+r)} = \frac{2}{3} \Rightarrow \frac{h}{h+r} = \frac{2}{3} \Rightarrow \frac{h}{r} = \frac{2}{1}$
$\therefore \quad 2\pi r(h+r) = 924$
$\therefore \quad 2\pi rh = 924 \times \frac{2}{3} = 616 cm^2$
$\Rightarrow \quad 2 \times \pi \times x \times 2x = 616$
$\Rightarrow \quad x = 7 \qquad \therefore r = 7\ cm \qquad$ and $\quad h = 14\ cm$
$\therefore \quad \pi r^2 h = \frac{22}{7} \times (7)^2 \times 14 = 2156\ cm^3$

25. Ans: a
Solution
$2\pi rh = 1320 \Rightarrow h = 10\ cm$
$\therefore \quad 2\pi r(h+r) = 2 \times \frac{22}{7} \times 21 \times 31 = 4092 cm^2$

26. Ans: a
Solution
$\frac{r}{h} = \frac{3x}{4x}, \pi r^2 h = 4851 \Rightarrow x = 3.5$
$\therefore \quad r = 10.5\ m \ and \ h = 14\ m$
$\therefore \quad 2\pi rh = 2 \times \frac{22}{7} \times 10.5 \times 14 = 924\ m^3$

27. Ans: d
Solution
$\frac{r_1}{r_2} = \frac{4x}{x}, but V_1 = V_2$
$\therefore \quad \pi(4x)^2 \times h_1 = \pi(x)^2 h_2$
$\Rightarrow \quad h_2 = 16h_1$

Exercise – 03

1. Ans: c
Solution
$2\pi r(h+r) = 2640$
$\Rightarrow \quad 2\pi r(30) = 2640$
$\Rightarrow \quad r = 14\ m$
$\Rightarrow \quad h = 16\ m \qquad (\because\ r + h = 30\ m)$
$\therefore \quad h : r = 8 : 7$

2. Ans: a
Solution
$\frac{2\pi r_1 h_1}{2\pi r_2 h_2} = \frac{3}{2} \times \frac{6}{7} = \frac{9}{7}$

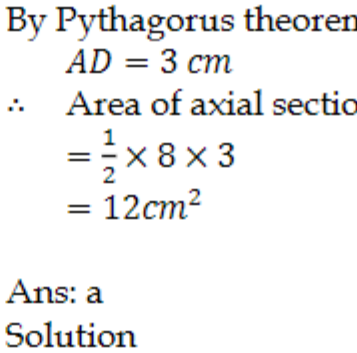
3. Ans: c
Solution
Since radius and height of the cylinder are same as that of cone. Therefore cylinder can contain $15 \times 3 = 45\ litre\ of\ milk.$

4. Ans: c
Solution
$\frac{1}{3} \times \pi \times (5x)^2 \times (12x) = 314\frac{2}{7} = \frac{2200}{7}$
$\Rightarrow \quad x = 1$
$\therefore \quad r = 5 \ and \ h = 12$
$\therefore \quad l = 13\ m$

5. Ans: d
Solution
$2\pi r = 220 \Rightarrow r = 35\ cm$
$\therefore \quad l = \sqrt{r^2 + h^2} = 91\ cm$
$\therefore \quad \pi rl = \frac{22}{7} \times 35 \times 91 = 10010\ cm^2$

6. Ans: b
Solution
$\frac{\pi r_1 l_1}{\pi r_2 l_2} = \frac{3}{2} \qquad (\because r_1 = r_2)$
$\therefore \quad \frac{A_1}{A_2} = \frac{3}{2} \Rightarrow \frac{A_1}{300} = \frac{3}{2}$
$\therefore \quad A_1 = 450\ cm^2$

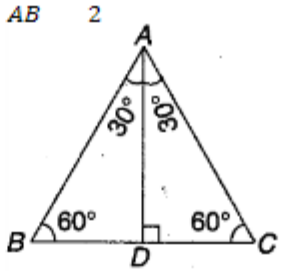
7. Ans: b
Solution



By Pythagorus theorem
$AD = 3\ cm$
$\therefore$ Area of axial section
$= \frac{1}{2} \times 8 \times 3$
$= 12 cm^2$

8. Ans: a
Solution
$\frac{V_2}{V_1} = \frac{(r_2)^2 h_2}{(r_1)^2 h_1} = \frac{(2r)^2}{(r)^2}$
$(\because h_1 = h_2)$
$\Rightarrow \quad \frac{V_2}{V_1} = \frac{4}{1}$

9. Ans: b
Solution
$\frac{BD}{AB} = \cos 60°$
$\frac{BD}{AB} = \frac{1}{2}$



$BD = CD$, are the radii of the base and $AB = AC$ are the slant heights of the cone. A is the vertex and BC is the base.

10. Ans: a
Solution
Volume of cone $= \frac{1}{3}\pi \times 144 \times 35$
Volume of water flowing per second $= \pi \times (0.8)^2 \times \frac{500}{60}$
$\therefore$ Required time $= \frac{\left(\frac{\pi}{3}\right)\times 144\times 35}{\pi\times 0.64\times\left(\frac{500}{60}\right)}$
$= 315\ seconds$

11. Ans: b
Solution
$\frac{4}{5}\pi(r_1^3 + r_2^3 + r_3^3) = \frac{4}{3}\pi(6)^3$
$\Rightarrow\ 27 + 64 + r_3^3 = 216$
$\Rightarrow\ r_3^3 = 125$
$\Rightarrow\ r_3 = 5\ cm$

12. Ans: c
Solution
Number of bottles × Volume of each bottle = Volume of hemisphere
$n \times \pi \times (3)^2 \times 1 = \frac{2}{3}\pi \times (6)^3$
$\Rightarrow\ n = 16$

13. Ans: c
Solution
Volume of hemisphere $= \frac{2}{3}\pi r^3$
$\frac{2}{3} \times \frac{22}{7} \times (21)^3 = 19404m^3$

14. Ans: d
Solution
Change in height (or level) or water $= \frac{Volume\ of\ sphere}{Base\ area\ of\ cylinder}$
$= \frac{\frac{4}{3}\pi\times(9)^3}{\pi\times(12)^2} = \frac{27}{4}\ cm$

15. Ans: c
Solution
Volume of cone = Volume of sphere
$\frac{1}{3}\pi r^2 \times \frac{7}{2} = \frac{4}{3}\pi(7)^3$
$\Rightarrow\ r = 14\sqrt{2}cm$

16. Ans: b
Solution
Volume of pyramid $= \frac{1}{3} \times base\ area \times height$
$= \frac{1}{3} \times 25 \times 12 = 100\ cm^3$