MBA PIONEER 2024

QUANTITATIVE APTITUDE

DPP: 12

Surface area and volume 1

Q1 Find the maximum value of the ratio of the longest diagonal to the surface diagonal of a cuboid with sides 3cm, 4cm and 12cm.
(A) 13 : 5 (B) 7 : 3
(C) 6 : 5 (D) None of these

Q2 What is the total surface area of a prism having a height of 18 cm and having a square base of side 15 cm?
(A) 1750 cm^2 (B) 1530 cm^2
(C) 840 cm^2 (D) None of these

Q3 What is the ratio of the volume of a prism to that of a pyramid if they have the same base and heights?
(A) 4 : 3 (B) 2 : 1
(C) 3 : 1 (D) 5 : 3

Q4 What is the total surface area of a pyramid having a slant height of 16 cm and the base of which is a square of side 8 cm?
(A) 340 cm^2 (B) 320 cm^2
(C) 420 cm^2 (D) 360 cm^2

Q5 What is the lateral surface area of a frustum of a cone having top radius 10 cm, radius of base 18 cm and slant height 12 cm?
(A) 1100 cm^2 (B) 1156 cm^2
(C) 1056 cm^2 (D) 960 cm^2

Q6 What is the ratio of the areas of two squares made with sides as the major diagonal and the minor diagonal respectively of a regular hexagon of side 10 cm?
(A) 6 : 5 (B) 4 : 3
(C) 7 : 4 (D) None of these

Q7 A goat is tied to one corner of a grassy square plot of side 18 m with a rope 14 m long. Find the ratio of the area that it can graze to the area it can't graze inside the square plot.
(A) 73 : 89 (B) 77 : 85
(C) 61 : 68 (D) None of these

Q8 A circular path runs all around and outside a circular garden of diameter 84 m. If the difference between the outer circumference of the path and the circumference of the garden is 176 m, find the width of the path.
(A) 14 m (B) 28 m
(C) 21 m (D) None of these

Q9 A rectangle has four times the area of a square. The length of the rectangle is 9 cm greater than the side of the square and the breadth is equal to the side of the square. Find the difference in the perimeter of the rectangle and the square.
(A) 18 cm (B) 12 cm
(C) 30 cm (D) 15 cm

Q10 A metal wire is bent in the shape of a square enclosing an area of 17424 cm^2. If the same metal wire is bent in the shape of a circle, then find the area enclosed in cm^2.
(A) 16856 (B) 21024
(C) 22176 (D) None of these

Q11

A frustum of a right pyramid has its top and bottom surfaces in the shape of squares. The side of the bottom square is 4 cm and that of the top is 3 cm. If the height of the frustum is 12 cm, then find the volume of the frustum.

(A) 144 cm^3 (B) 148 cm^3

(C) 160 cm^3 (D) 180 cm^3

Q12 The top of a conical vessel has a circumference of 352 m. Water flows in at a rate of 60 m^3/sec. Find the approximate time (in minutes) taken for the vessel to be 75% full if its depth is 60 m.

(A) 41 (B) 65

(C) 53 (D) None of these

Q13 A rectangular football field is 350 m long and 80 m wide. A cuboidal well 32 m deep is dug in the field with dimensions 15 m × 12 m × 32 m. The mud extracted from the well is evenly spread over the remaining field. Find the quantum of increase in the level of the field (approximately)

(A) 0.195 m (B) 0.256 m

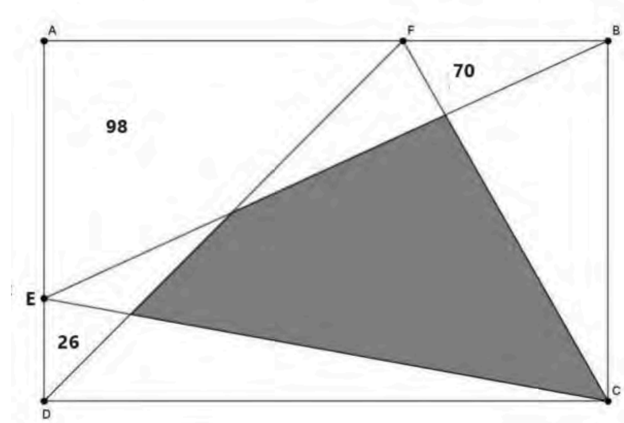
(C) 0.207 m (D) 0.523 m

Q14 A solid metal cylinder of 35 cm height and 56 cm diameter is melted and recast into two cones in the ratio 3 :4 by volume, keeping the height as 35 cm. Find the percentage change in the flat surface area due to the above change.

(A) 40% (B) 45%

(C) 50% (D) 35%

Q15 *Find the area (in sq. units) of the shaded region, the values given inside the quadrilateral represent the area in sq. units of that particular enclosed region*



Q16 Find the total surface area in sq. cm. of a hollow cylinder, open at both ends, whose external diameter is 18 cm, thickness is 3 cm and the height is 40 cm.

(A) 1230π (B) 1650π

(C) 1080π (D) 1290π

Q17 The girth of a cylindrical tree is 880 cm and its height is 2.7 m. Wood sells at Rs. 2000 per cubic feet. If there was a wastage of 10% in cutting the tree, then what is the total realization from the sale (in lakhs) of the tree? (1 inch = 2.5 cm, 1 ft = 12 inch)

(A) Rs. 12.56 (B) Rs. 11.088

(C) Rs. 15.45 (D) None of these

Q18 A 70 cm long metal cylindrical rod of diameter 8 cm is placed inside a 70 cm long wooden cylindrical pipe. The outer and inner radii of the wooden pipe are 8 cm and 6 cm respectively. Find the weight of the pipe with the rod inside it if 1 cm^3 metal weighs 30g and wood weighs 10g.

(A) 145.4 kg (B) 167.2 kg

(C) 154.2 kg (D) 152.4 kg

Q19 The sum of the radius of the base of a solid cylinder and the height of the cylinder is 15 cm. If the total surface area of the cylinder is 660 cm^2, then find the volume of the cylinder (in cubic cm)

(A) 1458 (B) 1232

(C) 1396 (D) None of these

Q20 Water flows through pipe of cross section 35 m^2 into a cuboidal reservoir of base 70 m × 50 m. At what speed must water flow through the pipe, so that the water level in the reservoir rises by 6 m in 4 hours?

(A) $120\ m^3/hour$

(B) $180\ m^3/hour$

(C) $150\ m^3/hour$

(D) $90\ m^3/hour$

Q21 Diameter of the base of a right circular cone filled with water is 26 cm. A cylindrical pipe, 5 mm in radius is attached to the surface of the cone at a point. The perpendicular distance between the point and the base(the top) is 15 cm. The distance from the edge of the base to the point is 17 cm, along the surface. If water flows at the rate of 20 m/minute through the pipe, then find the time elapsed before the water stops coming out of the pipe.

(A) 2.65 (B) 2.59

(C) 3.14 (D) 4.58

Q22 A rectangular swimming pool is 72 m long and 30 m wide. The shallow edge of the pool is 5 m deep. For every 13 m that one walks up the inclined base of the swimming pool, one gains an elevation of 5 m. If water can be drained out at the rate of 108 m^3/min, then find the time taken to completely empty the swimming pool if it is filled up to its brim?

(A) 400 minutes (B) 420 minutes

(C) 450 minutes (D) 540 minutes

Q23 The center of a circle inside a triangle is at a distance of 625 cm from each of the vertices of the triangle. If the diameter of the circle is 350 cm and the circle is touching only two sides of the triangle, then find the area of the triangle in sq. cm

(A) 387174 (B) 387072

(C) 395658 (D) None of these

Q24 Two circles, both of radii 5 cm, intersect such that the circumference of each one passes through the center of the other. Find the area of the intersecting region in sq. cm

(A) 38.96 (B) 33.59

(C) 31.56 (D) 30.68

Q25 A hexagonal prism of length 30 cm is cut into two equal halves along its length, so that the cutting plane passes through two opposite vertices of the hexagonal base. Find the surface area in sq. cm. of one of the resultant solids if all sides of the hexagon measure 8 cm.

(A) 1257 (B) 1454.54

(C) 1366.27 (D) None of these

Q26 The interior of a building is in the form of a cylinder of diameter 12√3 m, surmounted by a cone of vertical angle 60 degrees. Find the volume of the building in meter cubic if the overall height of the building is 30 m.

(A) 1944π (B) 1856π

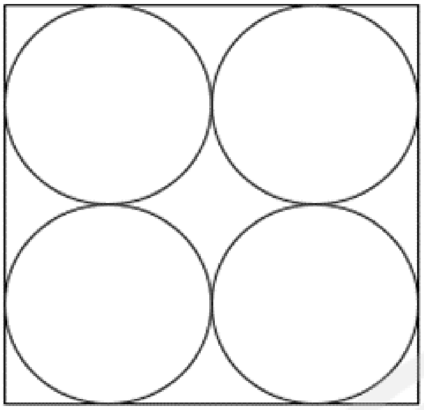
(C) 2105π (D) 2446π

Q27 An equilateral triangle of $27\sqrt{3}$ cm is cut and a regular hexagon of the largest side is carved out of it. Find the approximate area of the hexagon in sq. cm

(A) 215 (B) 232

(C) 256.46 (D) 631.33

Q28 Four identical circles are placed inside a square as shown in the figure. For each circle, the magnitude of its area is the same as the magnitude of its circumference. Find the approximate area of the square not occupied by the circles (in sq. units)



(A) 13.76 (B) 46.58
(C) 16.89 (D) None of these

Q29 The radii of a cylinder and a cone are equal and their heights are also equal. If the ratio of curved surface area of the cone to that of the cylinder is 17 : 16, the find the ratio of the radius to height for the cylinder
(A) 15 : 8 (B) 13 : 9
(C) 17 : 7 (D) None of these

Q30 An equilateral triangle of side $20\sqrt{3}$cm has a circle inscribed in it. There is another equilateral triangle which is inscribed inside the circle. Find the area of the inscribed triangle.
(A) $75\sqrt{3}\ cm^2$ (B) $25\sqrt{3}\ cm^2$
(C) $50\sqrt{3}\ cm^2$ (D) $40\sqrt{3}\ cm^2$

Answer Key

Q1	(A)
Q2	(B)
Q3	(C)
Q4	(B)
Q5	(C)
Q6	(B)
Q7	(B)
Q8	(B)
Q9	(A)
Q10	(C)
Q11	(B)
Q12	(A)
Q13	(C)
Q14	(C)
Q15	194
Q16	(D)
Q17	(B)
Q18	(B)
Q19	(B)
Q20	(C)
Q21	(B)
Q22	(A)
Q23	(B)
Q24	(D)
Q25	(C)
Q26	(A)
Q27	(D)
Q28	(A)
Q29	(A)
Q30	(A)

Hints & Solutions

Q1 Text Solution:

Longest Diagonal $= \sqrt{(l^2 + b^2 + h^2)}$

$= \sqrt{(3^2 + 4^2 + 12^2)}$

$= \sqrt{169}$

= 13 cm

For the ratio to be maximum, the surface diagonal should be minimum possible.

So, $\sqrt{(3^2 + 4^2)} = 5\ cm$

Thus, ratio = 13 : 5 (Ans)

Q2 Text Solution:

Total surface area = Lateral SA + 2 × Area of base

Lateral surface area will be the (perimeter of the base x height) while the base is that of a square.

Total SA = 4 × 15 × 18) + (2 × 15 ×15)

=> Answer = 1530 cm^2

Q3 Text Solution:

If their bases are the same, then the base area is also the same.

Volume of Prism = Base area × Height

Volume of Pyramid = 1/3 × Base area × Height

Hence, ratio = 3 : 1 (Ans)

Q4 Text Solution:

Total surface area of a piramid is the sum of the lateral surface area and the area of the base

Here, base area = area of the square = 8 × 8 = 64 cm^2

Now, the lateral surface area here will be the area of the four triangles which will be congruent because of the square base.

The base of each of the triangular faces will be the side of the square whereas slant height will be the height of the triangular face.

Lateral SA = 4 × 1/2 × 8 × 16 = 256 cm^2

Thus, total SA = 256 + 64 = 320 cm^2(Ans)

Q5 Text Solution:

Let the slant height be l', the top radius to be 'r_1' and the radius of the base to be 'r_2'

The lateral SA of a frustum can be calculated as -

Lateral SA = π × l × (r_1 + r_2)

=> Lateral SA = (22/7) × 12 × (10 + 18) = **1056 cm^2** (Ans)

Q6 Text Solution:

For a regular hexagon with side 'a', the length of the major diagonal is '2a' whereas the length of the minor diagonal is '√3a'.

So, here for the square with side as the major diagonal, side = 2 × 10 = 20 cm

Square with side as the minor diagonal, side $= 10\sqrt{3}$

Thus, ratio of areas $= 20^2 : (10\sqrt{3})^2 = 4 : 3$ (Ans)

Q7 Text Solution:

Total available area of the plot = 18 × 18 = 324 m^2

As the goat is tied to one of the corners, the area it can graze will be in the form of a quadrant of a circle whose center is at the corner and the radius is the length of the rope.

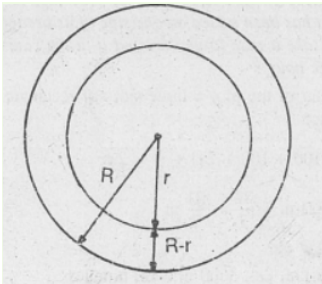
Area that can be grazed = 1/4 × π × 14^2 = (1/4) × (22/7) × 196 = 154 m^2

Note: We are taking 1/4th of the area of the circle as the area available to graze is just one quadrant of the circle. The goat can't graze in an area outside the square plot.

Area that can't be grazed = 324 - 154 = 170 m^2

Hence, ratio = 154 : 170 = 77 : 85 (Ans)

Q8 Text Solution:



Diameter of the garden = 84 m => radius = r = 42 m

Circumference, C = 2 × π × 42 = 2 × (22/7) × 42 = 264 m

Circumference of the outer path = 264 + 176 = 440 m

Let the radius of the outer path be R

So, 2 × π × R = 440

=> R = 70 m

Thus, the width of the path = R – r = 70 – 42 = **28 m** (Ans)

Q9 Text Solution:

Let the side of the square be 'a' cm.

So, length of the rectangle = 'a + 9' cm and breadth = 'a' cm

Thus, area of the square = a^2 and the area of the rectangle = a (a + 9)

According to the question,

a (a + 9) = 4 × a^2

=> a = 3

Length = 12 cm and Breadth = 3 cm

Hence, perimeter of the square = 4 × 3 = 12 cm

Perimeter of the rectangle = 2 (12 + 3) = 30 cm

Thus, difference = 30 – 12 = 18 cm

Q10 Text Solution:

Area of the square = 17424 cm^2

Side of the square = $\sqrt{17424}$

= 132 cm

=> Perimeter = 528 cm

Now, the perimeter is the length of the metal wire which in turn is also the circumference of the circle.

So, 2 × π × r = 528 => r = 84 cm

Thus, the area enclosed = π × r × r = 22/7 × 84 × 84 = **22176 cm^2** (Ans)

Q11 Text Solution:

Volume of frustum of pyramid = Volume of the bigger pyramid – Volume of the smaller pyramid

Now the base of the bigger pyramid is the bigger square and that of the smaller pyramid is the smaller square.

Using similarity, base ratio = height ratio

Let the height of the smaller pyramid be 'h'. So, height of the bigger pyramid = 'h + 12'

So, 4 : 3 = (h + 12) : h => h = 36 cm

So, height of the bigger pyramid = 48 cm

Volume of a Pyramid = 1/3 × Base area × Height

So, Volume of frustum = 1/3 × (48 × 16 – 36 ×9) = **148 cm^3** (Ans)

Q12 Text Solution:

Let the radius of the top of the conical vessel be 'r'.

So, 2 × π × r = 352 m => r = 56 m

So, volume = (1/3) π r^2 h = (1/3) × (22/7) × 56^2 × 60 = 197120 m^3

Now 75% of this volume = 147840 m^3

Hence, time taken = 147840/60 = 2464 seconds = 41.06 minutes = **41** (Approximately)

Q13 Text Solution:

Volume of well = 15 × 12 × 32 = 5760 m^3

Area remaining in the field after the well is dug = 350 × 80 – 15 × 12 = 27820 m^2

Now, the mud extracted will be evenly spread on the above calculated area.

Let the increase in the level of the field be 'h'

So, 27820 × h = 5760

=> h = 0.207 m (Ans)

Q14 Text Solution:

Volume of the cylinder = π r^2 h and base surface area = 2π r^2

Let the two cones recasted have radii r_1 and r_2 respectively.

Thus, their volumes are $1/3 \times \pi r_1{}^2 h$ and $1/3\, x\, \pi\, r_2{}^2 h$ respectively which are in the ratio 3 : 4

Thus, the radii are in the ratio $= \sqrt{3} : 2$

Now, $\pi\ r^2 h\ = \frac{1}{3} \times\ \pi\ r_1^2 h\ + \frac{1}{3} \times\ \pi\ r_2^2 h$

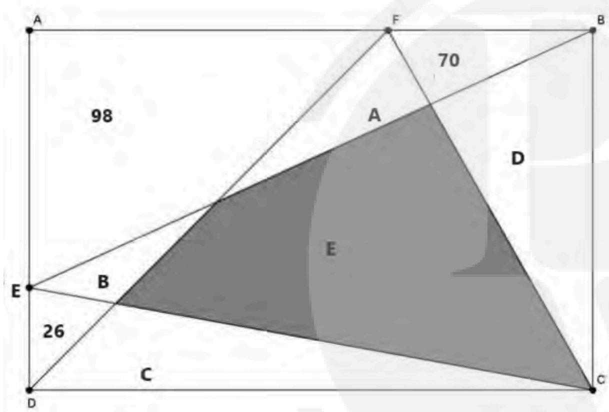
$\Rightarrow\ r_1^2 + r_2^2 =\ 3r^2$

Initial flat surface area $= 2\pi\, r^2$ and new combined flat surface area = $3\pi\, r^2$

Therefore, percentage change $= \left(3\pi\, r^2\ -\ 2\pi\, r^2\right)/2\pi\, r^2\ \times\ 100\ =\ 50\%$

(Ans)

Q15 Text Solution:



From given fig. we can say

$area\ of\ \triangle\ DFC = \frac{1}{2}(area\ of\ quad.\ ABCD)$

$\{base\ and\ height\ is\ same\ and\ area\ ABCD = b \times h\ and\ that\ of\ triangle\ is\ \frac{1}{2} \times b \times h)$

$area\ of\ \triangle\ DFC = area\ of\ (\triangle\ DAF + \triangle\ BFC)$

$\Rightarrow A + E + C = (98 + B + 26 + 70 + D) \ldots (i)$

$also,\ area\ of\ \triangle\ BEC = area\ of\ (\triangle\ ABE + \triangle\ CED)$

$\Rightarrow B + E + D = (98 + A + 70 + 26 + C) \ldots (ii)$

$Adding\ (i)\ and\ (ii)$

$\Rightarrow A + B + C + D + 2E$

$= (98 + 26 + 70 + B + D)$

$+ (98 + 70 + 26 + A + C)$

$\Rightarrow A + B + C + D + 2E = 388 + A + B + C + D$

$\Rightarrow 2E = 388$

$\Rightarrow E = 194$

Q16 Text Solution:

For the outer cylinder, $r_2\ =\ \ 9\ cm$, height h = 40 cm

As thickness = 3 cm, thus for the inner cylinder $r_1\ =\ \ 6\ cm$, height h = 40 cm

Hence, the total surface area of the hollow cylinder

= Lateral surface area of the inner cylinder + Lateral surface area of the outer cylinder + Area available due to thickness on top and bottom

=> TSA = $2\ x\ \pi\ x\ r_1 h\ +\ 2\ x\ \pi\ x\ r_2 h\ +\ 2\ x\ \pi\ x\ \left(r_2{}^2\ - r_1{}^2\right)$

=> TSA = $2\ x\ \pi\left(9\ x\ 40\ +\ 6\ x\ 40\ +\ \left(9^2\ - 6^2\right)\right.$

=> TSA = 1290π (Ans)

Q17 Text Solution:

Let 'r' be the radius of the wood of the tree.

$2 \times \pi \times r = 880$

$\Rightarrow r = 140\ cm$

Thus, volume = $\pi \times r^2 \times h = \frac{22}{7} \times 140 \times 140 \times 270$

$= 16632000\ cm^3$

As, 1 ft = 12 inches = 30 cm

I cubic feet = 27000 cm^3

Thus, Volume in cubic feet $= \frac{16632000}{27000}$ = 616

Wastage = 10% of 616 = 61.6

Hence, wood available for sale = 554.4

Therefore, the sale realized = 554.4 × 2000 = Rs. 11.088 lakhs (Ans)

Q18 Text Solution:

Here, volume of the wooden pipe = $\pi \times (8^2 - 6^2) \times 70 = 6160\ cm^3$

Weight of the wooden pipe = 6160 × 10 = 61600 g = 61.6 kg

Volume of the cylindrical pipe = $\pi \times (4^2) \times 70 = 3520\ cm^3$

Weight of the cylindrical pipe = $3520 \times 30 = 105600\ g = 105.6$

Therefore, total weight = 105.6 + 61.6 = 167.2 kg (Ans)

Q19 Text Solution:

Let 'r' and 'h' be the radius and height of the solid cylinder respectively.

Given that, r + h = 15 and $2 \times \pi \times r(r + h) = 660$

=> $2 \times \pi \times r \times 5 = 660$

=> r = 7 cm

Thus, h = 15 - 7 = 8 cm

Hence, the volume of the cylinder = $\pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 8 = 1232\ cm^3$ (Ans)

Q20 Text Solution:

Volume of the water that must flow in the tank in 4 hours

= 70 × 50 × 6 = 21000 m^3

Let the flow rate be 'f' $m^3/hour$

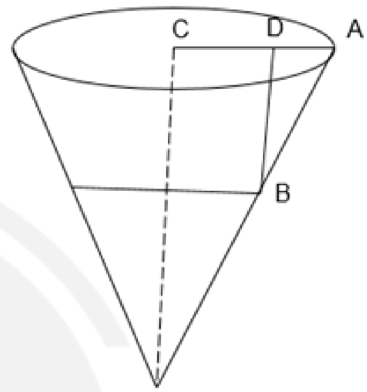
Area of the cross section = 35

So, 21000 = 35 × (f) × 4

=> f = 150 (Ans)

Q21 Text Solution:

In the fig, AB = 17 cm, AC = 13 cm, BD = 15 cm



$AD = \sqrt{(17^2 - 15^2)} = 8\ cm$

So, CD = 13 - 8 = 5 cm

Water will come out of the cone till the water level reaches the point B. That means the volume of water equivalent to the volume of the frustum will be drained out.

Volume of Frustum = $\pi \times \frac{h}{3} \times (r^2{}_1 + r^2{}_2 + r_1 x\, r_2) = \frac{22}{7} \times \frac{15}{3} \times [13^2 + 5^2 + 13 \times 5] = 4070\ cm^3$

Rate of flow of water = 20 m/minute. Let us say the time needed to drain out is 'T' minutes

Area of cross section of the pipe = $\pi \times 0.5 \times 0.5\ cm^2$

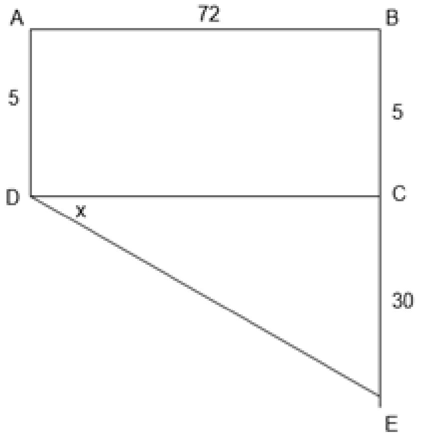
So,

$\pi \times 0.5 \times 0.5)\ cm^2 \times (20 \times 100)\ cm/min \times (T\ min) = 4070$

=> T = 2.59 minutes (Ans)

Q22 Text Solution:

The cross sectional (front)view of the fool can be shown as -



Here the cross section of the swimming pool is like a trapezium with the height of the trapezium as 72 m and the cross section traversing a width of 30m

For every 13 m that one walks up the inclined base, one gains an elevation of 5 m. Let the angle of inclination be 'x'

So, $Sin(x) = \frac{5}{13}$

$\Rightarrow \tan\ (x) = \frac{5}{12}$

So, it the total length of the swimming pool is 48 m, then the depth (max) = 30 m maintaining the same tan (x)

Thus, the parallel sides of the trapezium become 35 m and 5 m respectively and the height is 72 m.

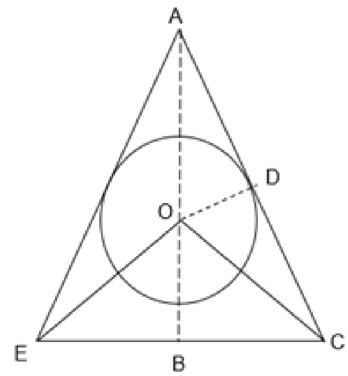
Thus, volume of water in the pool = Area of cross section x Height

$\Rightarrow$ $Volume = \frac{1}{2} \times 72 \times (5 + 35) \times 30$ = 43200

Thus time required to empty = $\frac{43200}{108}$ = 400 minutes (Ans)

Q23 Text Solution:

In the fig below,



Here, OA = OC = OE = 625. So, <OAD = <OCD

Both AE and AC are tangents to the circle with center as 'O' and let 'O' be a point on AB

Diameter of the circle = 350. Thus, OD = 175

Now, AD = 600 as AOD is a right angled triangle.

So, sin(<OAD) = OD/AO = $\frac{175}{625}$ and cos(<OAD) = $\frac{AD}{AO}$ = $\frac{600}{625}$

Also, <BOC = 2 × <OAD = 90 – <OCB

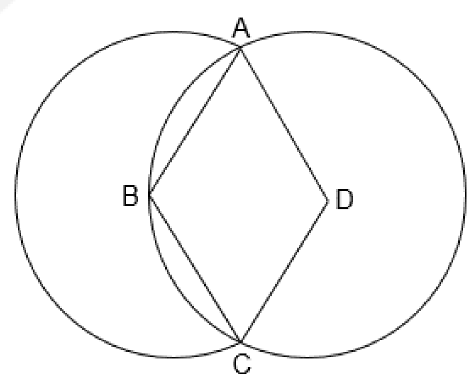
Hence, <ACB = 90 – <OAD

From this, cos (<ACB) = sin (<OAD) and sin(<ACB) = cos(<OAD)

So, BC = 7 × 48 and AB = 24 × 48

Thus, area of the triangle = $\frac{1}{2}$× AB × EC = 387072

Q24 Text Solution:



According to the question,

AB = BC = BD = CD = 5 cm

So, we can say ABD and BCD are equilateral triangles.

=> <ACB = 60

Thus area of the sector with $< ABD = \frac{120}{360} \times \pi \times 5 \times 5 = \frac{25}{3}(\pi)$

Now, area of triangle $ABC = \sqrt{\frac{3}{4}} \times \left(5 \times 5\right) = 25\sqrt{\frac{3}{4}}$

Thus, area of the segment $ACD = \frac{25}{3}(\pi) - ar(ABD)$

Similarly, area of segment $ABD = \frac{25}{3}(\pi) - ar(ACD)$

Thus, area of the intersecting region $= 2\left[\frac{25}{3}\left(\pi\right) - ar\left(ABD\right)\right] = \frac{50}{3}\left(\pi\right) -$ = $25\frac{\sqrt{3}}{2}$

30.68

Q25 Text Solution:

Major diagonal of a hexagon = 2 × side = 16 cm

Surface area of the resultant solid will consist of 3 identical rectangles on the lateral surface with breadth as 8 cm (side of the hexagon) and length as the length of the prism

There will be another rectangle at the base with dimensions 30× 16 .

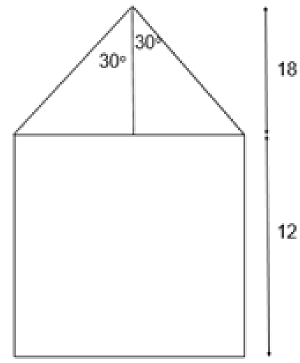
Note: The breadth of this rectangle is the major diagonal of the hexagon

Also, the area of the two bases will be in shape of trapezium and height of the trapezium will be the height of the equilateral triangle with side as 8 cm

Thus, TSA = $3 \times 8 \times 30 + 30 \times 16 + 2 \times \frac{1}{2}(8 + 16) \times 4\sqrt{3}$

= 1366.27

Q26 Text Solution:



Here the radius of the cylinder = radius of the cone = $6\sqrt{3}m$

As, the cone angle = 60, thus, tan(30) = r/h

=> $h = 6\sqrt{3} \times \sqrt{3} = 18\ m$

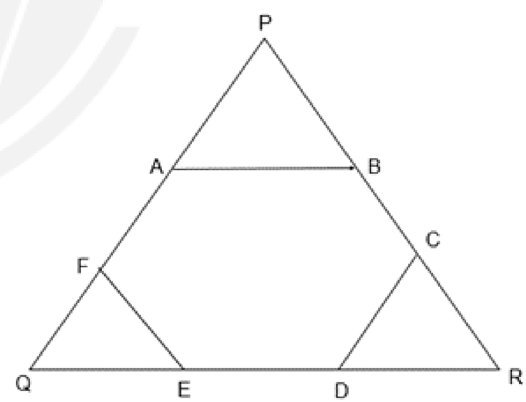
Thus, volume of the building = Volume of the cone + Volume of the cylinder

=> Volume = $\pi\ r^2 h_1 + \frac{1}{3\pi\ r^2 h_2}$

=> Volume = $\pi\ (6\sqrt{3} \times 6\sqrt{3} \times 12 + \frac{1}{3} \times\ 6\sqrt{3} \times 6\sqrt{3} \times 18)$

=> Volume = $1944\pi\ m^3$(Ans)

Q27 Text Solution:



In the above fig,

AF = FE = AB are the sides of the regular hexagon.

But, FE = FQ and AB = AP as well.

Thus, AP = AF = QF = $9\sqrt{3}$ cm

As a result, area of the regular hexagon can be calculated as -

$A = 3\frac{\sqrt{3}}{2} \times 9\sqrt{3} \times \ 9\sqrt{3} = 631.33\ cm^2$ (Ans)

Q28 Text Solution:

Let the radius of the circles be 'r'

So, $2\pi\, r \ = \pi\, r^2 \ => \ r \ = \ 2$

If r = 2, then the diameter of each of the circles is 4. Thus the side of the square is 2 x diameter = 8 cm

Hence the area not occupied by the circles can be calculated as -

= Total area of square - 4 x area of circle

$= 8 \ \times \ 8 - 4x\ \pi\ (2)^2$

$= 64 - 16\pi$

= 64 - 16(3.14)

= 64 - 50.24

$= 13.76$ (Ans)

Q29 Text Solution:

Let the radius be 'r' and the height be 'h' for both the cone and cylinder.

CSR of the cylinder = $2\pi\ rh$

Slant height of the cone $= l = \sqrt{(h^2 \ + \ r^2)}$

So, CSA of cone $= \pi\ rl \ = \pi\ r\sqrt{(h^2 \ + r^2)}$

Now, $\frac{\pi\ r\sqrt{(h^2 + r^2)}}{2\pi\ rh}$ = 17 : 16

Solving this,

=> r : h = 15 : 8 (Ans)

Q30 Text Solution:

Here we will apply the relation between the inradius and circumradius of an equilateral triangle.

Note: If inradius is 'r' and circumradius is 'R', then for an equilateral triangle with side 'a',
$R = \frac{a}{\sqrt{3}}$ ***and*** $r = \frac{a}{2\sqrt{3}}$***. Thus R : r = 2 : 1***

Now, the side of the bigger equilateral triangle is $20\sqrt{3}\ cm$. The circle inscribed in it will be its incircle.

Thus radius of the circle, $r = \frac{20\sqrt{3}}{2\sqrt{3}} = \ 10$

Now, this circle becomes the circumcircle for the smaller equilateral triangle. Thus its radius will be the circumradius of the smaller equilateral triangle.

Let the side of the smaller equilateral triangle be 'b'

So, $\frac{b}{\sqrt{3}} = 10$

$=> b = 10\sqrt{3}$

Thus, the area of the small equilateral triangle

= $\sqrt{\frac{3}{4}} \times \ \left(10\sqrt{3}\right)^2 \ = \ 75\sqrt{3}\ cm^2$ (Ans)