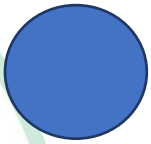
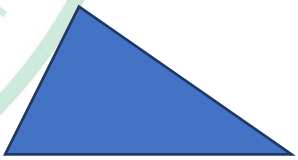
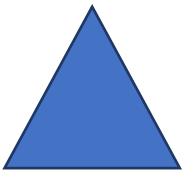
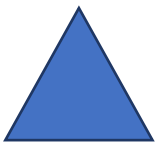
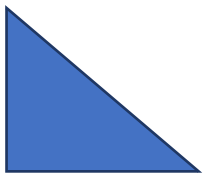
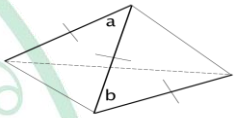
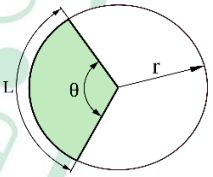
MANIDHANAEYAM FREE IAS ACADEMY – TNPSC - PRELIMINARY EXAM

UNIT – X – APTITUDE & MENTAL ABILITY

AREA & VOLUME

Mensuration- 2D

Shape	Area	Perimeter/ Circumference	Figure
Square	a^2	4a	
Rectangle	l × b	2 (l + b)	
Circle	πr^2	2 π r	
Semi-circle	$\pi r^2/2$	r (π+2)	
Quarter Circle	$\pi r^2/4$	$(\pi r/2)+2r$	
Scalar Triangle	√[s(s–a) (s–b)(s–c)], Where, s = (a+b+c)/2	a+b+c	
Isosceles Triangle	½ × b × h	2a + b	
Equilateral Triangle	$(\sqrt{3}/4) \times a^2$	3a	

Right Angle Triangle	½ × b × h	b + hypotenuse + h	
Rhombus	½ × d_1 × d_2	4 × side	
Parallelogram	b × h	2(l+b)	
Quadrilateral	½×d×(h_1+h_2)	a+b+c+d	
Trapezium	½ h(a+c)	a+b+c+d	
Sector	$\pi r^2 \times (\frac{\theta}{360})$	2r+L	

Q.1) The area of a rectangular land is 240m². If 8 CM is decreased from its length it will become a square. Then the length and breadth of the land respectively are...

(A) 12 cm, 20 cm

(B) 20 cm, 12 cm

(C) 12 cm, 8 cm

(D) 20 cm, 8 cm

Ans: B

Solution: Let the breadth of the given rectangle be 'X' cm.

Then, length (X + 8) cm

Now area 240cm²

Area of rectangle=length x breadth= (x + 8) x x =240

x^2+8x-240= 0

x = 12 or x = —20

But x cannot be negative, So, x 12

Hence, length= x + 8 =12 + 8= 20cm and breadth= 12cm

Q.2) Find the side of the equilateral triangle if the area of an equi-lateral triangle is $900\sqrt{3}$ cm²

(A) 30 cm

(B) 90 cm

(C) 60 cm

(D) 120 cm

Ans: 60

Solution: The area of equilateral triangle is 90 cm²

Since, the area of equilateral triangle = $\frac{\sqrt{3}}{4}a^2$

Therefore, $\frac{\sqrt{3}}{4}a^2 = 900\sqrt{3}$

$a^2 = 4 \times 900 \rightarrow a=60$

Q.3) The semi perimeter of a triangle having sides 15 cm, 20 cm and 25 cm is

(A) 60

(B) 65

(C) 30

(D) 35

Ans: C

Solution: Perimeter of a triangle= Sum of their side lengths= A+B+C

Perimeter= 15+20+25= 60

So, Semi-perimeter= 60/2= 30

Q.4) Find the area of a semicircle whose radius is 28 cm.

(A) 618 cm²

(B) 144 cm²

(C) 1232 cm²

(D) 784 cm²

Ans: B

Solution: Area of semi-circle= $\pi r^2/2$

= (1/2) x (22/7) x 28 x 28

$=1232cm^2$

Q.5) A horse is tethered to one corner of a rectangular field of dimensions 60 m by 42 m by a rope 14 m long for grazing. How much area can? The horse left ungrazed?

(A) 2366 m^2

(B) 1827 m^2

(C) 1366 m^2

(D) 2212 m^2

Ans: A

Solution: Area of the grazed field = $(\frac{\theta}{360}) \times \pi r^2$

Area of the grazed field = $(\frac{90}{360}) \times \pi \times 14 \times 14 = 154\ m^2$

Total area of the field = 60 x 42 = 2520 m^2

Area left ungrazed = Total area of the field - Area of the grazed field

= 2520 -154= 2366 m^2

Q.6) The radius of a cart wheel is 35 cm. How many revolutions does it make in travelling a distance of 154 m

(A) 70

(B) 189

(C) 119

(D) 86

Ans: A

Solution: According to the question, We need to cover 154 m distance

154 m = 15400 cm

The distance cover in one revolution = $2\pi r$

$\Rightarrow$ 2x (22/7) x 35 = 220 cm

Number of revolutions = 15400/220 = 70

Q.7) The sides of a triangle are 8 m, 10 m and 6 m, then the area of the triangle is

(A) 18 m^2

(B) 24 m^2

(C) 86 m^2

(D) 72 m^2

Ans: B

Solution: Area of Scalar Triangle= $\sqrt{[s(s-a)\ (s-b)(s-c)]}$, Where, s = (a+b+c)/2

$s = \frac{8+10+6}{2} = 12$

$Area = \sqrt{(12(12-8)(12-10)(12-6))}$

Area= 24 m^2

Q.8) The ratio of length and breadth of a rectangle is 3:2 respectively. The respective ratio of its perimeter and area is 5:9. What is the breadth of the rectangle in metres?

(A) 6 m

(B) 8 m

(C) 9 m

(D) 13 m

Ans: A

Solution: The breadth of the rectangle is 6m.

The ratio of Length and Breadth= 3:2

Let the length and breadth be 3x and 2x respectively

Perimeter of the rectangle= 2(3x + 2x) = IOX

Area of the rectangle= 3x x 2x = $6x^2$

Now the ratio of perimeter and area is given as 5:9

So, we can form the equation as: $10x/6x^2 = 5/9 \Rightarrow x = 3$

Hence, the breadth of the rectangle is 2x = 2 x 3 = 6m

Q.9) If the side of a square is increased by 20%. Then its area is increased by

A) 20%

B) 40%

C) 60%

D) 44%

Ans: D

Solution: Assume initial Area Percentage= 100%

If Area is increased by 20%, then new area percentage= 100 x (120/100) x (120/100)= 144%

Then, Increased area percentage is 44%

Q.10) Find the length of the altitude of an equilateral triangle of sides $3\sqrt{3}$ cm

(A) 5.4

(B) 4.5

(C) 4.0

(D) 4.2

Ans: B

Solution: Side of an equilateral ΔABC= $3\sqrt{3}$ cm.

AC=BC = $3\sqrt{3}$ cm

Let AD = h (Altitude)

BD = $3\sqrt{3}$ /2 (ALTITUDE BISECTS THE BASE)

$AB^2 = AD^2 + BD^2 \Rightarrow (3\sqrt{3})^2 = h^2 + (3\sqrt{3}/2)^2$

$27 = h^2 + (27/4) \Rightarrow h^2 = 27 - (27/4) = 81/4$

h= 9/2= 4.5 cm

Q.11) What would be the measure of the diagonal of a square whose area is equal to 882 cm^2?

(A) 38 cm

(B) 42 cm

(C) 32 cm

(D) 48 cm

Ans: B

Solution: Area of a square = 882 sq.cms

Area= $(Side)^2$ = 882

Side = $\sqrt{882}$

Diagonal of a square = $\sqrt{2}$ x side= $\sqrt{882} \times \sqrt{2}$

Diagonal of a square = 42 cm

Q.12) The radius and length of arc of a sector are 10 cm and 15 cm respectively. Find its perimeter?

(A) 35 cm

(B) 15 cm

(C) 25 cm

(D) 30 cm

Ans: A

Solution: Perimeter of Sector= 2r+L= (2 x 10) + 15= 35 cm

Q.13) In a circle of radius 10 cm, an arc subtends an angle of 90° at the centre. Find the area of major sector.

(A) 1650/3 cm^2

(B) 1650/9 cm^2

(C) 1650/11 cm^2

(D) 1650/7 cm^2

Ans: D

Solution: Area of arc= $\pi r^2 \times (\frac{\theta}{360}) = (22/7) \times 10 \times 10 \times (\frac{90}{360}) = \frac{1650}{7}$ cm^2

Q.14) The perimeter of a rectangle is 60 metres. If its length is twice its breadth, then its area is

(A) 160 m^2

(B) 180 m^2

(C) 200 m^2

(D) 220 m^2

Ans: C

Solution: Let the breadth of the rectangle be x metres

Then, length of the rectangle = 2x metres

Perimeter of rectangle=2 (Length + Breadth) = 2(2X + X) = 60

So, length = 20 m, breadth = 10 m

Area = (20 x 10) = 200 m^2

Q.15) In a circular path, the radii of 2 concentric circles are 56 m and 49 m. Find the area of the circular path.

(A) 3210 m^2

(B) 3120 m^2

(C) 2310 m^2

(D) 2130 m^2

Ans: C

Solution: Let R ,r are radii of two concentric circles.

R = 56 cm ,r = 49 cm

area of the pathway = $\pi R^2 - \pi r^2$

$= \pi$ (56 +49) (56-49) = (22/7) 105 x 7

= 22 x 105= 2310 cm^2

Q.16) A playground 60 m x 40 m is extended on all sides by 3 m. What is the extended area

(A) 366 m^2

(B) 636 m^2

(C) 666 m^2

(D) 638 m^2

Ans: B

Solution: Length of rectangular park with path= 60 + 3 + 3= 66m

Breadth of rectangular park with path= 40 + 3 + 3 =46m

Area of path= Area of park with path-Area of park without path

=(66 x 46)-(60 x 40)=3036 – 2400= 636 m^2

Q.17) The measures of the angles of a triangle are in the ratio 5: 4:3. Find the angles of the triangle?

(A) 65°, 60° and 55°

(B) 85°, 50° and 45°

(C) 75°, 70° and 35°

(D) 75°, 60° and 45°

Ans: D

Solution: Consider angles of triangle is 5x, 4x, 3 x

This property of triangle says that all Angles in a triangle sum up and make 180°

Now following the angle sum property.

5x+ 4x+ 3x =180

12x =180 ⇒x= 15

Angles are 75, 60, 45

Q.18) Breadth of a rectangle is 27 cm less than its length. If the perimeter is 3 m 6 cm then its length and breadth are respectively

(A) 100 cm, 73 cm

(B) 90 cm, 63 cm

(C) 80 cm, 53 cm

(D) 103.5 cm, 76.5 cm

Ans: B

Solution: Let the length be L cm; hence the breadth = (L - 27) cm

Perimeter = 306 = 2 {L + (L - 27)} = 4L - 54

4L = 306 + 54 = 60. OR L = 90 cm

Therefore, Length = 90 cm, Breadth = (90 - 27) = 63 cm

Q.19)The length of a chain used as the boundary of a semi-circular park is 72 m. What is the area of the park?

(A) 77 m^2

(B) 90 m^2

(C) 126 m^2

(D) 308 m^2

Ans: D

Solution: The area or the boundary of semi Circular Park

=> $\pi r + 2r = 72m$

=>$r(\pi + 2) = 72$

=> r = 14 m

Area of the semi circular park $=\pi r^2/2 = \frac{22}{7} * \frac{1}{2} * 14 * 14 = 308\ m^2$

Q.20) The length of building is 40 m and its breadth is 20 m in. A path of the width 1 m is made all round the building outside. Find the area of the path,

(A) 144 m^2

(B) 134 m^2

(C) 124 m^2

(D) 104 m^2

Ans: C

Solution: Area of park= I x b =40 x 20= 800 m^2

Area of park with path is= (42 x 22)= 924 m^2

Therefore, Area of path= Area of park with path — Area of rectangular park

=924-800= 124 m^2

Q.21) Area of trapezium is 960 cm^2. The parallel sides are 40 cm and 60 cm. Find the distance between parallel sides

(A) 18.2 cm

(B) 19.2 cm

(C) 20.4 cm

(D) 21.4 cm

Ans: B

Solution: Area of trapezium=960= ½ h(a + c)= ½ x h x (40+60)$\Rightarrow h = 19.2\ cm$

Q.22) The area of field is the shape of trapezium measures 1440 m^2. The perpendicular distance between parallel sides is 24m. If the ratio of parallel sides is 5:3, then the length of longer parallel side is

(A) 75 m

(B) 60 m

(C) 120 m

(D) 45 m

Ans: A

Solution: Area of trapezium = 1/2(Sum of parallel sides) x Height

1440= ½ x 24 (5x+3x) $\Rightarrow x = 15$

The length of longer parallel side= 5x= 5 x 15= 75

Q.23) If the length of a rectangle is decreased by 50% and the breadth is increased by 80%, then the % change in the area of rectangle is

(A) Decreased by 10%

(B) Increased by 10%

(C) Decreased by 20%

(D) Increased by 20%

Ans: A

Solution: change in the area of rectangle= 100 x (50/100) x (180/100) = 90%. So, decreased by 10%

Q.24) A plot of land is in the form of a quadrilateral where one of its diagonals is 100 m long. If two vertices on either side of this diagonals are 50 m away from the diagonal. Find the area of the plot of land

(A) 5000 m^2

(B) 1000 m^2

(C) 10000 m^2

(D) 500 m^2

Ans: A

Solution: Length of the diagonal = 100 m

Two vertices on either side of diagonal=50m.

Total length of two vertices = 50x2 = 100m

so, area of the plot = 5000m^2

Q.25) A rectangular swimming pool 60 m long, 40 m wide and 1.5 m deep is to be tiled. If the side of the square tile is 50 cm. Find the number of tiles needed.

(A) 10200

(B) 20400

(C) 10800

(D) 20800

Ans: C

Solution: Total area to be tiled = (60 x 40) + (2 x 1.5 x 40) + (2 x 1.5 x 60)

= 2400 + 120 + 180 = 2700 m^2

Area of one square tile = 0.5 x 0.5 = 0.25 m^2

Number of square tiles = 2700/0.25 = 10800 tiles

Q.26) The sides (in cm.) of a right-angled triangle are x-1, x, x +1. Then area of the right-angled triangle is

(A) 12 sq. cm.

(B) 20 sq. Cm.

(C) 6 sq. cm.

(D) 22 sq. cm.

Ans: C

Solution: As it is a right-angled triangle, we apply Pythagoras theorem

Therefore, $(x-1)^2 + x^2 = (x+1)^2$

$x^2 - 4x = 0 \Rightarrow x = 4$

So, other sides are 3 and 5

Area right angle triangle= ½ × b × h= ½ × 3 × 4= 6 cm^2

Q.27) ABCD is parallelogram. P and Q are the mid-points of sides BC and CD respectively. If the area of ΔABC is 12 cm^2, then the area of ΔAPQ is

(a) 12 cm2

(b) 8 cm2

(c) 9 cm2

(d) 10 cm2

Ans: C

Solution: Δ APQ= 3/8 (■$ABCD$)

=3/4 (ΔABC)

= (3/4) x 12= 9 sq.cm.

Q.28) Perimeter of a rhombus is 2p unit and sum of length of diagonals is m unit, then area of the rhombus is

(a) (1/4) m^2 p sq unit
(b) (1/4) mp^2 sq unit
(c) (1/4) (m^2- p^2) sq unit
(d) (1/4) (p^2- m^2) sq unit
Ans: c
Solution: (1/4) (m^2- p^2) sq unit

Q.29) The outer and inner diameter of a circular path be 728 metre and 700 metre respectively. The breadth of the path is

(a) 7 metres
(b) 28 metres
(c) 14 metres
(d) 20 metres
Ans: C
Solution: Width of path = Outer Radius - Inner Radius = 364 - 350 = 14 m

Q.30) In a rhombus ABCD, ĐA = 60° and AB = 12 cm. Then the diagonal BD is

(a) 10 cm
(b) 2 √3 cm
(c) 6 cm
(d) 12 cm
Ans: D
Solution: In rhombus ABCD Using cos θ=B/H
cos 60°=BD/12 ⇒½= BD/12 ⇒2BD=12cm

Q.31) The perimeter of a sheet of paper in the shape of a quadrant of a circle is 75 cm. Its area would be?

(a) 100 cm2
(b) 346.5 cm2
(c) 693 cm2
(d) 512.25 cm2
Ans: B

Solution: Perimeter $=(\pi r/2) + 2r \Rightarrow 75 = (22\ r/14) + 2r$

$75= 50r/14 \Rightarrow r= 21$

Area of quadrant= $=\pi r^2/4= (1/4) \times (22/7) \times 21 \times 21= 346.5\ cm^2$

Q.32) The hypotenuse of a right–angled triangle is 39 cm and the difference of other two sides is 21 cm. Then, the area of the triangle is

(a) 270 sq. cm
(b) 450 sq. cm
(c) 540 sq. cm
(d) 180 sq. cm

Ans: A

Solution: 270 cm^2

Q.33) Calculate the perimeter of a quadrant of a circle of radius 21 cm.

(A) 65 cm
(B) 44 cm
(C) 75 cm
(D) 88 cm

Ans: C

Solution: Perimeter $=(\pi r/2)+2r= ((1/2) \times (22/7) \times 21) + (2 \times 21)= 75$ cm

Q.34) If the diagonal of a square is 10 cm, then the side of the square is

(A) $5\sqrt{2}$ cm
(B) $2\sqrt{5}$ cm
(C) $3\sqrt{5}$ cm
(D) $5\sqrt{3}$ cm

Ans: A

Solution: According to Pythagoras theorem, $a^2+ a^2=10^2$

$2\ a^2= 10^2 \Rightarrow a = 5\sqrt{2}$ cm

Q.35) A school auditorium is 45 m long and 27 m wide. This auditorium is surrounded by a veranda of width 3 m on its outside. Find the area of the veranda

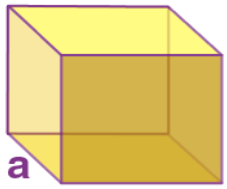
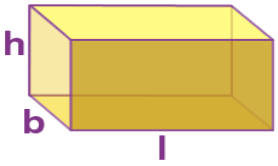
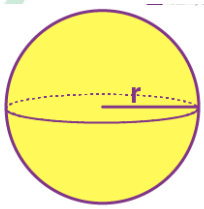
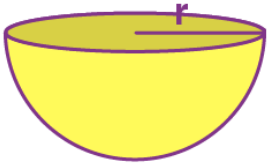
(A) 864 m^2
(B) 846 m^2
(C) 468 m^2

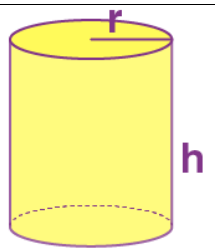
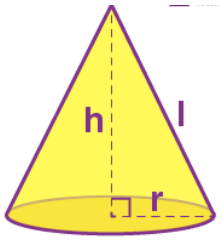
(D) 648 m^2

Ans: C

Solution: Area of the veranda= Area of auditorium with veranda- Area of auditorium
= (51 x 33)-(45 x 27) = 468m^2

Mensuration- 3D

Shape	Volume (Cubic Units)	Curved Surface Area (CSA) or Lateral Surface Area (LSA) (Square units)	Total Surface Area (TSA) (Square units)	Figure
Cube	a^3	LSA = 4 a^2	6 a^2	
Cuboid	$l \times b \times h$	LSA = 2h(l + b)	2 (lb +bh +hl)	
Sphere	(4/3) π r^3	4 π r^2	4 π r^2	
Hemi-Sphere	(⅔) π r^3	2 π r^2	3 π r^2	

Cylinder	$\pi r^2 h$	$2\pi r h$	$2\pi rh + 2\pi r^2$	
Cone	$(\frac{1}{3}) \pi r^2 h$	$\pi r l$	$\pi r (r + l)$	

Q.1) Volume of a hollow sphere is 11352/7 cm^3. If the outer radius is 8 cm, find the inner radius of the sphere

(A) 6cm

(B) 8 cm

(C) 5 cm

(D) 7 cm

Ans: C

Solution: Now, given that V= 11352/7 cm^3

$\Rightarrow 34\pi(R^3-r^3)= 11352/7$

$\Rightarrow 34\times(22/7)(8^3-r^3)= 11352/7$

$512-r^3=387 \Rightarrow r^3=125=5$

Hence, the inner radius, r=5cm.

Q.2) If the ratio of radius of two spheres is 4:7, the ratio of their volume is

(A) 4: 7

(B) 64: 343

(C) 49: 16

(D) 16: 49

Ans: B

Solution: Ratio of radii of 2 spheres is 4: 7.

Ratio of their volume $=4^3 : 7^3 = 64: 343$

Q.3) The slant height of a right circular cone is 13 m and its height is 5 m. Find area of the curved surface.

1. 490.28 m^2
2. 288.28 m^2
3. 450m^2
4. 200 m^2

Ans: A

Solution: Area of curved surface = πrl

Now r = √(132 - 52) = √169 - 25 = √144 = 12m

Required Area= (22/7) x 13 x 12 = 490.28m^2

Q.4) Ratio of Volumes of cube and Sphere is 6/π. Find the ratio of side of cube and radius of sphere.

(A) 2: 1

(B) 3: 1

(C) 4: 1

(D) 5: 1

Ans: A

Solution: Let the side of cube is 'a' and radii of sphere is 'r'.

Now Volume of cube= a^3

Volume of sphere= 4/3π x r^3

a^3 / (4/3) π r^3 = 6 / π

a / r = 2 / 1

Q.5) How many coins 3 mm thick and 1.2 cm in diameter should be melted in order to form a right circular cylinder, having base diameter 4 cm and height 27 cm?

(A) 850

(B) 950

(C) 980

(D) 1000

Ans: D

Sol: Let the number of coins be n. We have

n x π x (1.2/2)2 x 0.3 = π (4/2)2 x 27

⇒ n = 1000

Q.6) **An open rectangular tank is made of concrete, the sides and base being 30 cm thick. Internally the tank is 8m long, 4 m broad and 3 m high. Find its weight in kg, if concrete weighs 1 kg per 1000 cubic centimetre.**

(A) 34,548 kg

(B) 44,416 kg

(C) 39,416 kg

(D) 40,000 kg

Ans: A

Solution: The outer dimensions are 8.6 x 4.6 x 3.3 m.

So volume of the block = 8.6 x 4.6 x 3.3 – 8 x 4 x 3 = 130.548 - 96 = 34.548 cu. m = 34548000 cu cm,

Weight of the block =34548000/1000 = 34548 kg.

Q.7) In a cylinder, if radius is doubled and height is halved. then what happens to the curved surface area?

(A) Halved

(B) Doubled

(C) Does not change

(D) Four times

Ans: C

Solution: Original curved surface area= $2\pi rh$

New curved surface area= $2\pi\ (2r)\ (\frac{h}{2}) = 2\pi rh$ so, Does not change

Q.8) The length, breadth and height of a hall are 8 m, 10 m, 4 m respectively and the hall has one door of area 3 m x 1.5 m. Find the cost of painting the walls at the rate of 200 per square metre.

(A) Rs. 28,800

(B) Rs. 59,900

(C) Rs. 27,900

(D) Rs. 29,900

Ans: C

Sol: Surface area of the room = 2(l + b) X h

= 2 * (8+10) * 4

= 2(18) * 4=144 m^2

Area of the door =1 * b = 3 x1.5 = 4.5 m^2

Area of the wall: 144 - 4.5 = 139.5 m^2

Cost of painting per square metre = Rs.200

Cost of painting per square metre 139.5 x 200 = Rs.2790

Q.9) If the capacity of a cylindrical tank is 1848 m^3 and the diameter of its base is 14 m, then find the depth of the tank?

(A) 12 m

(B) 13 m

(C) 14 m

(D) 15 m

Ans: A

Sol: Volume of cylinder=1848= $\pi r^2 h = \pi * 7 * 7 * h \Rightarrow h = 12m$

Q.10) Three solid metal cubes, whose edges are 6 cm, 8 cm and 10 cm are melted and a new cube is made. Find the length of edge of the new cube.

(A) 12 cm

(B) 24 cm

(C) 20 cm

(D) 48 cm

Ans: A

Sol: Volume of the new cube = Sum of the volumes of all the three smaller cubes

$6^3 + 8^3 + 10^3 = a^3 \quad \Rightarrow a^3 = 1728 \Rightarrow a = 12cm$

Q.11) A heap of paddy is in the form of a right circular cone whose diameter is 4.2 m and height 2.8 m. If the heap is to be covered exactly by a canvas to protect it from rain, find the area of the canvas required.

(A) 22.6 m^2

(B) 27.2 m^2

(C) 23.1 m^2

(D) 11.3 m^2

Ans: C

Sol: diameter =4.2 m, radius =2.1 m Also given, height =2.8 m

Let 'l' be the slant height of the cone

$l = \sqrt{(h^2 + r^2)} = \sqrt{(2.8^2 + 2.1^2)} = \sqrt{12.25} = 3.5$ m

Curved surface area of cone $=\pi rl = 722\times2.1\times3.5 =23.1\ m^2$

Q.12) The radii of two right circular cylinders are in the ratio 4:3 and their heights are in the ratio 7:4 then the ratio of their curved surface areas is in the ratio

(A) 3:5

(B) 5:3

(C) 3:7

(D) 7:3

Ans: D

Solution: $S2/S1=2\pi r_1h_1/2\pi r_2h_2=(4/3)^* (7/4)=7:3$

Q.13) A wall is to be constructed with length 60 m, breadth 3 m and height 5 m. How many bricks are required to construct a wall with length 30 cm, breadth 15 cm and height 20 cm?

(A) 135,000

(B) 150,000

(C) 175,000

(D) 100,000

Ans: D

Solution: Number of bricks= Volume of wall/ volume of brick= $(60^*3^*5)/(0.3^*0.15^*0.2)= 100,000$

Q.14) Using the clay, Malar makes a cone, a hemisphere and a cylinder have equal bases and the heights of the cone and a cylinder are equal. They same as the common radius then find the ratio of their respective volumes

(A) 1:2:3

(B) 1:2:4

(C) 1:2:6

(D) 1:2:8

Ans: A

Solution: Bases of a cone, hemisphere and a cylinder are same Let radius of each = r and height of each = r

Volume of cone $=1/3\pi r^2\times r=1/3\pi r^3$

Volume of hemisphere $=2/3\pi r^3$

volume of cylinder $=\pi r^2(r)=\pi r^3$

ratio in their volumes $=(1/3)\pi r^3:(2/3)\pi r^3:\pi r^3=1/3:2/3:1=1:2:3$

Q.15) Spherical metal ball of radius 6 cm is melted and casted into small spherical balls having diameter 6 mm. How many small balls can be casted

(A) 1000

(B) 2000

(C) 6000

(D) 8000

Ans: D

Solution: Number of balls= Volume of Sphere/ Volume of spherical ball

Number of small balls $= \{(4/3) \times (22/7) \times 6 \times 6 \times 6\} / \{(4/3) \times (22/7) \times 0.6 \times 0.6 \times 0.6\} = 8000$

Q.16) The radii of two circular ends of a frustum shaped bucket are 15 cm and 8 cm. If its depth is 63 cm, find the capacity of the bucket in litres

(A) 2.6994 litres

(B) 269.94 litres

(C) 26.994 litres

(D) 2699.4 litres

Ans: C

Solution: The volume of the bucket (frustum)$=(1/3)\pi(R^2+r^2+Rr)$

$=(1/3)\times(22/7)\times63\times(15^2+8^2+15\times8)=29664/1000$ litres

Thus, the capacity of the bucket =26.994 litres.

Q.17) Using clay, a student made a right circular cone of height 48 cm and base radius 12 cm. Another student reshapes it in the form of sphere. Find the radius of the sphere.

(A) 12 cm

(C) 9 cm

(B) 15 cm

(D) 14 cm

Ans: A

Solution: $(4/3)\pi r^3=(1/3)\times\pi\times(12)^2\times(48) \Rightarrow 4\times r^3=(12)2\times(48)$

$r^3=(12)^3 \Rightarrow r=12$ cm

Q.18) The radius of a spherical balloon increases from 7cm to 14 cm as air is being pumped into it. Find the ratio of surface areas of the balloon in two cases

. (A) 1: 27

(B) 1: 4

(C) 1: 9

(D) 1: 8

Ans: B

Solution: Given radius r1=7 cm, r2=14 cm

Initial surface area (r1=7)=$4\pi r^2$ =4×(22/7)×7×7 =616 cm^2

Surface area (r2=14)=$4\pi r^2$=4×(22/7)×14×14 =2464 cm^2

Ratio of surface area =2464/616=1/4

Q.19) The volume of a solid hemisphere is 29106 cm^3. Another hemisphere whose volume is two-third of the above is carved out. Find the radius of the new hemisphere.

(A) 21.5 cm

(B) 12 cm

(C) 21 cm

(D) 23 cm

Ans: C

Solution: The volume of hemisphere = 29106 cm3

Let the radius of another hemisphere = R

The volume of new hemisphere = 2/3 x 29106 = 19404 cm3

(2/3) πR^3 = 19404 ⇒19404 x 3/2 x 7/22

9261 = $r^3 \Rightarrow r = 21$

Q.20) A hemispherical tank of radius 1.75 m is full of water. It is connected with a pipe which empties the tank at the rate of 7 litres per second, how much time will it take to empty the tank completely?

(A) 27 minutes

(B) 26 minutes

(C) 72 minutes

(D) 62 minutes

Ans: A

Solution:

$$7000\,x = \frac{2}{3}\times\frac{22}{7}\times\underline{175}\times 175\times 175$$

$$x = \frac{2}{3}\times\frac{22}{7}\times\frac{175\times175\times175}{7000}$$

$$= 1604.16 \text{ seconds}$$

$$x = \frac{1604.16}{60} \text{ minutes}$$

$$x = 26.73 \text{ minutes}$$

$$\cong 27 \text{ minutes}$$

Q.21) The length, breadth and height of a room are respectively 12 metres, 9 metres and 6 metres. How many cubic boxes are needed to fill the room if the Bide of each box is 1.5 metres?

(A) 1072

(B) 648

(C) 324

(D) 192

Ans: D

Solution: Volume of room = l*b*h = 12 * 9 * 6 = 648 m^3

volume of one cubic box = a^3= (1.5)^3= 3.375 m^3

so no of boxes required = 648/3.375 = 192

Q.22) A hollow cylindrical iron pipe is of length 35 cm. Its outer and inner diameters are 10 cm and 8 cm respectively, Find the weight of the pipe if 1 cu.cm of iron weighs 7 gm.

(A) 6.93 kg

(B) 9.90 kg

(C) 7.53 kg

(D) 7,93 kg

Ans: A

Solution: volume of the hollow cylinder = $V = \pi R^2h - \pi r^2h$

$V = (22/7)\times35\times((10/2)^2 - (8/2)^2) = 990\ cm^3$

Weight of 1 cm^3 of the metal = 7 gm/cm^3

m = 990 × 7 gm= 6930 gm= 6.93 kg

Q.23) Two iron sheets spherical in shape each of diameters 6 cm are immersed in the water contained in a cylindrical vessel of radius 6 cm. the level of the water in the vessel will be raised by?

(a) 1 cm

(b) 2 cm

(c) 3 cm

(d) 6 cm

Ans: B

Solution:

$$2 \times \left(\frac{4}{3} \times \pi \times r^3\right) = \pi R^2 h$$

$$\Rightarrow 2 \times \frac{4}{3} \times \pi \times 27 = \pi \times 36 \times h$$

$$h = \frac{27 \times 4 \times 2}{36 \times 3}$$

$$\Rightarrow h = \frac{8 \times 27}{3 \times 36} = 2cm$$

Q.24) Total surface area of hollow hemisphere is equal to

(A) $2\pi(R^2 + r^2)$ sq. units

(B) $2\pi(R^2 - r^2)$ sq. units

(C) $\pi(R^2 + r^2)$ sq. units

(D) $\pi(3R^2 + r^2)$ sq. units

Ans: B

Solution: π $(3R^2 + r^2)$ sq. units

Q.25) The cylinder whose base is not in circular form is called

(A) Circular cylinder

(B) Right circular cylinder

(C) Oblique cylinder

(D) Irregular Cylinder

Ans: C

Solution:

(1) If the base of a cylinder is not circular then it is called Oblique cylinder.

(2) If the base is circular but not perpendicular to the axis of the cylinder, then the

cylinder is called Circular cylinder.

(3) If the axis is perpendicular to the circular base, then the cylinder is called Right circular cylinder.

Q.26) A circus tent is cylindrical to a height of 3 m and conical above it. If the base radius is 52.5 m and slant height of the cone is 53 m, find the area of canvas required to make the tent.

(A) 315 π m^2

(B) 3097.5 π m^2

(C) 2782.5 π m^2

(D) 9735 π m^2

Ans: B

Solution: C.S.A of cylinder $=2\pi rh$

C.S.A. of conical portion $S2=\pi rl$

Area of canvas of tent $=S1+S2=2\pi rh+\pi rl=\pi r(2h+l)$

$=(\pi)\times 52.5(3\times 2+53)=3097.5\ \pi\ m^2$

Q.27) The breadth, height and volume of a cuboid are 10 cm, 11 cm and 3080 cm3 respectively. Find the length of the cuboid.

(A) 21 cm

(B) 28 cm

(C) 24 cm

(D) 30 cm

Ans:

Solution: Vol. of Cuboid=I x b x h = L x 10x11=3080 ⇒L= 3080/110=28cm

Q.28) The radius and height of cylinder and cone are equal. If the volume of cylinder is 120 cm^3, then the volume of cone is

(A) 90 cm^3

(B) 40 cm^3

(C) 30 cm^3

(D) 100 cm^3

Ans: B

Solution:

Volume of a right circular cone = $(1/3)\pi r^2h$

Volume of right circular cylinder = πr^2h

Volume of a right circular cone = (1/3) Volume of right circular cylinder= (1/3) * 120= 40 cm^3

Q.29) A rectangular paper of width 14 cm is rolled along with its width and a cylinder of radius 20 cm is formed. Find the volume of the cylinder.

(A) 980 cc

(B) 1400 cc

(C) 1960cc

(D) 17600 cc

Ans: D

Solution: Radius of cylinder = r= 20 cm.

Volume of the cylinder = $\pi r^2h = (22/7)\times20\times20\times14 = 17600cm3$

Q.30) Surface Area of a hemisphere is 2772 cm^2. Then the total surface area of hemisphere is

(A) 4158 cm^2

(B) 3882 cm^2

(C) 3172 cm^2

(D) 4258 cm^2

Ans: A

Solution: CSA of hemisphere = $2\pi r^2$

$$\Rightarrow 2\pi r^2 = 2772 = 2 \times \frac{22}{7} \times r^2 = 2772$$

$$\Rightarrow r^2 = \frac{2772\times7}{2\times22} = 441 \Rightarrow r = 21 \text{ cm}$$

TSA of hemisphere = $3\pi r^2 = 3 \times \frac{22}{7} \times 21 \times 21 = 4158$ cm

Q.31) The volume of a sphere-shaped shot-put is 310.464 cu.cm, then the radius is

(A) 4.2

(C) 6.4

(B) 4.8

(D) 8.4

Ans: D

Solution: Volume of shot-put, $V=(4/3)\pi r^3 = 310.464$

$310.464= (4/3)*(22/7)* r^3 \Rightarrow r = 8.4$ cm

Q.32) What is the volume of a cube whose diagonal measure is $4\sqrt{3}$ c.m?

(A) 16

(B) 19

(C) 22

(D)64

Ans: D

Solution: Given, diagonal of a cube $4\sqrt{3}$ cm

Let the length of an edge of the cube be x cm

Then diagonal of the cube= $a\sqrt{3} = 4\sqrt{3} \Rightarrow a=4$

volume of the cube= $a^3= 64$ cm^3

Q.33) Three solid cubes of sides 1 cm, 6 cm and 8 cm are melted to form a new cube. Find the total surface area of the cube so formed?

(A) 384 cm2

(B) 486 cm2

(C) 456 cm2

(D) 430 cm2

Ans: B

Solution: Volume of cube formed = volume of cube 1 + volume of cube 2 + volume of cube 3

$a^3= 1^3 + 6^3 + 8^3 = 729$ cm$^3 \Rightarrow a=9$

Surface area of the cube formed $=6 a^2= 6 \times 9 \times 9= 486$ cm^2

Q.34) The ratio of the volume of a cube to that of a sphere which will exactly fit inside the cube is

(A) π:4

(B) 1: π

(C) 6: π

(D) π: 1

Ans: D

Solution: Let the side cube be 'a' cm.

So, the total surface area of the cube = $6a^2$ cm2

And, total surface area of the sphere = $4 \times \pi \times (a/2)^2$ cm2

$4 \times \pi \times (a/2)^2 = 6a^2 \Rightarrow 6 : \pi$

Q.35) A cylindrical shaped well of depth 20m and diameter 14m is dug. The dug out soil is evenly spread to form a cuboid-platform with base dimensions 20m×14m. Find the height of the platform.

(A) 44 m

(C) 22 m

(C) 33 m

(D) 11 m

Ans: D

Solution: 20*14*x=22*7*20

2*x=22

x=11 m