Geometry - 5

Career Launcher

QA - 29

CEX-Q-0230/18

Contents

- Mensuration

Number of Questions : 25

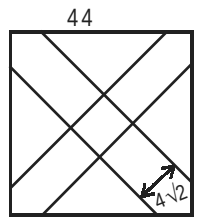
1. A sector of a circle of radius 25 cm and length of arc 44 cm is folded to form a cone. Find the volume of the cone.
   (1) 336 cm^3 (2) 1232 cm^3
   (3) 1272 cm^3 (4) 1562 cm^3

2. If the sum of length of all the edges of a cuboid is 96 cm and the length of the longest diagonal of the cuboid is 15 cm. Then the total surface area (in cm^2) of it is
   (1) 175.5 (2) 275
   (3) 351 (4) 378

3. A field is 250 m long and 60 m wide. A rectangular well of 12m × 5m × 24.9m is dug in the field and the earth from the well is evenly spread over the field. Find the quantum of increase in the level of the field.
   (1) 12 cm (2) 10 cm
   (3) 8 cm (4) 15 cm

4. A cylinder, a hemisphere and a cone, all have the identical base and the same height. The area of their curved surfaces will be in the ratio.
   (1) 1 : 1 : √2 (2) 1 : √2 : 1
   (3) 2 : √2 : 2 (4) √2 : √2 : 1

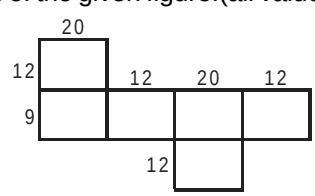
5. Inside a square park of side 44m, a path of $4\sqrt{2}$m width is to be made along both the diagonals of the park. Find the area of the path.



   (1) 672 m^2 (2) 640 m^2
   (3) 608 m^2 (4) 320 m^2

6. Assume that the drop of water is spherical and its diameter is one tenth of a cm. A conical glass has a height equal to the diameter of its rim. If 32000 drops of water fill the glass completely, then the height of the glass (in cm) is
   (1) 3 (2) 1
   (3) 4 (4) 2

7. Find the sum of the longest and shortest diagonal of the cuboid formed by folding the flaps of the given figure.(all values are in cm)



   (1) 150 cm (2) 40 cm
   (3) 25 cm (4) 24 cm

8. A cone resting on its base is cut horizontally into 4 pieces. If the ratio of their heights (from bottom part to upper part) is 3 : 2 : 1 : 2 , find the ratio of the volume of the four parts thus formed, from top to bottom.
(1) 27 : 8 : 1 : 8 (2) 512 : 125 : 27 : 8
(3) 8 : 19 : 98 : 387 (4) None of these

9. A wire of length 264 cm is bent to form a circle (C), a square (S), a triangle (T) and a regular hexagon (H). Which of the following is the correct order of their areas.
(1) T > S > H > C (2) C > H > S > T
(3) C > T > S > H (4) H > S > T > C

10. There are 2 pieces of rectangular paper of sizes 24 × 42 each. The first one is cut into minimum number of squares (m), and the second one is cut into minimum number of squares (n) all of equal size. Find m : n.
(1) 1 : 1 (2) 1 : 2
(3) 5 : 28 (4) 1 : 4

11. A wire of diameter 7 mm is tightly bound around a cylinder to cover it exactly once to make a coil. The cylinder has a height of 196 cm and a radius of 14 cm. Find the approximate length (in cm) of this wire.
(1) 24639 (2) 48976
(3) 46238 (4) 56436

12. There are two sets of glass containers. Set A consists of 3 cylindrical glass containers and set B consists of 3 cuboidal glass containers. The cost of set A is Rs. 700 and the ratio of radii of containers in set A is 2 : 3 : 4, also the height of all containers in set A is equal to the height of smallest container of set A. The cost of set B is Rs. 800 and the ratio of volumes of these containers are in ratio 4 : 8 : 16. Volume of the middle size containers in both the set is same. So which set of container offers a better deal i.e. offers more volume per unit price.
(1) Both offers the same deal
(2) Set A
(3) Set B
(4) Data Insufficient

13. A spherical ball of diameter 4 cm is kept over a hollow cylinder of height 3 cm and volume 9π. Find the height (in cm) of complete structure from the ground.
Type the answer in the box below

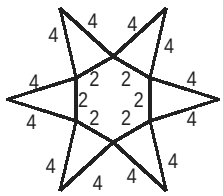
14. The cost of a pizza is directly proportional to the area occupied by the cheese on it. Three sizes of pizzas are available i.e 7 inch, 10 inch and 13 inch for Rs 240, Rs 540 and Rs 960. Which pizza is the best deal (more cheese per Rupee). Also every pizza has an area along the circumference of width 0.5 inch, on which cheese is not applied.
(1) 7 inch (2) 10 inch
(3) 13 inch (4) All deals are same

15. A rectangular swimming pool is 48 m long and 20 m wide. The shallow edge of the pool is 1 meter deep. For every 2.6 m that one walks down along the inclined base of the swimming pool, one looses an elevation of 1 m. What is the volume of water (in cubic meters), in the swimming pool? Assume that the swimming pool is filled up to the brim.
[XAT – 2004]
(1) 960 (2) 12960
(3) 6790 (4) 10560

16. A large solid sphere is melted and molded to form identical right circular solid cones with base radius and height same as the radius of the sphere. One of these cones is melted and molded to form a smaller solid sphere. Then the ratio of surface area of the smaller to the larger sphere is
(1) $1 : 3^{4/3}$ (2) $1 : 2^{3/2}$
(3) $1 : 3^{2/3}$ (4) $1 : 2^{4/3}$

17. A spherical ball of radius 1 cm is dropped into a conical vessel of radius 3 cm and slant height 6 cm. The volume of water (in cm^3) that can just immerse the ball is (ball is enough heavy to settle down)
(1) $\pi/3$ (2) $4\pi/3$
(3) $5\pi/3$ (4) 3π

18. A regular hexagon of side 2 cm has triangular flaps of side 4 cm drawn over each side of the hexagon. Now the hexagon is taken as a base and the triangular flaps are folded to make a hexagonal pyramid. Find the volume of this pyramid.



(1) 12 cm^3 (2) 4 cm^3
(3) $2\sqrt{3}$ cm^3 (4) $\sqrt{3}/2$ cm^3

19. A tank internally measuring 150 cm x 120 cm × 100 cm has 1281600 cm^3 water in it. Porous bricks are placed in the water until the tank is full up to its brim. Each brick absorbs one tenth of its volume of water. How many bricks of 20 cm × 6 cm × 4 cm can be put in the tank without spilling over the water?
(1) 1100 (2) 1200
(3) 1150 (4) 1250

20. A car has four wheels and a stepney. The wheels have a diameter of 56 cm and it makes 400 revolutions in a minute. What is the maximum distance that the car can travel, if the life of a wheel is 120 hours.
(1) 4224 km (2) 5280 km
(3) 6336 km (4) 2112 km

21. A right angled triangle has two sides 15 and 20, which is not its longest side, is revolved about its hypotenuse. Find the volume of the figure thus formed.
(1) 1800π (2) 3600π
(3) 1200π (4) 600π

22. An insect wants to climb to the top of a cylindrical pole of height 66cm and diameter 14cm. If it takes exactly 2 spirals to reach exactly at the top of the point from where it started, what will be the minimum distance travelled by the insect.
(1) 55 cm (2) 110 cm
(3) 220 cm (4) $\sqrt{1573}$ cm

23. An insect wants to go from one vertex of a cuboid of dimension 3 × 4 × 12 to the other vertex which is farthest from this vertex. Find the ratio of shortest distances travelled by the insect when it flies to when it crawls.
(1) 13 : $\sqrt{193}$ (2) 13 : $\sqrt{241}$
(3) 13 : $\sqrt{265}$ (4) None of these

24. A spherical ball of radius 5cm floats on a liquid, but it is partially submerged in the liquid. 8 cm of the height of the shape is visible outside the liquid. If the liquid leaves behind a mark on the ball, find the circumference of this mark.
(1) 4π (2) 6π
(3) 8π (4) 10π

25. Two cylinders of radius 7, height 48 are divided in 2 equal parts in two different ways. One by cutting it horizontally, and other by cutting it vertically. Find the ratio of total surface areas in both the cases.
(1) 278/399 (2) 682/941
(3) 349/504 (4) 682/773

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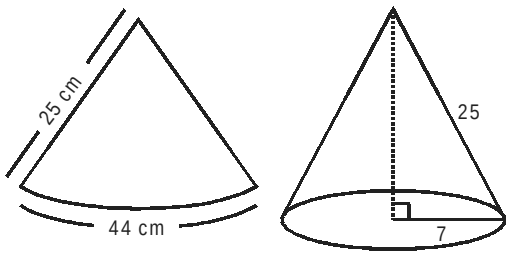
QA - 29 : Geometry - 5
Answers and Explanations

CEX-Q-0230/18

1	2	**2**	3	**3**	2	**4**	4	**5**	2	**6**	3	**7**	2	**8**	3	**9**	2	**10**	3
11	1	**12**	2	**13**	6	**14**	4	**15**	4	**16**	4	**17**	3	**18**	1	**19**	2	**20**	3
21	3	**22**	2	**23**	1	**24**	3	**25**	2										

1. 2



If you fold the arc you will get a cone with length = 25
$2\pi r = 44$

i.e. $2 \times \frac{22}{7} \times r = 44$

$\Rightarrow r = 7$
Now, $h^2 = l^2 - r^2 = 25^2 - 7^2 = 24^2$

$V = \frac{1}{3} \times \pi r^2 h$

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24 = 1232$

2. 3 Sum of all the edges = $4(l + b + h) = 96$

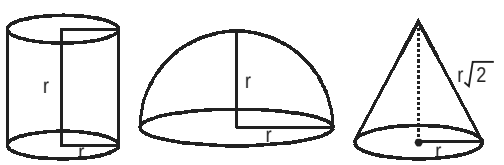
diagonal = $15 = \sqrt{l^2 + b^2 + h^2}$
$l^2 + b^2 + h^2 = 225$
$l + b + h = 24$
$(l + b + h)^2 = 24^2$
$l^2 + b^2 + h^2 + 2 (lb + bh + hl) = 576$
$225 + 2 (lb + bh + hl) = 576$
$2 (lb + bh + hl) = 351$ = Total surface area

3. 2 The area of well = $12 \times 5 = 60 m^2$
depth = 24.9 m

$$\underset{\text{remaining area}}{(250 \times 60 - 60)} \times \underset{\text{increase in height}}{h} = \underset{\text{volume of earth from well}}{60 \times 24.9}$$

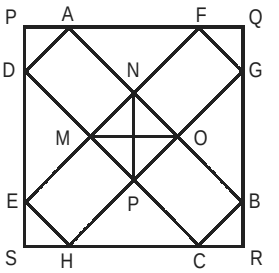
$60(250 - 1)h = 60 \times 24.9$
$\Rightarrow$ h = 0.10 m = 10 cm

4. 4



Ratio of curved surface areas
$= 2\pi r \times r : 2\pi r \times r : \pi \times r \times \sqrt{2}\, r$
$= \sqrt{2} : \sqrt{2} : 1$

5. 2



Area of the path = Area of □ ABCD + Area of □ EFGH + 4 × Area of (ΔAPD) – Area of (□ MNOP)
[As all triangles are congruent and 4 × Area of ΔAPD = Area of (□ MNOP)]
= AB × BC + EF × FG = 2(AB × BC)
$= 2 \times 40\sqrt{2} \times 4\sqrt{2}$
= 2 × 320 = 640.

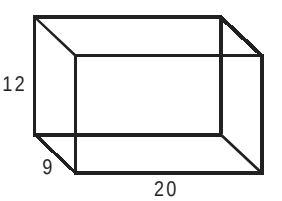
6. 3 Total volume of water drops = Volume of glass

$$32000 \times \frac{4}{3} \times \pi \times \left(\frac{1}{20}\right)^3 = \frac{\pi}{3} \times r^2 \times 2r$$

$$r^3 = \frac{32000 \times 4}{8000 \times 2}$$

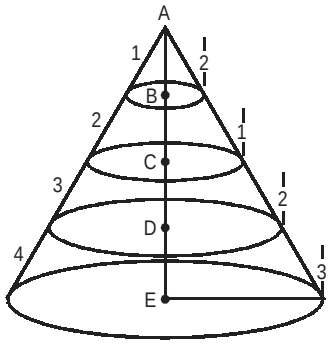
r = 2 cm
h = 2r = 4 cm

7. 2



If you fold the flaps you get a cuboid
Longest diagonal = $\sqrt{12^2 + 9^2 + 20^2} = 25$ cm
Smallest diagonal = $\sqrt{12^2 + 9^2} = 15$ cm
So, sum of diagonals = 25 + 15 = 40 cm

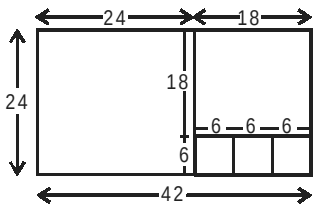
8. 3



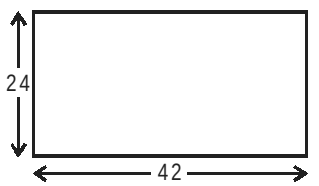
AB : AC : AD : AE = 2 : 3 : 5 : 8
Ratio of the volumes
$\Rightarrow V_1 : V_{1+2} : V_{1+2+3} : V_{1+2+3+4}$
$= AB^3 : AC^3 : AD^3 : AE^3$
= 8 : 27 : 125 : 512
$V_1 : V_2 : V_3 : V_4 = 8 : 19 : 98 : 387$

9. 2 If perimeter is constant, as the number of sides increases areas also increases.
So, C > H > S > T

10. 3

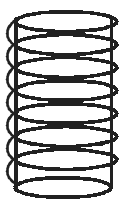


We get 5 squares.



HCF of (24, 42) = 6
So, the identical squares will be off 6 × 6.
Number of squares will be 4 × 7 = 28.
So, the ratio will be 5 : 28.

11. 1



Since separation between two consecutive turns is 7 mm,

number of turns = $\frac{\text{height}}{\text{diameter}} = \frac{196\times10}{7}$

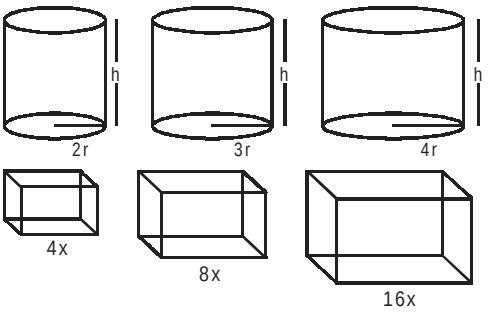
Total length of wire = circumference × number of turns

$= 2 \times \pi \times r \times \frac{\text{height}}{\text{diameter}}$

$= 2 \times \frac{22}{7} \times 14 \times \frac{196\times10}{7} = 24640$ cm.

Since, there will be some shortage of length so length of wire = 24639 cm (approx.)

12. 2



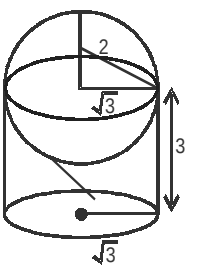
Ratio of volumes of cylindrical boxes = 4 : 9 : 16
Ratio of volumes of cuboidal boxes = 4 : 8 : 16
To equate the volume of the middle box,
Cylinder = 32 : 72 : 128
Cuboid = 36 : 72 : 144
Total volume of cylinder = 232x
Total volume of cuboid = 252x

$\left(\frac{\text{Volume}}{\text{Price}}\right)_A = \frac{232x}{700} = 0.3314x$

$\left(\frac{\text{Volume}}{\text{Price}}\right)_B = \frac{252x}{800} = 0.315x$

$\Rightarrow$ Set A has a better deal.

13. 6



$\pi r^2 h = 9\pi$

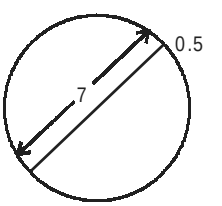
$\Rightarrow r = \sqrt{3}$ [h = 3 cm, given]

$h^2 = 2^2 - (\sqrt{3})^2$

h = 1

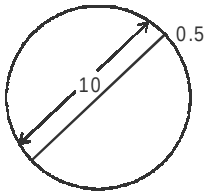
So, the top most point will be 6 cm above the ground.

14. 4



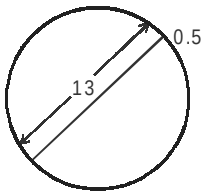
Cheese spread diameter = 6

Area = $\pi \times 3^2$



Cheese spread diameter = 9

Area = $\pi \times 4.5^2$



Cheese spread diameter = 12

Area = $\pi \times 6^2$

Ratio of areas $= 3^2 : 4.5^2 : 6^2$

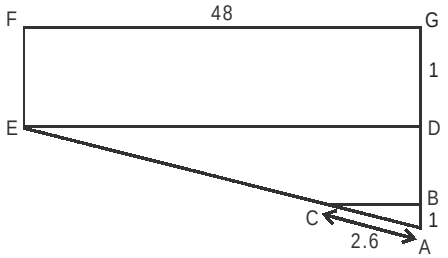
$= 4 : 9 : 16$

Ratio of price $= 240 : 540 : 960$

$= 4 : 9 : 16$

$\Rightarrow$ So, all deals are same.

15. 4



The cross sectional view of pool. For every 2.6 m inclination there is height of 1 m.

$BC^2 = 2.6^2 - 1^2 = 5.76\ m^2$

$BC = 2.4$ m

$\Delta ABC \sim \Delta ADE$

$\frac{BC}{DE} = \frac{AB}{AD}$; $\frac{2.4}{48} = \frac{1}{AD} \Rightarrow AD = 20$ m $\Rightarrow AG = 21$ m

Area of AEFG = $\frac{1}{2} \times 48 \times (1 + 21) = 528\ m^2$

Volume of pool = Area of AEFG × width

$= 528 \times 20 = 10560\ m^3$

16. 4 Let radius of bigger sphere = r

volume of cone = $\frac{1}{3} \times \pi \times r^2 \times h = \frac{1}{3}\pi r^3$

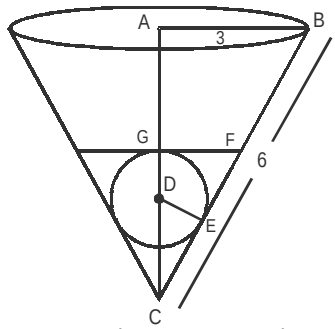
volume of cone = volume of smaller sphere

$\frac{1}{3}\pi r^3 = \frac{4}{3}\pi r_1^3$; $r_1^3 = \frac{1}{4}r^3$; $r_1 = \left(\frac{1}{4}\right)^{1/3} r$

ratio of surface areas = $4\pi r_1^2 : 4\pi r^2$

$= \left(\frac{1}{2^2}\right)^{2/3} r^2 : r^2 = 1 : 2^{4/3}$.

17. 3



Here, ABC is a 30°, 60° and 90° traingle and BC is laying tangentially to the ball.

Hence, $\Delta ABC \sim \Delta EDC \sim \Delta CFG$

$\frac{3}{6} = \frac{1}{DC} \Rightarrow DC = 2 \Rightarrow CE = \sqrt{3}$

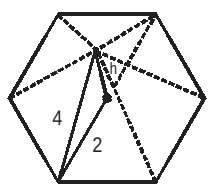
Similarly, $\frac{3}{GF} = \frac{AC}{CG}$

$\frac{3}{GF} = \frac{3\sqrt{3}}{3} \Rightarrow GF = \sqrt{3}$

Now, required volume $= \frac{\pi}{3}(\sqrt{3})^2 \cdot 3 - \frac{4\pi}{3} \cdot 1^3$

$= 3\pi - \frac{4\pi}{3} = \frac{5\pi}{3}$.

18. 1



If the flaps are closed

$4^2 = 2^2 + h^2 \Rightarrow h = 2\sqrt{3}$

Area of regular hexagon = $\frac{3\sqrt{3}}{2}(\text{side})^2$

$= \frac{3\sqrt{3}}{2} \times 2 \times 2 = 6\sqrt{3}$

Volume of pyramid = $\frac{1}{3} \times$ base area × height

$= \frac{1}{3} \times 6\sqrt{3} \times 2\sqrt{3} = 12$

19. 2 Total volume = 150 × 120 × 100 = 1800000

Water available = 1281600

Remaining volume = 1800000 – 1281600 = 518400

Bricks absorb 10% of water, so they increase 90% of volume.

$518400 = n \times 90\% \times 20 \times 6 \times 4 \Rightarrow n = 1200$

20. 3 Circumference of a wheel = $\pi \times d$

$$= \frac{22}{7} \times 56 = 176 \text{ cm}$$

Distance travelled in a min = 176×400

$= 70400 \text{ cm} = 704 \text{ m}$

Distance travelled in 120 hrs by all

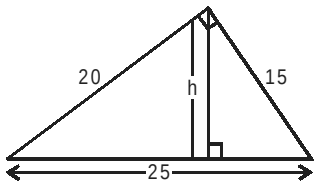
5 wheels = $120 \times 5 \times 712 \times 60$

$= 25344000 \text{ m} = 25344 \text{ km}$

Distance covered by 4 wheels

$$= \frac{25344}{4} = 6336.$$

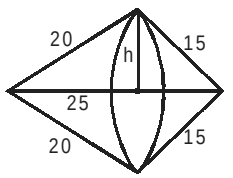
21. 3



It is revolved along hypotenuse so 2 cones will be formed.

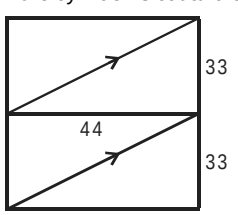
$$\frac{1}{2} \times h \times 25 = \frac{1}{2} \times 20 \times 15$$

h = 12



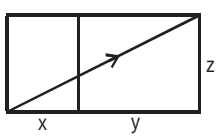
Volume $\frac{1}{3} \times \pi \times 12^2 \times 25 = 1200\pi.$

22. 2 If the cylinder is cut and opened, the path will look like



Distance travelled $= 2\sqrt{33^2 + 44^2} = 2 \times 55 = 110.$

23. 1 If we cut and open the box



If insect flies the smallest distance covered will be body diagonal = $\sqrt{3^2 + 4^2 + 12^2} = 13$

If it crawls the smallest distance will be equal to

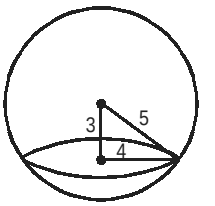
$\sqrt{(x+y)^2 + z^2}$

Now, (x + y) should be minimum

$= \sqrt{(3+4)^2 + 12^2} = \sqrt{193}$

Ratio of distances = 13 : $\sqrt{193}$.

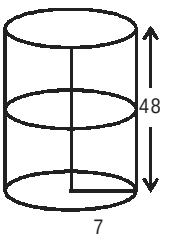
24. 3



Radius of the circular mark = 4

Circumference = $2\pi r = 8\pi$

25. 2



Surface area of cylinder

$= 2\pi r (r + h)$

$$= 2 \times \frac{22}{7} \times 7 (48 + 7) = 2420$$

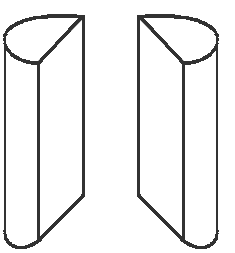
If you cut horizontally you will get 2 additional surfaces and both will be circles.

So increment in the surface area

$= 2 \times \pi r^2$

$$= 2 \times \frac{22}{7} \times 7 \times 7 = 308.$$

If you cut vertically you will 2 additional surfaces having rectangular faces increment in the surface area will be = $48 \times 14 \times 2 = 1344$.



Ratio of areas = $\frac{2420 + 308}{2420 + 1344}$

$$= \frac{2728}{3764} = \frac{682}{941}.$$