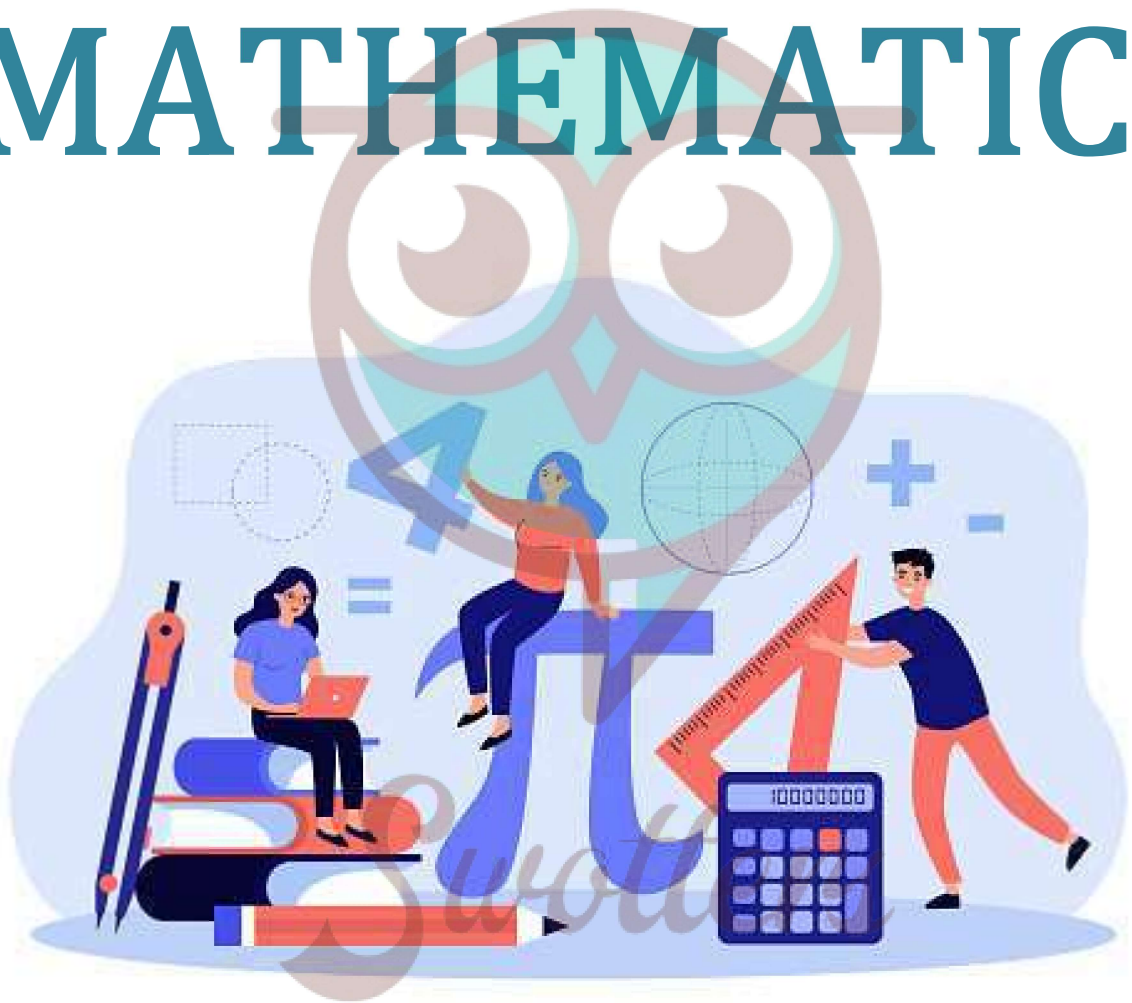# MATHEMATICS

Important Questions

Multiple Choice questions-

Question 1. If the perimeter of one of the faces of a cube is 40cm, then its volume is:

(a) 6000cm³

(b) 1600cm³

(c) 1000cm³

(d) 600cm³

Question 2. A cuboid having surface areas of 3 adjacent faces as a, b and c has the volume:

(a) $3\sqrt{abc}$

(b) $\sqrt{abc}$

(c) ABC

(d) (ABC)²

Question 3. The radius of a cylinder is doubled, and the height remains the same. The ratio between the volumes of the new cylinder and the original cylinder is

(a) 1 : 2

(b) 3 : 1

(c) 4 : 1

(d) 1 : 8

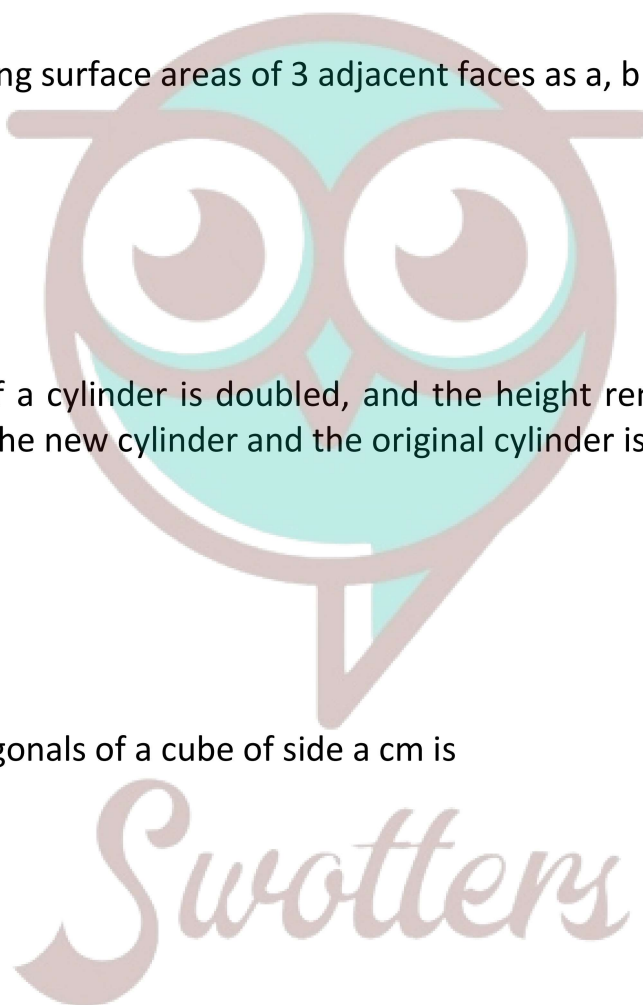Question 4. Length of diagonals of a cube of side a cm is

(a) √2a cm

(b) √3a cm

(c) $\sqrt{3a}$ cm

(d) 1cm

Question 5. Volume of spherical shell is

(a) $\frac{2}{3}\pi r^3$

(b) $\frac{3}{4}\pi r^3$

(c) $\frac{4}{3}\pi(R^3 - r^3)$

(d) None of these

Question 6. Volume of hollow cylinder

(a) $\pi(R^2 - r^2)h$

(b) $\pi R^2 h$

(c) $\pi r^2 h$

(d) $\pi r^2(h_1 - h_1)$

Question 7. The radius of a sphere is 2r, then its volume will be

(a) $\frac{4}{3}\pi r^3$

(b) $4\pi r^3$

(c) $\frac{8}{3}\pi r^3$

(d) $\frac{32}{3}\pi r^3$

Question 8. In a cylinder, radius is doubled, and height is halved, curved surface area will be

(a) Halved

(b) Doubled

(c) Same

(d) Four time

Question 9. The total surface area of a cone whose radius is $\frac{r}{2}$ and slant height 2l is

(a) $2\pi r(l + r)$

(b) $\pi r(l + \frac{r}{4})$

(c) $\pi r(l + r)$

(d) $2\pi rl$

Question 10. The radius of a hemispherical balloon increases from 6cm to 12cm as air is being pumped into it. The ratios of the surface areas of the balloon in the two cases is

(a) 1 : 4

(b) 1 : 3

(c) 2 : 3

(d) 2 : 1

Very Short:

1. How much ice-cream can be put into a cone with base radius 3.5cm and height 12cm?

2. Calculate the edge of the cube if its volume is 1331cm³.

3. The curved surface area of a cone is 12320 sq. cm, if the radius of its base is 56cm, find its height.

4. Two cubes of edge 6cm are joined to form a cuboid. Find the total surface area of the cuboid.

5. A metallic sphere is of radius 4.9cm. If the density of the metal is 7.8 g/cm², find the mass of the sphere $(\pi = \frac{22}{7})$

6. The volume of a solid hemisphere is 1152 π cm³. Find its curved surface area.

7. Find the diameter of a cylinder whose height is 5cm and numerical value of volume is equal to numerical value of curved surface area.

8. In a cylinder, if radius is halved and height is doubled, then find the volume with respect to original volume.

Short Questions:

1. A spherical ball is divided into two equal halves. If the curved surface area of each half is 56.57c find the volume of the spherical ball. [use π = 3.14]

2. Find the capacity in liters of a conical vessel having height 8 cm and slant height 10cm.

3. Calculate the surface area of a hemispherical dome of a temple with radius 14m to be whitewashed from outside

4. A rectangular piece of paper is 22cm long and 10cm wide. A cylinder is formed by rolling the paper along its length. Find the volume of the cylinder.

5. A heap of wheat is in the form of a cone whose diameter is 10.5m and height is 3m. Find it volume. If 1m3 wheat cost is ₹ 10, then find total cost.

6. A cylindrical vessel can hold 154 g of water. If the radius of its base is 3.5cm, and 1cm³ of water weighs 1 g, find the depth of water.

Long Questions:

1. It costs ₹ 3300 to paint the inner curved surface of a 10m deep well. If the rate cost of painting is of ₹ 30 per m², find:

   (a) inner curved surface area

   (b) diameter of the well

   (c) capacity of the well.

2. Using clay, Anant made a right circular cone of height 48cm and base radius 12cm. Varsha reshapes it in the form of a sphere. Find the radius and curved surface area of the sphere so formed.

3. A dome of a building is in the form of a hemisphere. From inside, it was whitewashed at the cost of ₹ 498.96. If the rate of whitewashing is ₹ 4 per square metre, find the:

(i) Inside surface area of the dome

(ii) Volume of the air inside the dome.

4. A right triangle ABC with sides 5cm, 12cm and 13cm is revolved about the side 5cm. Find the volume of the solid so obtained. If it is now revolved about the side 12cm, then what would be the ratio of the volumes of the two solids obtained in two cases?

5. A right triangle of hypotenuse 13cm and one of its sides 12cm is made to revolve taking side 12cm as its axis. Find the volume and curved surface area of the solid so formed.

Assertion and Reason Questions-

1. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

   a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

   b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

   c) Assertion is correct statement but reason is wrong statement.

   d) Assertion is wrong statement but reason is correct statement.

Assertion: If diameter of a sphere is decreased by 25%, then its curved surface area is decreased b 43.75%.

Reason: Curved surface area is increased when diameter decreases.

2. In these questions, a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

   a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

   b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

   c) Assertion is correct statement but reason is wrong statement.

   d) Assertion is wrong statement but reason is correct statement.

Assertion: The external dimensions of a wooden box are 18 cm, 10 cm and 6 cm respectively and thickness of the wood is 15 mm, then the internal volume is 765 cm^3.

Reason: If external dimensions of a rectangular box be l, b and h and the thickness of its sides be x , then its internal volume is (l − 2x) (b − 2x) (h − 2x)

Case Study Questions-

1. Read the Source/ Text given below and answer any four questions:

Veena planned to make a jewellery box to gift her friend Reeta on her marriage. She made the jewellery box of wood in the shape of a cuboid. The jewellery box has the dimensions as shown in the figure below. The rate of painting the exterior of the box is Rs. 2 per cm². After making the box she took help from his friends to decorate the box.

The blue colour was painted by Deepak, Black by Suresh, green by Harsh and the yellow was painted by Naresh.
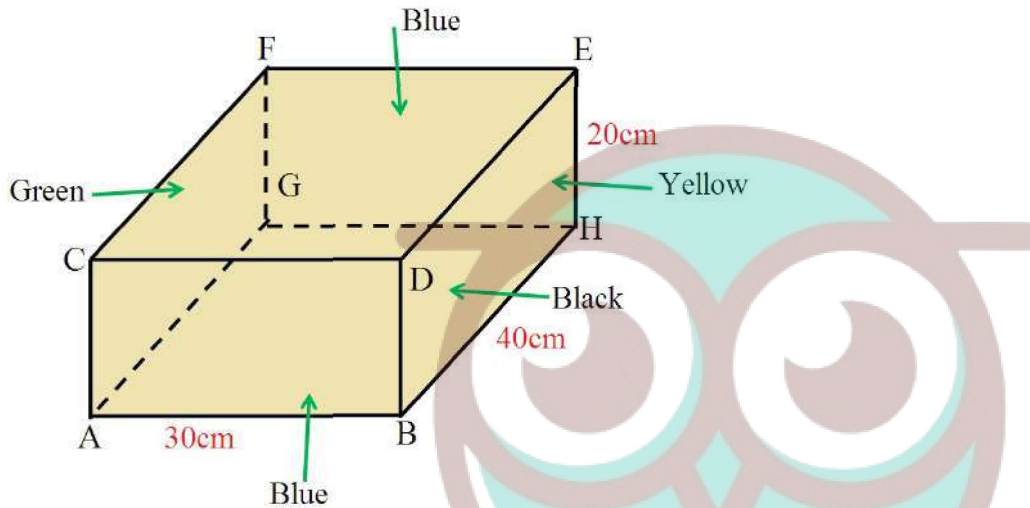
i. What is the volume of the box?

    a. 24000cm³

    b. 1200cm³

    c. 800cm³

    d. 600cm³

ii. How much area did Suresh paint?

    a. 24000cm²

    b. 1200cm²

    c. 800cm²

    d. 600cm²

iii. How much area did Deepak paint?

    a. 24000cm²

    b. 600cm²

    c. 800cm²

    d. 1200cm²

iv. What amount did Harsh charge?

    a. Rs. 800

b. Rs. 1200

c. Rs. 1600

d. Rs. 2000

v. What amount did Veena pay for painting:

    a. Rs. 2600

    b. Rs. 5200

    c. Rs. 5000

    d. Rs. 6000

2. Read the passage given below and answer these questions:

Dev was doing an experiment to find the radius r of a sphere. For this he took a cylindrical container with radius R = 7cm and height 10cm. He filled the container almost half by water as shown in the left figure. Now he dropped the yellow sphere in the container. Now he observed as shown in the right figure the water level in the container raised from A to B equal to 3.40cm.
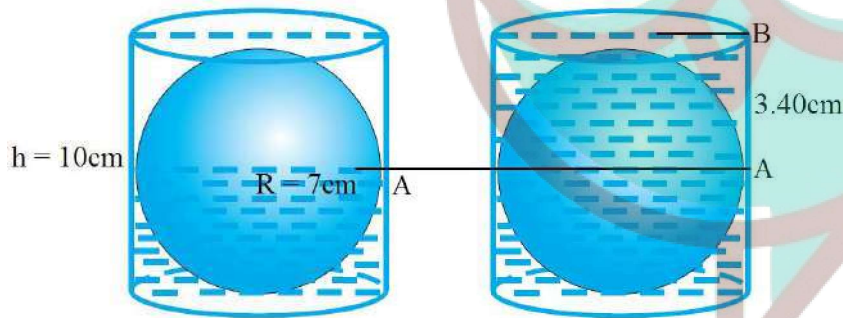
i. What is the approximate radius of the sphere?

    a. 7cm

    b. 5cm

    c. 4cm

    d. 3cm

ii. What is the volume of the cylinder?

    a. 700cm^3

    b. 500cm^3

    c. 1540cm^3

    d. 2000cm^3

iii. What is the volume of the sphere?

    a. 700cm^3

    b. 600cm^3

c. $500cm^3$

d. $523.8cm^3$

iv. How many litres water can be filled in the full container? (Take 1 litre = $1000cm^3$):

a. 1.50

b. 1.44

c. 1.54

d. 2

v. What is the surface area of the sphere?

a. $314.3m^2$

b. $300m^2$

c. $400m^2$

d. $350m^2$

Answer Key:

MCQ:

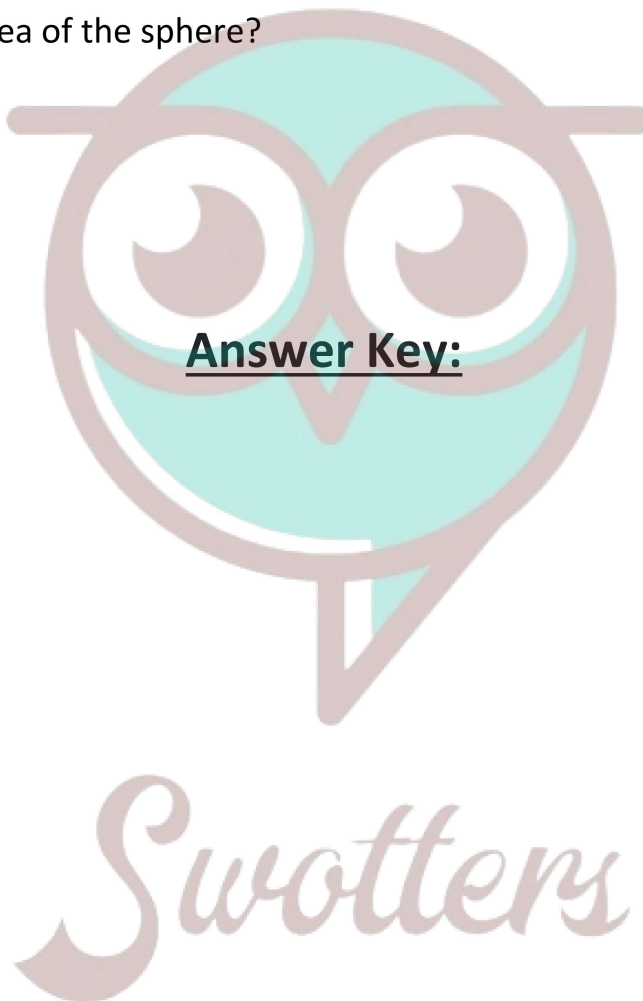1. (c) $1000cm^3$

2. (b) $\sqrt{abc}$

3. (c) 4 : 1

4. (b) $\sqrt{3}a$ cm

5. (c) $\frac{4}{3}\pi(R^3 - r^3)$

6. (a) $\pi(R^2 - r^2)h$

7. (d) $\frac{32}{3}\pi r^3$

8. (c) Same

9. (b) $\pi r(l + \frac{r}{4})$

10. (a) 1 : 4

Very Short Answer:

1. Here, radius (r) = 3.5cm and height (h) = 12cm

∴ Amount of ice-cream = $\frac{1}{3}\pi r^2$

= $\frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times 12$

= 154cm^3

2. Volume of cube = 1331cm^3

   (Side)^3 = 1331

   Side = (11 × 11 × 11) $\frac{1}{3}$ = 11cm

3. Here, radius of base of a cone (r) = 56cm

   And, curved surface area = 12320cm^2

   πrl = 12320

   $l = \frac{12320}{\pi r}$

   $= \frac{12320 \times 7}{22 \times 56} = 70$cm

   Again, we have

   r^2 + h^2 = l^2

   h^2 = l^2 – r^2 = 70^2 - 56^2

   = 4900 - 3136 = 1764

   h = √1764 = 42cm

   Hence, the height of the cone is 42cm.

4. When two cubes are joined end to end, then

   Length of the cuboid = 6 + 6 = 12cm

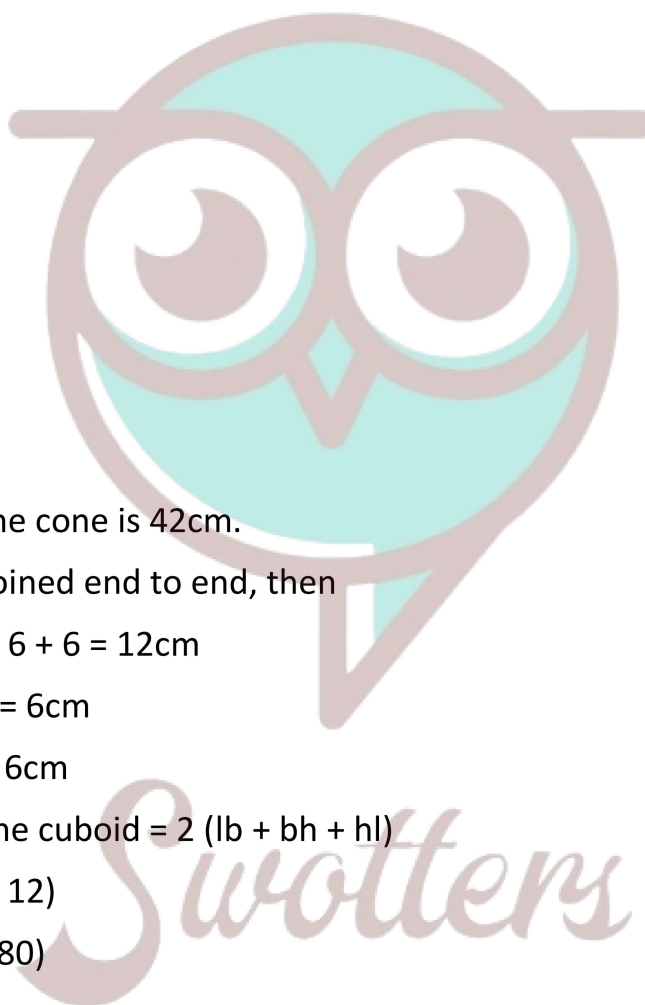   Breadth of the cuboid = 6cm

   Height of the cuboid = 6cm

   Total surface area of the cuboid = 2 (lb + bh + hl)

   = 2(12 × 6 + 6 × 6 + 6 × 12)

   = 2(72 + 36 + 72) = 2(180)

   = 360cm^2

5. Here, radius of metallic sphere (r) = 4.9cm

$\therefore$ Volume of metallic sphere $= \dfrac{4}{3}\pi r^3$

$$= \dfrac{4}{3} \times \dfrac{22}{7} \times (4.9)^3$$

$$= \dfrac{4}{3} \times \dfrac{22}{7} \times 4.9 \times 4.9 \times 4.9$$

$$= 493 \text{ cm}^3$$

Density of metal used $= 7.8 \text{ g/cm}^3$

Mass of the sphere $=$ Volume $\times$ Density

$$= 493 \times 7.8 = 3845.4 \text{ g}$$

6. Here, volume of hemisphere $= 1152\,\pi \text{ cm}^3$

$\therefore \dfrac{2}{3}\pi r3 = 1152$

$\Rightarrow r^3 = (12)^3\,\pi$

$\Rightarrow r\ \dfrac{1152 \times 3}{3} = 1728$

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

Now, curved surface area $= 2\pi r^2$

$= 2 \times \pi \times (12)^2 = 288\pi \text{ cm}^2$

7. Here, height of cylinder (h) = 5cm

According to the statement of the question, we have

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

r = 2cm

Thus, diameter of the base of the cylinder is 2 × 2 i.e., 4cm.

8. Here, $r = \dfrac{r}{2}$. h = 2h

$\therefore$ Volume of cylinder $= \pi\left(\dfrac{r}{2}\right)^2 2h = \dfrac{1}{2}\pi r^2 h$

Original volume of cylinder $= \pi r^2 h$

Volume w.r.t. original volume of cylinder

$$= \dfrac{\dfrac{1}{2}\pi r^2 h}{\pi r^2 h} = \dfrac{1}{2}$$

Short Answer:

Ans: 1. Since curved surface of half of the spherical ball = 56.57cm^2

$2\pi r^2 = 56.57$

$$\Rightarrow r^2 = \frac{56.57}{2 \times 3.14} = 9$$

$$\Rightarrow r = 3 \text{ cm}$$

Now, volume of spherical ball $= \frac{4}{3}\pi r^3$

$$= \frac{4}{3} \times 3.14 \times 3 \times 3 \times 3$$

$$= 113.04 \text{ cm}^3$$

$$= 113.04 \text{cm}^3$$

Ans: 2. Height of conical vessel (h) = 8cm

Slant height of conical vessel (l) = 10cm

$\therefore r^2 + h^2 = l^2$

$\Rightarrow r^2 + 8^2 = 10^2$

$\Rightarrow r^2 = 100 - 64 = 36$

$\Rightarrow r = 6$cm

Now, volume of conical vessel $= \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 6 \times 8 = 301.71 \text{cm}^3 = 0.30171$ litre

Ans: 3. Here, radius of hemispherical dome (r) = 14m

Surface area of dome $= 2\pi r^2$

$= 2 \times \frac{22}{7} \times 14 \times 14 = 1232 \text{m}^2$

Hence, total surface area to be whitewashed from outside is 1232m².

Ans: 4. Since rectangular piece of paper is rolled along its length.

$\therefore 2\pi r = 22$

$r = \frac{22 \times 7}{2 \times 22} = 3.5$cm

Height of cylinder (h) = 10cm

$\therefore$ Volume of cylinder $= \pi r^2 h$

$= \frac{22}{7} \times 3.5 \times 3.5 \times 10 = 385cm^3$

Ans: 5. Diameter of cone = 10.5m

Radius of cone (r) = 5.25m

Height of cone (h) = 3m

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

$= \frac{1}{3} \times \frac{22}{7} \times 5.25 \times 5.25 \times 3$

$= 86.625m^3$

Cost of $1m^3$ of wheat = ₹ 10

Cost of 86.625 m3 of wheat = ₹ 10 × 86.625

= ₹ 866.25

Ans: 6. Since 1 cm3 of water weighs 1 g.

∴ Volume of cylindrical vessel = 154 cm3

πr2h = 154

227 × 3.5 × 3.5 × h = 154
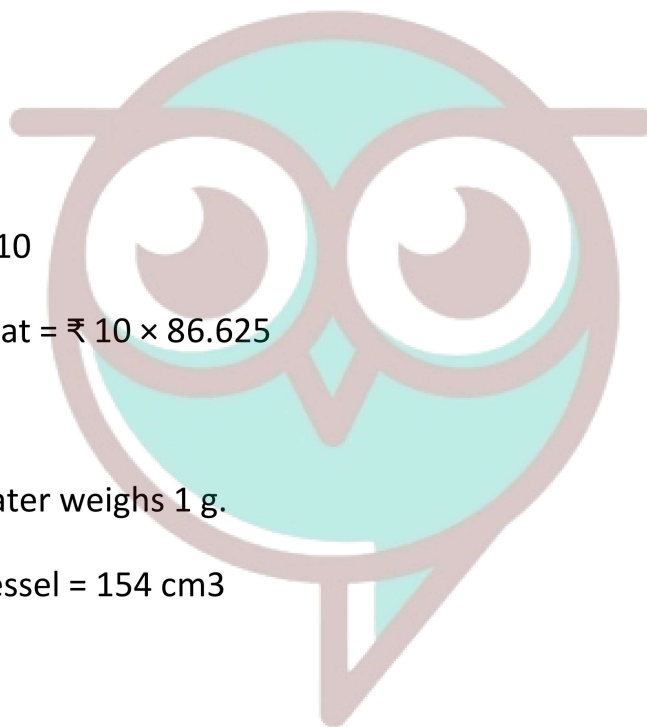
$h = \frac{154 \times 7}{22 \times 3.5 \times 3.5}$

h = 4

cm Hence, the depth of water is 4cm.

Long Answer:

Ans: 1. Depth of well (h) = 10m

Cost of painting inner curved surface is ₹ 30 per m^2 and total cost is ₹ 3300

∴ Curved surface area = $\frac{3300}{30}$ = 110 m²

$2\pi rh = 110$

$r = \frac{110}{2\pi h}$

$= \frac{110 \times 7}{2 \times 22 \times 10}$

= 1.75 m = 175 cm

Now, volume of the well = $\pi r^2 h$

$= \frac{22}{7} \times 1.75 \times 1.75 \times 10 = 96.25$ m³

Hence, inner curved surface area is 110m², diameter of the well is 2 × 1.75 i.e., 3.5m and capacity of the well is 96.25m³.

Ans: 2. Height of cone (h) = 48 cm

Radius of the base of cone = 12 cm

Let R be the radius of sphere so formed

∴ Volume of sphere = Volume of cone

$\frac{4}{3}\pi R^3 = \frac{1}{3}\pi r^2 h$

$4R^3 = 12 \times 12 \times 48$

$R^3 = 12 \times 12 \times 12$

R = 12cm

Now, curved surface area of sphere = $4\pi R^2$

$= 4 \times \frac{22}{7} \times 12 \times 12$

= 1810.29cm

Ans: 3. Here, dome of building is a hemisphere.

Total cost of whitewashing inside the dome = ₹ 498.96

Rate of whitewashing = ₹ 4 per m²

∴ Inside surface area of the dome = $\frac{498.96}{4}$ = 124.74 m²

∴ $2\pi r^2 = 124.74$

$2 \times \frac{22}{7} \times r^2 = 124.74$

$$r^2 = \frac{124.74 \times 7}{2 \times 22}$$

⇒ $r^2 = 19.845$

⇒ $r = 4.45$ cm

Volume of the air inside the dome $= \frac{2}{3} \pi r^3$

$$= \frac{2}{3} \times \frac{22}{7} \times 4.45 \times 4.45 \times 4.45$$

$$= 184.63 \text{ cm}^3$$

Ans: 4. Here, right triangle ABC with sides 5cm, 12cm and 13cm is revolved about the side 5cm.

∴ Radius of the base of cone = 12cm

Height of the cone = 5cm

∴ Volume of the cone $= \frac{1}{3}\pi(12)^2(5) = \frac{\pi}{3} \times 720$ cm³

Again, right triangle ABC is now revolved about the side 12 cm.

∴ Radius of the base of cone = 5 cm

Height of the cone = 12 cm

∴ Volume of the cone $= \frac{1}{3}\pi(5)^2(12) = \frac{\pi}{3} \times 300$ cm³

Now, the required ratio of their volumes $= \frac{\pi}{3} \times 720 : \frac{\pi}{3} \times 300$

= 12 : 5

Ans: 5. Here, hypotenuse and one side of a right triangle are 13cm and 12cm respectively

∴ Third side $= \sqrt{(13)^2 - (12)^2}$

$$= \sqrt{169 - 144}$$

$$= \sqrt{25} = 5 \text{ cm}$$

Now, given triangle is revolved, taking 12cm as its axis

∴ Radius of the cone (r) = 5cm

Height of the cone (h) = 12cm

Slant height of the cone (1) = 13cm

∴ Curved surface area $= \pi rl = \pi(5)(13) = 65\pi$cm²

Volume of the cone $= \frac{1}{2}\pi r^2 h = \frac{1}{2}\pi \times 5 \times 5 \times 12 = 100\pi$ cm³

Hence, the volume and curved surface area of the solid so formed are 100 π cm³ and 65 π cm² respectively.

Assertion and Reason Answers-

1. c) Assertion is correct statement but reason is wrong statement.

2. a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

Case Study Answers-

1.

(i)	(a)	$24000 cm^3$
(ii)	(b)	$1200 cm^2$
(iii)	(d)	$1200 cm^2$
(iv)	(c)	Rs. 1600
(v)	(b)	Rs. 5200

2.

(i)	(b)	5cm
(ii)	(c)	$1540 cm^3$
(iii)	(d)	$523.8 cm^3$
(iv)	(c)	1.54
(v)	(a)	$314.3 m^2$