

Exercise 20.1

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Question 1: Find the curved surface area of a cone, if its slant height is 60 cm and the radius of its base is 21 cm.

Solution:

Slant height of cone (l) = 60 cm

Radius of the base of the cone (r) = 21 cm

Now,

Curved surface area of the right circular cone = $\pi rl = 22/7 \times 21 \times 60 = 3960 \text{ cm}^2$

Therefore the curved surface area of the right circular cone is 3960 cm^2

Question 2: The radius of a cone is 5cm and vertical height is 12cm. Find the area of the curved surface.

Solution:

Radius of cone (r) = 5 cm

Height of cone (h) = 12 cm

Find Slant Height of cone (l):

We know, $l^2 = r^2 + h^2$

$$l^2 = 5^2 + 12^2$$

$$l^2 = 25 + 144 = 169$$

$$\text{Or } l = 13 \text{ cm}$$

Now,

$$\text{C.S.A} = \pi rl = 3.14 \times 5 \times 12 = 204.28$$

Therefore, the curved surface area of the cone is 204.28 cm^2

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Question 3 : The radius of a cone is 7 cm and area of curved surface is 176 cm^2 .Find the slant height.

Solution:

Radius of cone(r) = 7 cm

Curved surface area(C.S.A)= 176 cm^2

We know, C.S.A. = $\pi r l$

$$\Rightarrow \pi r l = 176$$

$$\Rightarrow \frac{22}{7} \times 7 \times l = 176$$

$$\text{or } l = 8$$

Therefore, slant height of the cone is 8 cm.

Question 4: The height of a cone 21 cm. Find the area of the base if the slant height is 28 cm.

Solution:

Height of cone(h) = 21 cm

Slant height of cone (l) = 28 cm

We know that, $l^2 = r^2 + h^2$

$$28^2 = r^2 + 21^2$$

$$r^2 = 28^2 - 21^2$$

$$\text{or } r = 7\sqrt{7} \text{ cm}$$

Now,

Area of the circular base = πr^2

$$= \frac{22}{7} \times (7\sqrt{7})^2$$

$$= 1078$$

Therefore, area of the base is 1078 cm^2 .

Question 5: Find the total surface area of a right circular cone with radius 6 cm and height 8 cm.

Solution:

Radius of cone (r) = 6 cm

Height of cone (h) = 8 cm

Total Surface area of the cone (T.S.A)=?

Find slant height of cone:

We know, $l^2 = r^2 + h^2$

$$= 6^2 + 8^2$$

$$= 36 + 64$$

$$= 100$$

$$\text{or } l = 10 \text{ cm}$$

Now,

Total Surface area of the cone (T.S.A) = Curved surface area of cone + Area of circular base

$$= \pi r l + \pi r^2$$

$$= (22/7 \times 6 \times 10) + (22/7 \times 6 \times 6)$$

$$= 1320 + 792$$

$$= 2112$$

Therefore, area of the base is 2112 cm^2 .

Question 6: Find the curved surface area of a cone with base radius 5.25 cm and slant height 10 cm.

Solution:

Base radius of the cone (r) = 5.25 cm

Slant height of the cone (l) = 10 cm

Curved surface area (C.S.A) = $\pi r l$

$$= 22/7 \times 5.25 \times 10$$

$$= 165$$

Therefore, curved surface area of the cone is 165 cm^2 .

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Question 7: Find the total surface area of a cone, if its slant height is 21 m and diameter of its base is 24 m.

Solution:

Diameter of the cone(d)=24 m

So, radius of the cone(r)= diameter/ 2 = 24/2 m = 12m

Slant height of the cone(l) = 21 m

T.S.A = Curved surface area of cone + Area of circular base

$$= \pi r l + \pi r^2$$

$$= (22/7 \times 12 \times 21) + (22/7 \times 12 \times 12)$$

$$= 1244.57$$

Therefore, total surface area of the cone is 1244.57 m².

Question 8: The area of the curved surface of a cone is 60π cm². If the slant height of the cone be 8 cm, find the radius of the base.

Solution:

Curved surface area(C.S.A)= 60π cm²

Slant height of the cone(l) = 8 cm

We know, Curved surface area(C.S.A) = $\pi r l$

$$\Rightarrow \pi r l = 60\pi$$

$$\Rightarrow r \times 8 = 60$$

$$\text{or } r = 60/8 = 7.5$$

Therefore, radius of the base of the cone is 7.5 cm.

Question 9: The curved surface area of a cone is 4070 cm^2 and diameter is 70 cm . What is its slant height? (Use $\pi = 22/7$)

Solution:

Diameter of the cone (d) = 70 cm

So, radius of the cone (r) = diameter/2 = $70/2 \text{ cm} = 35 \text{ cm}$

Curved surface area = 4070 cm^2

Now,

We know, Curved surface area = $\pi r l$

So, $\pi r l = 4070$

By substituting the values, we get

$$22/7 \times 35 \times l = 4070$$

$$\text{or } l = 37$$

Therefore, slant height of cone is 37 cm .

Question 10: The radius and slant height of a cone are in the ratio $4:7$. If its curved surface area is 792 cm^2 , find its radius. (Use $\pi = 22/7$)

Solution:

Curved surface area = 792 cm^2

The radius and slant height of a cone are in the ratio $4:7$ (Given)

Let $4x$ be the radius and $7x$ be the height of cone.

Now,

Curved surface area (C.S.A.) = $\pi r l$

$$\text{So, } 22/7 \times (4x) \times (7x) = 792$$

$$\text{or } x^2 = 9$$

$$\text{or } x = 3$$

Therefore, Radius = $4x = 4(3) \text{ cm} = 12 \text{ cm}$

Exercise 20.2

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Question 1: Find the volume of the right circular cone with:

(i) Radius 6cm, height 7cm

(ii) Radius 3.5cm, height 12cm

(iii) Height is 21cm and slant height 28cm

Solution:

(i) Radius of cone(r)=6cm

Height of cone(h)=7cm

We know, Volume of a right circular cone = $\frac{1}{3} \pi r^2 h$

By substituting the values, we get

$$= \frac{1}{3} \times 3.14 \times 6^2 \times 7$$

$$= 264$$

Volume of a right circular cone is 264 cm^3

(ii) Radius of cone(r)=3.5 cm

Height of cone(h)=12cm

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

By substituting the values, we get

$$= \frac{1}{3} \times 3.14 \times 3.5^2 \times 12$$

$$= 154$$

Volume of a right circular cone is 154 cm^3

(iii) Height of cone(h)=21 cm

Slant height of cone(l) = 28 cm

Find the measure of r:

We know, $l^2 = r^2 + h^2$

$$28^2 = r^2 + 21^2$$

$$\text{or } r = 7\sqrt{7}$$

Now,

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

By substituting the values, we get

$$= \frac{1}{3} \times 3.14 \times (7\sqrt{7})^2 \times 21$$

$$= 7546$$

Volume of a right circular cone is 7546 cm^3

Question 2: Find the capacity in litres of a conical vessel with:

(i) radius 7 cm, slant height 25 cm

(ii) height 12 cm, slant height 13 cm.

Solution:

(i) Radius of the cone (r) = 7 cm

Slant height of the cone (l) = 25 cm

As we know that, $l^2 = r^2 + h^2$

$$25^2 = 7^2 + h^2$$

$$\text{or } h = 24$$

Now, Volume of a right circular cone = $\frac{1}{3} \pi r^2 h$

By substituting the values, we get

$$= \frac{1}{3} \times 3.14 \times (7)^2 \times 24$$

$$= 1232$$

Volume of a right circular cone is 1232 cm^3 or 1.232 litres

[$1 \text{ cm}^3 = 0.01 \text{ liter}$]

(ii) Height of cone(h)=12 cm

Slant height of cone(l)=13 cm

As we know that, $l^2 = r^2 + h^2$

$$13^2 = r^2 + 12^2$$

$$\text{or } r = 5$$

Now, Volume of a right circular cone = $\frac{1}{3} \pi r^2 h$

By substituting the values, we get
 $= \frac{1}{3} \times 3.14 \times (5)^2 \times 12$

$$= 314.28$$

Volume of a right circular cone is 314.28 cm³ or 0.314 litres.
[1 cm³ = 0.01 liters]

Question 3: Two cones have their heights in the ratio 1:3 and the radii of their bases in the ratio 3:1. Find the ratio of their volumes.

Solution:

Let the heights of the cones be h and $3h$ and radii of their bases be $3r$ and r respectively. Then, their volumes are

$$\text{Volume of first cone (V1)} = \frac{1}{3} \pi (3r)^2 h$$

$$\text{Volume of second cone (V2)} = \frac{1}{3} \pi r^2 (3h)$$

$$\text{Now, } V1/V2 = 3/1$$

Ratio of two volumes is 3:1.

Question 4: The radius and the height of a right circular cone are in the ratio 5:12. If its volume is 314 cubic meter, find the slant height and the radius. (Use $\pi=3.14$).

Solution:

Let us assume the ratio of radius and the height of a right circular cone to be x .

Then, radius be $5x$ and height be $12x$

We know, $l^2 = r^2 + h^2$

$$= (5x)^2 + (12x)^2$$

$$= 25x^2 + 144x^2$$

$$\text{or } l = 13x$$

Therefore, slant height is $13x$ m.

Now it is given that volume of cone = 314 m^3

$$\Rightarrow \frac{1}{3}\pi r^2 h = 314$$

$$\Rightarrow \frac{1}{3} \times 3.14 \times (25x^2) \times (12x) = 314$$

$$\Rightarrow x^3 = 1$$

$$\text{or } x = 1$$

So, radius = $5 \times 1 = 5 \text{ m}$

Therefore ,

Answer: Slant height = 13 m

Radius = 5 m

Question 5: The radius and height of a right circular cone are in the ratio 5 : 12 and its volume is 2512 cubic cm. Find the slant height and radius of the cone. (Use $\pi=3.14$).

Solution:

Let the ratio of radius and height of a right circular cone be y .

Radius of cone (r) = $5y$

Height of cone (h) = $12y$

Now we know, $l^2 = r^2 + h^2$

$$= (5y)^2 + (12y)^2$$

$$= 25y^2 + 144y^2$$

$$\text{or } l = 13y$$

Now, volume of the cone is given 2512cm^3

$$\Rightarrow \frac{1}{3}\pi r^2 h = 2512$$

$$\Rightarrow \frac{1}{3} \times 3.14 \times (5y)^2 \times 12y = 2512$$

$$\Rightarrow y^3 = \frac{(2512 \times 3)}{(3.14 \times 25 \times 12)} = 8$$

$$\text{or } y = 2$$

Therefore,

$$\text{Radius of cone} = 5y = 5 \times 2 = 10\text{cm}$$

$$\text{Slant height } (l) = 13y = 13 \times 2 = 26\text{cm}$$

Question 6: The ratio of volumes of two cones is 4 : 5 and the ratio of the radii of their bases is 2 : 3. Find the ratio of their vertical heights.

Solution:

Let the ratio of the radius be x and ratio of the volume be y .

$$\text{Then, Radius of 1st cone } (r_1) = 2x$$

$$\text{Radius of 2nd cone } (r_2) = 3x$$

$$\text{Volume of 1st cone } (V_1) = 4y$$

$$\text{Volume of 2nd cone } (V_2) = 5y$$

$$\text{We know formula for volume of a cone} = \frac{1}{3}\pi r^2 h$$

Let h_1 and h_2 be the heights of respective cones.

$$\frac{V_1}{V_2} = \frac{4}{5} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{4}{5} = \frac{4h_1}{9h_2} = \frac{4}{5} = \frac{h_1}{h_2} = \frac{9}{5}$$

Therefore, heights are in the ratio of 9 : 5.

Question 7: A cylinder and a cone have equal radii of their bases and equal heights. Show that their volumes are in the ratio 3:1.

Solution:

We are given, a cylinder and a cone are having equal radii of their bases and heights.

Let, radius of the cone = radius of the cylinder = r and

Height of the cone = height of the cylinder = h

Now,

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

Therefore, ratio of their volumes is 3:1.

Exercise VSAQs

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Question 1: The height of a cone is 15 cm. If its volume is $500\pi \text{ cm}^3$, then find the radius of its base.

Solution:

Height of a cone = 15 cm

Volume of cone = $500\pi \text{ cm}^3$

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

So, $500\pi = \frac{1}{3}\pi r^2 \times 15$

$$r^2 = 100$$

$$\text{or } r = 10$$

Radius of base is 10 cm.

Question 2: If the volume of a right circular cone of height 9 cm is $48\pi \text{ cm}^3$, find the diameter of its base.

Solution:

Height of a cone = 9 cm

Volume of cone = $48\pi \text{ cm}^3$

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

So, $48\pi = \frac{1}{3}\pi r^2 \times 9$

$$r^2 = 16$$

$$\text{or } r = 4$$

Radius of base $r = 4 \text{ cm}$

Therefore, Diameter = 2 Radius = $2 \times 4 \text{ cm} = 8 \text{ cm}$.

Question 3: If the height and slant height of a cone are 21 cm and 28 cm respectively. Find its volume.

Solution:

Height of cone (h) = 21 cm

Slant height of cone (l) = 28 cm

Find radius of cone:

We know, $l^2 = r^2 + h^2$

$$28^2 = r^2 + 21^2$$

$$\text{or } r = 7\sqrt{7} \text{ cm}$$

Now,

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

$$= \frac{1}{3} \times \pi \times (7\sqrt{7})^2 \times 21$$

$$= 2401 \pi$$

Therefore, Volume of cone is $2401 \pi \text{ cm}^3$.

Question 4: The height of a conical vessel is 3.5 cm. If its capacity is 3.3 litres of milk. Find the diameter of its base.

Solution:

Height of a conical vessel = 3.5 cm and

Capacity of conical vessel is 3.3 litres or 3300 cm^3

Now,

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

$$3300 = \frac{1}{3} \times \frac{22}{7} \times r^2 \times 3.5$$

$$\text{or } r^2 = 900$$

$$\text{or } r = 30$$

So, radius of cone is 30 cm

Hence, diameter of its base = 2 Radius = $2 \times 30 \text{ cm} = 60 \text{ cm}$