

**RD SHARMA**

**Solutions**

**Class 9 Maths**

**Chapter 20**

**Ex 20.2**

**Q1. Find the volume of the right circular cone with the following dimensions:**

**(a) Radius is 6cm and the height of the cone is 7cm**

**(b) Radius is 3.5cm and height is 12cm**

**(c) Slant height is 21cm and height is 28cm**

**Solution:**

**(a)** It is given that

Radius of the cone( $r$ )=6cm

Height of the cone( $h$ )=7cm

Volume of a right circular cone

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

$$= \frac{1}{3} * 3.14 * 6^2 * 7 = 264 \text{ cm}^3$$

**(b)** It is given that:

Radius of the cone( $r$ )=3.5 cm

Height of the cone( $h$ )=12cm

Volume of a right circular cone

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

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

$$= 154 \text{ cm}^3$$

**(c)** It is given that:

Height of the cone( $h$ )=28 cm

Slant height of the cone( $l$ )=21 cm

As we know that,

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

$$r = \sqrt{l^2 - h^2}$$

$$r = \sqrt{28^2 - 21^2} = 7\sqrt{7}$$

**Volume of a right circular cone:**

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

$$= \frac{1}{3} * 3.14 * (7\sqrt{7})^2 * 18$$

$$= 7546 \text{ cm}^3$$

**Q2. Find the volume of a conical tank with the following dimensions in liters:**

**(a) Radius is 7cm and the slant height of the cone is 25cm**

**(b) Slant height is 12cm and height is 13cm**

**Solution:**

**(a)** It is given that

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

Slant height of the cone ( $l$ ) = 25 cm

As we know that,

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

$$h = \sqrt{l^2 - r^2}$$

$$h = \sqrt{25^2 - 7^2}$$

$$= r = \sqrt{625 - 49} = 24 \text{ cm}$$

Volume of a right circular cone

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

$$= \frac{1}{3} * 3.14 * 7^2 * 24$$

$$= 1232 \text{ cm}^3 = 1.232 \text{ litres} \quad [1 \text{ cm}^3 = 0.01 \text{ l}]$$

**(c)** It is given that:

Height of the cone( $h$ ) = 12 cm

Slant height of the cone( $l$ ) = 13 cm

As we know that,

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

$$r = \sqrt{l^2 - h^2}$$

$$r = \sqrt{13^2 - 12^2}$$

$$= r = \sqrt{169 - 144} = \sqrt{25} = 5 \text{ cm}$$

**Volume of a right circular cone:**

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

$$= \frac{1}{3} * 3.14 * 5^2 * 10 = 314.85 \text{ cm}^3 = 0.307 \text{ litres} \quad [1 \text{ cm}^3 = 0.01 \text{ l}]$$

**Q3. 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 ratio of the height of the cone be  $h_x$

height of the 1<sup>st</sup> cone =  $h_x$

height of the of the 2<sup>nd</sup> cone =  $3h_x$

Let the ratio of the radius of the of the cone=  $r_x$

radius of the 1<sup>st</sup> cone= $3 r_x$

radius of the 2<sup>nd</sup> cone = $r_x$

The ratio of the volume=  $\frac{v_1}{v_2}$

Where  $v_1$  =volume of 1<sup>st</sup> cone

$v_2$  =volume of 2<sup>nd</sup> cone

$$\Rightarrow \frac{v_1}{v_2} = \frac{\frac{1}{3}\pi * r_a^2 h_a}{\frac{1}{3}\pi r_b^2 h_b}$$

$$= \frac{r_a^2 h_a}{r_b^2 h_b}$$

$$= \frac{3r_x^2 h_x}{r_x^2 h_x}$$

$$= \frac{9r_x^2 h_x}{3r_x^2 h_x}$$

$$= \frac{3}{1}$$

$$\Rightarrow \frac{v_1}{v_2} = \frac{3}{1}$$

**Q4. 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 to be y

Radius (r)=5y

Height (h)=12y

We know that

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

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

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

$$=169^2 = 13y$$

Now it is given that volume= $314m^3$

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

$$\Rightarrow \frac{1}{3} * 3.14 * 25y^2 * 12y = 314m^3$$

$$\Rightarrow y^3 = 1$$

$$\Rightarrow y = 1$$

Therefore ,

$$\text{Slant height}(l) = 13y = 13m$$

$$\text{Radius} = 5y = 5m$$

**Q5. 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 be y

$$\text{The radius of the cone}(r) = 5y$$

$$\text{Height of the cone} = 12y$$

Now we know,

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

$$= \sqrt{5y^2 + 12y^2}$$

$$= 13y$$

Now the volume of the cone is given  $2512\text{cm}^3$

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

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

$$\Rightarrow y^3 = \frac{2512 * 3}{3.14 * 25 * 2}$$

$$\Rightarrow y = 2$$

Therefore,

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

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

**Q6. 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

$$\text{Radius of 1}^{\text{st}} \text{ cone} = 2x$$

$$\text{Radius of 2}^{\text{nd}} \text{ cone} = 3x$$

Let the ratio of the volume be y

$$\text{Volume of 1}^{\text{st}} \text{ cone} = 4y$$

$$\text{Volume of 2}^{\text{nd}} \text{ cone} = 5y$$

$$\frac{y_1}{y_2} = \frac{4y}{5y}$$

$$= \frac{4}{5}$$

$$\Rightarrow \frac{\frac{1}{3}\pi r_a^2 h_a}{\frac{1}{3}\pi r_b^2 h_b} = \frac{4}{5}$$

$$\Rightarrow \frac{h_a \cdot (2x)^2}{h_b \cdot (3x)^2} = \frac{4}{5}$$

$$\Rightarrow \frac{h_a \cdot 4x^2}{h_b \cdot 9x^2} = \frac{4}{5}$$

$$\Rightarrow \frac{h_a}{h_b} = \frac{36}{20} = \frac{9}{5}$$

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

**Q7. 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:**

It's given that

A cylinder and a cone are having equal radii of their bases and heights

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

Height of the cone = height of the cylinder = h

Let the volume of cone =  $v_x$

Volume of cylinder =  $v_y$

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

$$\Rightarrow \frac{v_y}{v_x} = \frac{3}{1}$$

Therefore the ratio of their volumes is 3:1.

**Q8. If the radius of the base of a cone is halved, keeping the height same, what is the ratio of the volume of the reduced cone to that of the original cone?**

**Solution:**

Let the radius of the cone be  $r_x$  and height be  $h_x$

Then the volume of cone  $v_x = \frac{1}{3}\pi r_x^2 h_x$

Now,

Radius of the reduced cone =  $\frac{r_x}{2}$

Therefore volume of reduced cone  $v_y$

$$= \frac{1}{3}\pi \left(\frac{r_x}{2}\right)^2 * h_x$$

$$= \frac{1}{12} * \pi * r_x^2 * h_x$$

$$\therefore \frac{v_y}{v_x} = \frac{\frac{1}{12}\pi r^2 h}{\frac{1}{3}\pi r^2 h}$$

$$= \frac{3}{12} = \frac{1}{4}$$

Therefore the ratio between the volumes of the reduced and the original cone is 1:4.

**Q9. A heap of wheat is in the form of a cone of diameter 9 m and height 3.5 m. Find its volume. How much is canvas cloth required to just cover the heap? (Use  $\pi=3.14$ ).**

**Solution:**

It is given that

Diameter of heap(d)=9m

Therefore, Radius of the heap(r)

$$= \frac{d}{2}$$

$$= \frac{9}{2} = 4.5\text{m}$$

Height of the heap(h)=3.5m

Therefore, Volume of the heap= $\frac{1}{3}\pi r^2 h$

$$= \frac{1}{3} * 3.14 * 4.5^2 * 3.5$$

$$= 74.18\text{m}^3$$

Now,

$$l = \sqrt{r^2 + h^2}$$

$$= \sqrt{4.5^2 + 3.5^2} = 5.70\text{m}$$

Area to be covered by the cloth=Curved surface area of the heap

$$= \pi r l = 3.14 * 4.5 * 5.70 = 80.54 \text{ m}^3$$

**Q10. Find the weight of a solid cone whose base is of diameter 14 cm and vertical height 51 cm, supposing the material of which it is made weighs 10 grams per cubic cm.**

**Solution:**

It is given that :

Diameter(d)=14cm

Height of the cone(h)=51cm

Radius of the cone(r)= $\frac{d}{2}$

$$= \frac{14}{2} = 7\text{cm}$$

Therefore, Volume of cone(V)= $\frac{1}{3}\pi r^2 h$ =

$$= \frac{1}{3} * 3.14 * 7 * 5 * 51 = 2618 \text{ cm}^3$$

Now it is given that  $1 \text{ cm}^3$  material weighs 10gm.

Therefore,  $2618 \text{ cm}^3$  weighs  $= 2618 * 10 = 26180$  grams.

**Q11. A right angled triangle of which the sides containing the right angle are 6.3 cm and 10 cm in length, is made to turn round on the longer side. Find the volume of the solid, thus generated. Also, find its curved surface area.**

**Solution:**

It is given that

Radius of cone( $r$ ) = 6.3cm

Height of the cone( $h$ ) = 10cm

We know that

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

$$= l = \sqrt{6.3^2 + 10^2} = 11.819 \text{ cm}$$

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

$$= \frac{1}{3} * 3.14 * 6.3^2 * 10 = 415.8 \text{ cm}^3$$

Curved surface area of cone =  $\pi r l$

$$= 3.14 * 6.3 * 11.819 = 234.01 \text{ cm}^2$$

**Q12 Find the volume of the largest right circular cone that can be fitted in a cube whose edge is 14 cm.**

**Solution:**

Radius of the base of the largest cone =  $\frac{1}{2}$  \* edge of the cube

$$= \frac{1}{2} * 14 = 7 \text{ cm}$$

Height of the cone = Edge of the cube = 14cm

$$\text{Therefore, Volume of cone}(v) = \frac{1}{3} \pi r^2 h$$

$$= \frac{1}{3} * 3.14 * 7^2 * 14 = 718.66 \text{ cm}^3$$

**Q13 The volume of a right circular cone is  $9856 \text{ cm}^3$ . If the diameter of the base is 28 cm. Find:**

**(a) Height of the cone**

**(b) Slant height of the cone**

**(c) Curved surface area of the cone**

**Solution:**

**(a)** It is given that diameter of the cone( $d$ ) = 28cm

$$\text{Radius of the cone}(r) = \frac{d}{2}$$

$$= \frac{28}{2} = 14 \text{ cm}$$



Height of the cone = ?

Now,

$$\text{Volume of the cone}(v) = \frac{1}{3}\pi r^2 h = 9856 \text{ cm}^3$$

$$\Rightarrow \frac{1}{3} * 3.14 * 14^2 * h = 9856$$

$$\Rightarrow h = \frac{9856 * 3}{3.14 * 14 * 14} = 48 \text{ cm}$$

Therefore the height of the cone is 48cm

**(b)** It is given that

Radius of the cone(r)=14cm

Height of the cone=48cm

Slant height (l)=?

$$\text{Now we know that } l = \sqrt{r^2 + h^2}$$

$$= \sqrt{14^2 + 48^2} = \sqrt{2500} = 50 \text{ cm}$$

Therefore the slant height of the cone is 50cm.

**(c)** Radius of the cone(r)=14cm

Slant height of the cone(l)=50cm

Curved surface area(C.S.A) = ?

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

$$= 3.14 * 14 * 50 = 2200 \text{ cm}^2$$

Therefore curved surface of the cone is 2200 cm<sup>2</sup>

**Q14. A conical pit of top diameter 3.5m is 12m deep. What is its capacity in kilolitres?**

**Solution:**

It is given that :

Diameter of the conical pit(d)=3.5m

Height of the conical pit(h)=12m

Radius of the conical pit(r)=?

Volume of the conical pit(v)=?

$$\text{Radius of the conical pit}(r) = \frac{d}{2} = \frac{3.5}{2} = 1.75 \text{ m}$$

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

$$= \frac{1}{3} * 3.14 * 1.75^2 * 12 = 38.5 \text{ m}^3$$

Capacity of the pit =(38.5\*1 )kilolitres = 38.5 kilolitres

**Q15. Monica has a piece of Canvas whose area is  $551\text{m}^2$ . She uses it to have a conical tent made, with a base radius of 7m. Assuming that all the stitching margins and wastage incurred while cutting amounts to approximately  $1\text{ m}^2$ . Find the volume of the tent that can be made with it.**

**Solution:**

It is given that:

$$\text{Area of the canvas} = 551\text{m}^2$$

$$\text{Area that is wasted} = 1\text{m}^2$$

$$\text{Radius of tent} = 7\text{m}, \text{ Volume of tent (v)} = ?$$

$$\text{Therefore the Area of available for making the tent} = (551 - 1) = 550\text{ m}^2$$

$$\text{Surface area of tent} = 550\text{ m}^2$$

$$\Rightarrow \pi r l = 550$$

$$\Rightarrow l = \frac{550}{22} = 25\text{m}$$

$$\text{Slant height (l)} = 25\text{m}$$

We know that,

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

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

$$\Rightarrow 625 - 49 = h^2$$

$$\Rightarrow 576 = h^2$$

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

Height of the tent is 24m.

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

$$= \frac{1}{3} * 3.14 * 7^2 * 24 = 1232\text{ m}^3$$

Therefore the volume of the conical tent is  $1232\text{ m}^3$