20. Surface Area and Volume of a Right Circular Cone

Exercise 20.1

1. Question

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

Answer

Given,

Slant height of cone (r) = 60 cm

Radius of base of cone (l) = 21 cm

Curved surface area of cone = πrl = 22/7 × 21 × 60 = 3960 cm^2

2. Question

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

Answer

Radius of cone (r) = 5 cm

Vertical height (h) = 12 cm

Slant height of cone (I) = √(r^2+h^2) = √(5^2+12^2) = √25+144 = √169 = 13 cm

Curved surface area of cone = πrl = 22/7×5×13 = 204.28 cm^2

3. Question

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

Answer

Given,

Radius of base (*r*) = 7 cm

Area of curved surface = π*rl* = 176 cm

∴22/7×7×*l* = 176 = *l* = *8 cm*

4. Question

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

Answer

Given,

Height of cone (*h)* = 21 cm

Slant height (*l)*=28 cm

∴*l^2*=*r^2* + *h^2* =*r* = $\sqrt{l^2 - h^2}$ = $\sqrt{28^2 - 21^2}$ =7√7 cm

∴ Area of the base = π*r^2*= $\frac{22}{7}$ × $\left(7\sqrt{7}\right)^2$ cm^2 = 1078 cm^2

5. Question

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

Answer

We have,

Radius of right circular cone (r) = 6

Height of cone (h) = 8 cm

∴ slant height (l) = $\sqrt{r^2 + h^2}$ = l = $\sqrt{36 + 64}$ =10 cm

Total surface area of cone = πr^2 + $\pi r l$ = $\pi r(r+l)$

= $\frac{22}{7}$ ×6×16 cm²=301.71 cm²

6. Question

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

Answer

Given,

Base radius of cone (r)= 5.25 cm

Slant height of cone (l)= 10 cm

∴ Curved surface area =$\pi r l$

= $\frac{22}{7}$ ×5.25×10 cm²=165 cm²

7. Question

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

Answer

We have,

Slant height of cone(l) = 21 m

Radius of cone (r)= 12 m

Total surface area = πr^2 + $\pi r l$ = $\pi r(r+l)$

= $\frac{22}{7}$ ×12(12+21) m²

=$\frac{22}{7}$ ×12×33 cm²=1244.57 m²

8. Question

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.

Answer

We have,

Curved surface area of cone = 60π cm²

Slant height l = 8 cm

So , $\pi r l$ = 60π

rl = 60

= $r = \frac{60}{8}$ =7.5 cm

9. Question

The curved surface area of a cone is 4070 cm² and its diameter is 70 cm. What is its slant height? (Use π=22/7).

Answer

We have,

Area of curved surface = πrl = 4070 cm²

Radius of base r = 70/2 = 35 cm

= $\frac{22}{7}$ ×35×l =4070 = l = 37 cm

10. Question

The radius and slant height of a cone are in the ratio of 4 : 7. If its curved surface area is 792 cm², find its radius. (Use π=22/7)

Answer

We have,

Let radius of cone = r =4x,

Let slant height = l =7x

Area of curved surface = πrl = 792 cm²

Now, πrl = 792

$= \frac{22}{7} \times 4x \times 7x = 792 = x^2 = 9 = x = 3 \, \text{cm}$

∴r =4×3= 12 cm

l = 7×3 = 21 cm

11. Question

A Joker's cap is in the form of a right circular cone of base radius 7 cm and height 24 cm. Find the area of the sheet required to make 10 such caps.

Answer

We have,

Based radius of conical cap =r = 7cm

Vertical height = h = 24 cm

∴slant height = l =$\sqrt{r^2 + h^2}$ = $\sqrt{49+576}$ = 25 cm

Required area of sheet =

= 10×πrl=10×$\frac{22}{7}$×7×25 cm²=5500 cm²

12. Question

Find the ratio of the curved surface areas of two cones if their diameters of the bases are equal and slant heights are in the ratio 4 : 3.

Answer

We have,

$r_1 = r_2$

let , l_1 =4x, l_2 = 3x

$\frac{S_1}{S_2} = \frac{\pi r_1 l_1}{\pi r_2 l_2} = \frac{l_1}{l_2} = \frac{4}{3}$

13. Question

There are two cones. The curved surface area of one is twice that of the other. The slant height of the later is twice that of the former. Find the ratio of their radii.

Answer

We have,

$A_1 = 2A_2 = \pi r_1 l_1 = 2(\pi r_2 l_2)$

$l_2 = 2l_1$

$r_1 l_1 = 2r_2 \times 2l_1$, $= r_1 = 4r_2$

$\frac{r_1}{r_2} = \frac{4}{1}$

14. Question

The diameters of two cones are equal. If their slant heights are in the ratio 5 : 4, find the ratio of their curved surfaces.

Answer

We have,

$r_1 = r_2$

$l_1 : l_2 = 5 : 4$

$\frac{S_1}{S_2} = \frac{\pi r_1 l_1}{\pi r_2 l_2} = \frac{\pi r_2 \times \frac{5}{4} l_2}{\pi r_2 l_2} = \frac{5}{4}$

15. Question

Curved surface area of a cone is 308 cm² and its slant height is 14 cm. Find the radius of the base and total surface area of the cone.

Answer

We have,

Curved surface area of cone $= \pi r l = 308$ cm²

Slant height $= l = 14$cm

$= \frac{22}{7} \times r \times 14 = 308 = r = 7$ cm

Total surface area $= \pi r l + \pi r^2 = 308 + \frac{22}{7} \times 7^2$

$= 462$ cm²

16. Question

The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white-washing its curved surface at the rate of Rs. 210 per 100 m².

Answer

We have,

Radius of conical tomb = diameter /2 = 14/2 = 7 m

Slant height = l = 25 m

Curved surface area = πrl

Cost of white washing = (curved surface area × rate of white washing per m²)

$= \left\{ (\pi r l) \times \frac{210}{100} \right\}$

$= \left\{ \left(\frac{22}{7} \times 7 \times 25 \right) \times \frac{210}{100} \right\} = $ Rs.1155

17. Question

A conical tent is 10 m high and the radius of its base is 24 m. Find the slant height of the tent. If the cost of 1 m^2 canvas is Rs. 70, find the cost of the canvas required to make the tent.

Answer

We have,

Radius of base of tent = r = 24 m

Vertical height = h = 10 m

∴ slant height = l = $\sqrt{r^2 + h^2}$ = $\sqrt{576 + 100}$ = 26m

∴ Cost of canvas required = Rs. $\left[\left(\frac{22}{7} \times 24 \times 26\right) \times 70\right]$ = Rs. 137280

18. Question

A tent is in the form of a right circular cylinder surmounted by a cone. The diameter of cylinder is 24 m. The height of the cylindrical portion is 11 m while the vertex of the cone is 16 m above the ground. Find the area of the canvas required for the tent.

Answer

For cylindrical part, we have

Diameter = 24 m so, radius r = 24/2 = 12 m ,

Height = h = 11 m

For conical part, we have

Height of the cone = (16-11) m = 5 m

∴ Slant height = $\sqrt{12^2 + 5^2}$ m = 13 m

Hence, Area of the canvas required

= Curved surface area of cone + Curved surface area of cylinder

= π$r$$l$+2π$r$$h$=πr($l$+2$h$) = $\frac{22}{7}$×12×(13+22) m^2 = 1320 m^2

19. Question

A circus tent is cylindrical to a height of 3 metres and conical above it. If its diameter is 105 m and the slant height of the conical portion is 53 m, calculate the length of the canvas 5 m wide to make the required tent.

Answer

For cylindrical part, we have

Height(h) = 3 m

Radius (r) = $\frac{105}{2}$ m

∴ Total curved surface area = 2π$r$$h$+2π$r$$l$

= πr(2h+l) = $\frac{22}{7}$×$\frac{105}{2}$× (6+53) m^2= 11×15×59 m^2

Hence, length of 5 m wide canvas = $\frac{11 \times 15 \times 59}{5}$ m = 1947 m

20. Question

The circumference of the base of a 10 m height conical tent is 44 metres. Calculate the length of canvas used in making the tent if width of canvas is 2 m. (Use π=22/7).

Answer

We have,

Circumference of circular base of cone = 2πr = 44 m

Height (h) = 10 m

$= 2 \times \frac{22}{7} \times r = 44 = r = 7\text{m}$

Slant height (l) = √(10²+7²) = √149 = 12.20 m

Curved surface area of tent = πrl = 22/7 ×7×12.20 = 268.4 m²

Hence, length of 2m wide canvas needed = 268.4/2 = 134.2 m

21. Question

What length of tarpaulin 3 m wide will be required to make a conical tent of height 8 m and base radius 6 m? Assume that the extra length of material will be required for stitching margins and wastage in cutting is approximately 20 cm. (Use π=3.14).

Answer

we have,

Height of tent = 8 m

Base radius = 6 m

Slant height (l) $= \sqrt{r^2 + h^2} = \sqrt{36 + 64}$ = 10 m

Curved surface area of the cone = πrl = 3.14×6×10 m²

∴Length of 3 m wide tarpaulin required

$= \frac{3.14 \times 6 \times 10}{3}$ = 62.8 m

Extra length required for stitching and cutting wastage = 0.2 m

Total length required = 62.8+0.2 = 63m

22. Question

A bus stop is barricaded from the remaining part of the road, by using 50 hollow cone made of recycled cardboard. Each cone has a base diameter of 40 cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m². What will be the cost of painting all these cones. (Use π=3.14 and $\sqrt{1.04}$ = 1.02).

Answer

We have,

Radius of base= 20 cm = 0.2 m

Height of cone = 1 m

∴ slant height l = $\sqrt{r^2 + h^2}$ = $\sqrt{0.04+1}$ m = $\sqrt{1.04}$ m

= 1.02 m

Curved surface area of a cone = πrl =3.14×0.2×1.02 m²

Cost of painting = Rs. [(3.14×0.2×1.02×12)×50] = Rs. 384.33

23. Question

A cylinder and a cone have equal radii of their bases and equal heights. If their curved surface areas are in the ratio 8 : 5, Show that the radius of each is to the height of each as 3 : 4.

Answer

For cylinder, we have

Base radius = r

Height = h

∴ Curved surface area $S_1 = 2\pi rh$

For cone, we have

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

$S_2 = \pi rl = \pi r\sqrt{r^2 + h^2}$

We have,

$\frac{S_1}{S_2} = \frac{8}{5} = \frac{2\pi rh}{\pi r\sqrt{r^2+h^2}}$

$= \frac{2h}{\sqrt{r^2+h^2}} = \frac{8}{5}$

(squaring both side)

$= \frac{4h^2}{r^2+h^2} = \frac{64}{25}$

$= 100h^2 = 64r^2 + 64h^2$

$= 36h^2 = 64r^2$

(Square root both side)

$= 6h = 8r$

$= \frac{r}{h} = \frac{3}{4}$

Exercise 20.2

1. Question

Find the volume of a right circular cone with :

(i) radius 6 cm, height 7 cm.

(ii) radius 3.5 cm, height 12 cm

(iii) height 21 cm and slant height 28 cm.

Answer

i) we have,

Radius of cone = 6 cm

Height of cone = 7 cm

So, volume of cone = $\frac{1}{3}\pi r^2 h$ = 1/3 × 22/7 ×36×7 = 264 cm^3

ii) we have,

radius = 3.5 cm

height = 12 cm

volume of cone = 1/3×22/7×3.5×3.5×12 = 154 cm^3

iii) we have,

height = 21 cm

slant height = 28 cm

radius r = √(28^2-21^2) = √49×7 = 7√7 cm

volume of cone = 1/3×22/7×7√7×7√7×21 = 7546 cm^3

2. Question

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.

Answer

i) we have,

radius of cone =7cm

slant height =25 cm

vertical height of cone h = √(25^2 – 7^2) = √576 = 24 cm

hence capacity (volume) of cone = 1/3×22/7×49×24 = 1232 cm^3

ii) we have,

height = 12 cm

slant height =13 cm

radius of cone r = √(13^2-12^2) = √25 = 5 cm

volume of conical vessel = 1/3×22/7×5×5×12 = 2200/7 = 314.28 cm^3

3. Question

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.

Answer

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

$V_1 = \frac{1}{3}\pi(3r)^2 \times h$ and $V_2 = \frac{1}{3}\pi \times r^2 \times 3h$

$= \frac{V_1}{V_2} = \frac{3\pi r^2 h}{\pi r^2 h} = \frac{3}{1}$

4. Question

The radius and the height of a rightr circular cone are in the ratio 5 : 12. If its volume is 314 cubic metre, find the slant height and the radius (Use π =3.14).

Answer

We have,

Let radius of cone r=5x

Let height h = 12x

∴ Volume = 314 m^3

$= \frac{1}{3} \times 3.14 \times (5x)^2 \times 12x = 314$

$= x^3 = 1 = x = 1$

∴r =5 and h = 12

Now, slant height $l = \sqrt{r^2 + h^2} = l = \sqrt{25+144}$ = 13 m

5. Question

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 π =3.14)

Answer

Let radius $r = 5x$

Let height $h = 12x$

We have,

Volume= 2512 m³

$= \frac{1}{3} \times 3.14 \times 25x^2 \times 12x = 2512$

$= x^3 = 8 = x = 2$

$\therefore r = 10$ cm and $h = 24$ cm

Hence, slant height $l = \sqrt{r^2 + h^2} = \sqrt{100 + 576} = 26$ cm

6. Question

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.

Answer

1) We have,

$V_1 : V_2 = 4 : 5$

$r_1 = r_2 = 2 : 3$

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

7. Question

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

Answer

We have,

$r_1 = r_2$

$h_1 = h_2$

$\therefore \frac{volume\ of\ cylinder}{volume\ of\ the\ cone} = \frac{\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{3}{1}$

8. Question

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?

Answer

Let r be the radius of the base and h be the height of the original cone. Then,

$v_1 = \frac{1}{3}\pi r^2 h$

Let V_2 be the volume of the reduces cone. Then,

$$v_2 = \frac{1}{3}\pi\left(\frac{r}{2}\right)^2 \times h$$

$$\therefore \frac{v_1}{v_2} = \frac{4}{1} = \frac{v_1}{v_2} = \frac{4}{1}$$

Hence ratio of reduce cone to original cone = 1:4

9. Question

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 canvas cloth is required to just cover the heap? (Use π =3.14)

Answer

We have,

r adius = 9/2 = 4.5 m

height = 3.5 m

∴slant height $l = \sqrt{r^2 + h^2} = \sqrt{(4.5)^2 + (3.5)^2}$ = 5.70 m

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

$= \frac{1}{3} \times 3.14 \times (4.5)2 \times 3.5 = 74.1825$ m³

Area of canvas required = π*rl*

= 3.14×4.5×5.7 m² = 80.54 m²

10. Question

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.

Answer

We have ,

Radius *r* = 14/2 = 7 cm,

Height *h* = 51 cm

∴ Weight of solid cone $= \left(\frac{1}{3} \times \frac{22}{7} \times 7^2 \times 51\right) \times \frac{10}{1000}$ kg = 26.180 kg

11. Question

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.

Answer

We have,

r = 6.3 cm, *h* = 10 cm

∴$l = \sqrt{r^2 + h^2}$ cm= $\sqrt{(6.3)^2 + 100}$ cm

= $\sqrt{139.69}$ cm = 11.82 cm

Now, Volume $= \frac{1}{3} \times \frac{22}{7} \times (6.3)^2 \times 10$ cm³

= 415.8 cm³

Curved surface area $= \frac{22}{7} \times 6.3 \times 11.82$ cm²

= 234.03 cm²

12. Question

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

Answer

We have,

Radius of the base of the cone =14/2 = 7 cm

Height of the cone = 14 cm

∴ Volume of the cone = $\frac{1}{3} \times \frac{22}{7} \times 7^2 \times 14$ cm^3

= 718.66 cm^3

13. Question

The volume of a right circular cone is 9856 cm3. If the diameter of the base is 28 cm, find :

(i) height of the cone

(ii) slant height of the cone

(iii) curved surface area of the cone.

Answer

We have,

Volume of right circular cone = 9856 cm^3,

*R*adius of cone = 14 cm

$$\therefore \frac{1}{3} \times \frac{22}{7}(14)^2 \times h = 9856$$

h = 48 cm

slant height $l = \sqrt{r^2 + h^2} = \sqrt{196 + 2304} = 50$ cm

Curved Surface area of cone = πrl = $\frac{22}{7} \times 14 \times 50 cm^2 = 220 cm^2$

14. Question

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

Answer

We have,

Radius of conical pit = $\frac{3.5}{2} = \frac{7}{4} m$

Depth of pit 'h' = 12 m

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

= $\frac{1}{3} * \frac{22}{7} * 1.75 * 1.75 * 12$

= 38.5 m^3

Since, 1 m^3 = 1 kiloliter

Capacity of the pit = (38.5 × 1)

= 38.5 kilolitres

15. Question

Monica has a piece of Canvas whose area is 551 m². She uses it to have a conical tent made, with a base radius of 7 m. Assuming that all the stitching margins and wastage incurred while cutting, amounts to approximately 1 m². Find the volume of the tent that can be made with it.

Answer

1) We have,

Area of canvas = 551 m²

Area of canvas lost in wastage = 1 m²

∴ Area of canvas used in making tent

= (551-1) m² = 550 m²

= Surface area of the cone = 550 m²

We have,

r = radius of the base of the cone = 7 m

∴ Surface area = 550 m² = $\pi r l$ = 550

$= \frac{22}{7} \times 7 \times l = 550 = l = 25$ m

Let h be the height of the cone. Then,

$l^2 = r^2 + h^2 = h = \sqrt{l^2 - r^2} = \sqrt{25^2 - 7^2} = 24$ m

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

$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 24 \, m^3 = 1232$ m³

CCE - Formative Assessment

1. Question

The height of a cone is 15 cm. If its volume is 500π cm³, then find the radius of its base.

Answer

1) We have,

Height of cone = 15 cm

Volume of cone = 500π cm³

=1/3 πr²h = 500π

= r² =100 r =√100

Hence, radius of base r = 10 cm ,

2. Question

If the volume of a right circular cone of height 9 cm is 48π cm³, find the diameter of its base.

Answer

We have ,

Volume of cone = 48π cm³

Height of cone h = 9 cm

= 1/3πr²h = 48π

= r²= 16 r = 4 cm

Hence diameter of its base = 2 × radius = 2×4 = 8 cm

3. Question

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

Answer

We have ,

Height of cone h = 21 cm

Slant height l = 28 cm

Radius of cone = $\sqrt{(l^2-h^2)} = \sqrt{(28^2 – 21^2)} = \sqrt{343} = 7\sqrt{7}$ cm

Volume of cone = $1/3×22/7×7\sqrt{7}×7\sqrt{7}×21$

= 2401π cm^3

4. Question

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.

Answer

We have

Height of conical vessel = 3.5 cm

Volume = 3.3 litre = 3300 cm^3

= $1/3\pi r^2h$ = 3300

=r^2 = 3300×3×7 / 22×3.5 = 900

= r =$\sqrt{900}$ = 30 cm

Hence diameter of its base = 2× radius = 2×30 = 60 cm

5. Question

If the radius and slant height of a cone are in the ratio 7 : 13 and its curved surface area is 286 cm^2, find its radius.

Answer

We have

Let radius of cone = 7x

Let slant height = 13x

Curved surface area of cone = 286 cm^2

= πrl = 286 , 22/7×7x×13x = 286

= x^2 = 1

= x = 1

Hence radius of cone = 7×1 = 7 cm

6. Question

Find the area of canvas required for a conical tent of height 24 m and base radius 7 m.

Answer

We have,

Height of conical tent = 24 m

Radius of its base = 7 m

Slant height of cone l = √(r²+h²) = √(24²+7²) = √625 = 25 m

Slant height of cone $l = \sqrt{r^2+h^2} = \sqrt{24^2+7^2} = \sqrt{625} = 25$ m

Area of canvas required = πrl = 22/7×7×25 = 550 m²

7. Question

Find the area of metal sheet required in making a closed hollow cone of base radius 7 cm and height 24 cm.

Answer

We have,

Base radius of cone = 7 cm

Height of cone = 24 cm

Slant height of cone $l = \sqrt{r^2+h^2} = \sqrt{24^2+7^2} = \sqrt{625} = 25$ cm

Hence area of metal sheet required = total surface area of cone

= πr(l+r) = 22/7 ×7 (25+7)

=704 cm²

8. Question

Find the length of cloth used in making a conical pandal of height 100 m and base radius 240 m, if the cloth is 100π m wide.

Answer

We have ,

Height of conical pandal = 100m

Base radius of pandal = 240 m

Slant height $l = \sqrt{r^2+h^2} = \sqrt{240^2+100^2} = \sqrt{67600} = 260$ m

Curved surface area of cloth = πrl = π×260×240

Hence length of 100π m wide cloth = curved surface area of cloth/ width of cloth

= π×260×240 / 100π

= 26×24 = 624m

1. Question

The number of surfaces of a cone has, is

A. 1

B. 2

C. 3

D. 4

Answer

A cone has two surfaces,

(i) Curved surface

(ii) Circular base

2. Question

The area of the curved surface of a cone of radius 2*r* and slant height $\frac{1}{2}$, is

A. $\pi r l$

B. $2\pi r l$

C. $\frac{1}{2}\pi r l$

D. $\pi(r+l)r$

Answer

Radius of cone = 2r

Slant hight = $\frac{1}{2}$

Area of curved surface = $\pi r l$

$= \frac{22}{7} \times 2r \times \frac{1}{2} = \pi r l$

3. Question

The total surface area of a cone of radius $\frac{r}{2}$ and length 2l, is

A. $2\pi r(l+r)$

B. $\pi r\left(l+\frac{r}{4}\right)$

C. $\pi r(l+r)$

D. $2\pi r l$

Answer

Radius of cone = $\frac{r}{2}$

Length of cone = 2l

Total surface area of cone = $\pi r l + \pi r^2$

$= \pi \frac{r}{2} \times 2l + \pi \frac{r^2}{4}$

$= \pi r \left(l+\frac{r}{4}\right)$

4. Question

A solid cylinder is melted and cast into a cone of same radius. The heights of the cone and cylinder are in the ratio

A. 9 : 1

B. 1 : 9

C. 3 : 1

D. 1 : 3

Answer

We have radius of cylinder = radius of base of cone

$r_1 = r_2$

Let height of cylinder and cone is respectively h_1 and h^2

$= \frac{1}{3}\pi r_1 h_1 = \pi r_2 h_2$

$= \frac{h_1}{h_2} = \frac{3}{1}$

5. Question

The slant height of a cone is increased by 10%. If the radius remains the same, the curved surface area is increases by

A. 10%

B. 12.1%

C. 20%

D. 21%

Answer

Let radius of cone = r

Let slant height = x

Curved surface area = $\pi r x$

New slant height = $n + \dfrac{x \times 10}{100} = \dfrac{11x}{10}$

New volume = $\pi r \times \dfrac{11x}{10}$

Increase in volume = $\pi r \left(\dfrac{11x}{10} - x \right) = \pi r \dfrac{x}{10}$

Percentage increase in volume = $\dfrac{\frac{\pi r x}{10} \times 100}{\pi r x} = 10\%$

6. Question

The height of a solid cone is 12 cm and the area of the circular base is 64π cm². A plane parallel to the base of the cone cuts through the cone 9 cm above the vertex of the cone, the area of the base of the new cone so formed is

A. 9π cm²

B. 16π cm²

C. 25π cm²

D. 36π cm²

Answer

We have,

Height of cone = 12cm

Area of circular base = 64π cm²

Height from the vertex of small cone = 9 cm

π r² = 64π

r²= 64

Radius of base = 8cm

From similarity triangle $= \dfrac{12}{8} = \dfrac{9}{R}$

$= R = \dfrac{9 \times 8}{12} = 6\,cm$

R = radius of small cone

Area of small cone = πr² = π(6)² = 36π cm²

7. Question

If the radius of the base of a right circular cone is 3*r* and its height is equal to the radius of the base, then its volume is

A. $\frac{1}{3}\pi r^3$

B. $\frac{2}{3}\pi r^3$

C. $3\pi r^3$

D. $9\pi r^3$

Answer

We have,

Radius of base of cone = 3r

Height of cone = 3r

Volume of cone $= \frac{1}{3}\pi(3r)^2 \times 3r$

$= 9\pi r^3$

8. Question

If the volume of two cones are in the ratio 1 : 4 and their diameters are in the ratio 4 : 5, then the ratio of their heights, is

A. 1 : 5

B. 5 : 4

C. 5 : 16

D. 25 : 64

Answer

We have,

Ratio of volume of two cones $= \frac{v_1}{v_2} = \frac{1}{4}$

ratio of their diameter $= \frac{d_1}{d_2} = \frac{4}{5}$

ratio of their radius $= \frac{r_1}{r_2} = \frac{2}{\frac{5}{2}} = \frac{4}{5}$

so,

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

$= \frac{16h_1}{25h_2} = \frac{1}{4} = \frac{h_1}{h_2} = \frac{1}{4} \times \frac{25}{16} = \frac{25}{64}$

9. Question

The curved surface area of one cone is twice that of the other while the slant height of the latter is twice that of the former. The ratio of their radii is

A. 2 : 1

B. 4 : 1

C. 8 : 1

D. 1 : 1

Answer

We have,

$A_1 = 2A_2$, $\dfrac{A_1}{A_2} = \dfrac{2}{1}$

$2l_1 = l_2$, $\dfrac{l_1}{l_2} = \dfrac{1}{2}$

$= \dfrac{\pi r_1 l_1}{\pi r_2 l_2} = \dfrac{2}{1}$

$= \dfrac{r_1}{r_2} \times \dfrac{1}{2} = \dfrac{2}{1}$

$= \dfrac{r_1}{r_2} = \dfrac{4}{1}$

10. Question

If the height and radius of a cone of volume *V* are doubled, then the volume of the cone is,

A. 3 *V*

B. 4 *V*

C. 4 *V*

D. 8 *V*

Answer

We have,

Let radius of cone = r

Let height of cone = h

Volume = 1/3πr²h

New radius of cone = 2r

New height of cone = 2h

New volume $= \dfrac{1}{3}\pi(2r)^2 \times 2h$

$= \dfrac{1}{3}\pi 4r^2 \times 2h = 8v$

11. Question

The ratio of the volume of a right circular cylinder and a right circular cone of the same base and height, is

A. 1 : 3

B. 3 : 1

C. 4 : 3

D. 3 : 4

Answer

Let radius of both = r cm

Let height = h cm

Ratio of volume $= \dfrac{\pi r^2 h}{\frac{1}{3}\pi r^2 h} = \dfrac{1}{3}$

12. Question

A right circular cylinder and a right circular cone have the same radius and the same volume. The ratio of the height of the cylinder to that of the cone is

A. 3 : 5

B. 2 : 5

C. 3 : 1

D. 1 : 3

Answer

Let radius of both = r cm

Let volume of both = V cm

Ratio of height $= \dfrac{\pi r^2 h_1}{\frac{1}{3}\pi r^2 h_2} = \dfrac{v}{v}$

$= \dfrac{3h_1}{h_2} = 1$

$= \dfrac{h_1}{h_2} = \dfrac{1}{3}$

13. Question

If the base radius and the height of a right circular cone are increased by 20%, then the percentage increase in volume is approximately

A. 60

B. 68

C. 73

D. 78

Answer

Let base radius of cone = X

Let height of cone = Y

Volume of cone $= \dfrac{1}{3}\pi x^2 y$

New radius of cone $= x + x\dfrac{20}{100} = \dfrac{6x}{5}$

New height of cone $= y + y\dfrac{20}{100} = \dfrac{6y}{5}$

New volume $= \dfrac{1}{3}\pi \dfrac{36x^2}{25} \times \dfrac{6y}{5} = \dfrac{1}{3}\pi \dfrac{216x^2 y}{125}$

Increase in volume $= \dfrac{216x^2 y}{125} - x^2 y = \dfrac{91x^2 y}{125}$

Percentage increase in volume $= \dfrac{\frac{91x^2 y}{125}}{x^2 y} \times 100 = 72.8\%$

Approx 73%

14. Question

The diameters of two cones are equal. If their slant heights are in the ratio 5 : 4, the ratio of their curved surface areas, is

A. 4 : 5

B. 25 : 16

C. 16 : 25

D. 5 : 4

Answer

We have,

Ratio of slant height of cones $= \dfrac{l_1}{l_2} = \dfrac{5}{4}$

$d_1 = d_2$

$so, r_1 = r_2$

Ratio of curved surface area $= \dfrac{\pi r_1 l_1}{\pi r_2 l_2} = \dfrac{5}{4}$

15. Question

If *h, S* and *V* denote respectively the height, curved surface area and volume of a right circular cone, then $3\pi V h^3 - S^2 h^2 + 9V^2$ is equal to

A. 8

B. 0

C. 4π

D. $32\pi^2$

Answer

We have,

h= hight

s = curved surface area

v = volume

Then, $3\pi v h^3 - s^2 h^2 + 9v^2$

$= 3\pi \times \dfrac{1}{3}\pi r^2 h \times h^3 - \left((\pi^2 r^2 l^2)h^2\right) + 9 \times \left(\dfrac{1}{2}\pi r^2 h\right)^2$

$= \pi^2 r^2 h^4 - \left(\pi^2 r^2 (r^2 + h^2)h^2\right) + 9 \times \dfrac{1}{9}\pi^2 r^4 h^2$

$= \pi^2 r^2 h^4 - \pi^2 r^4 h^2 - \pi^2 r^2 h^4 + \pi^2 r^4 h^2 = 0$

16. Question

If a cone is cut into two parts by a horizontal plane passing through the mid-point of its axis, the ratio of the volumes of upper and lower part is

A. 1 : 2

B. 2 : 1

C. 1 : 7

D. 1 : 8

Answer

We have, (by mid point theorem)

Radius of complete cone = 2r

Radius of small cone after cutting = r

Hight of complete cone = 2h

Hight of small cone = h

$$volume\ of\ large\ triangle = \frac{1}{3}\pi(2r)^2 \times 2h$$

$$= \frac{8}{3}\pi r^2 h$$

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

$$volume\ of\ lower\ part = \left(\frac{8}{3} - \frac{1}{3}\right)\pi r^2 h = \frac{7}{3}\pi r^2 h$$

So ratio of volume of lower and upper parts $= \frac{\frac{1}{3}}{\frac{7}{3}} = 1:7$

17. Question

If the heights of two cones are in the ratio of 1 : 4 and the radii of their bases are in the ratio 4 : 1, then the ratio of their volumes is

A. 1 : 2

B. 2 : 3

C. 3 : 4

D. 4 : 1

Answer

Given,

$$\frac{h_1}{h_2} = \frac{1}{4}$$

$$\frac{r_1}{r_2} = \frac{4}{1}$$

$$= \frac{v_1}{v_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{16}{1} \times \frac{1}{4} = \frac{4}{1}$$