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CLASS – 9

MATHEMATICS

Chapter – 11

Surface Areas and Volumes

Part – 3

Surface Area of a Right Circular Cone

Vikas Saini

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OVERVIEW

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1. Introduction
2. Surface Area of a Right Circular Cone
3. Surface Area of a Sphere
4. Volume of a Right Circular Cone
5. Volume of a Sphere

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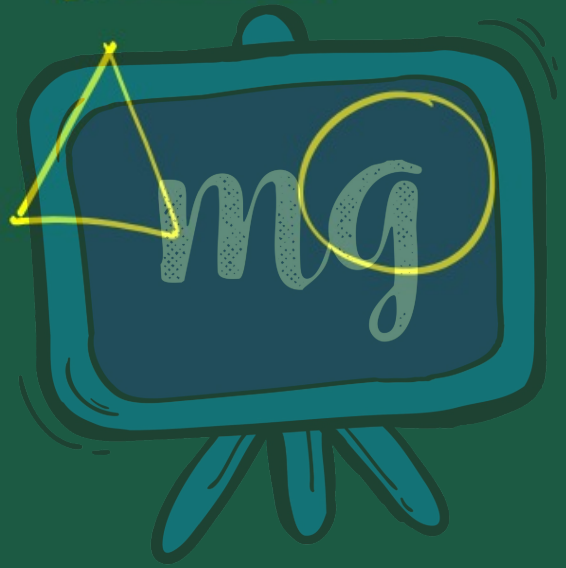
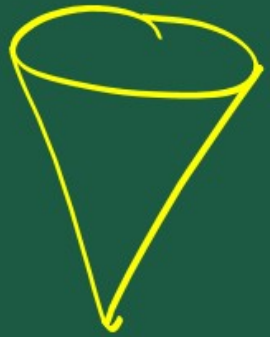
Cone → 3D Shape





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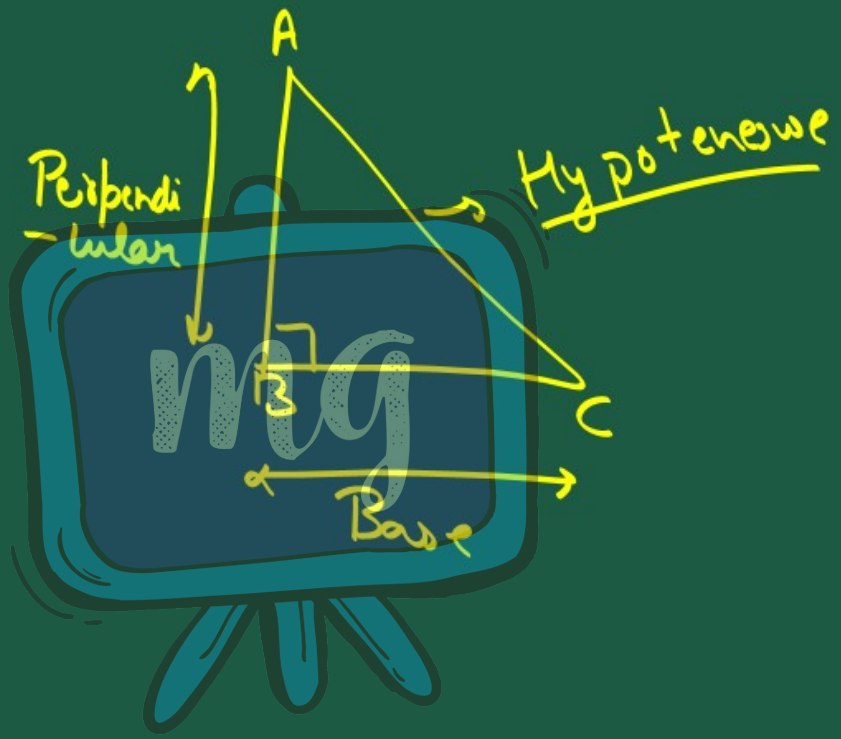

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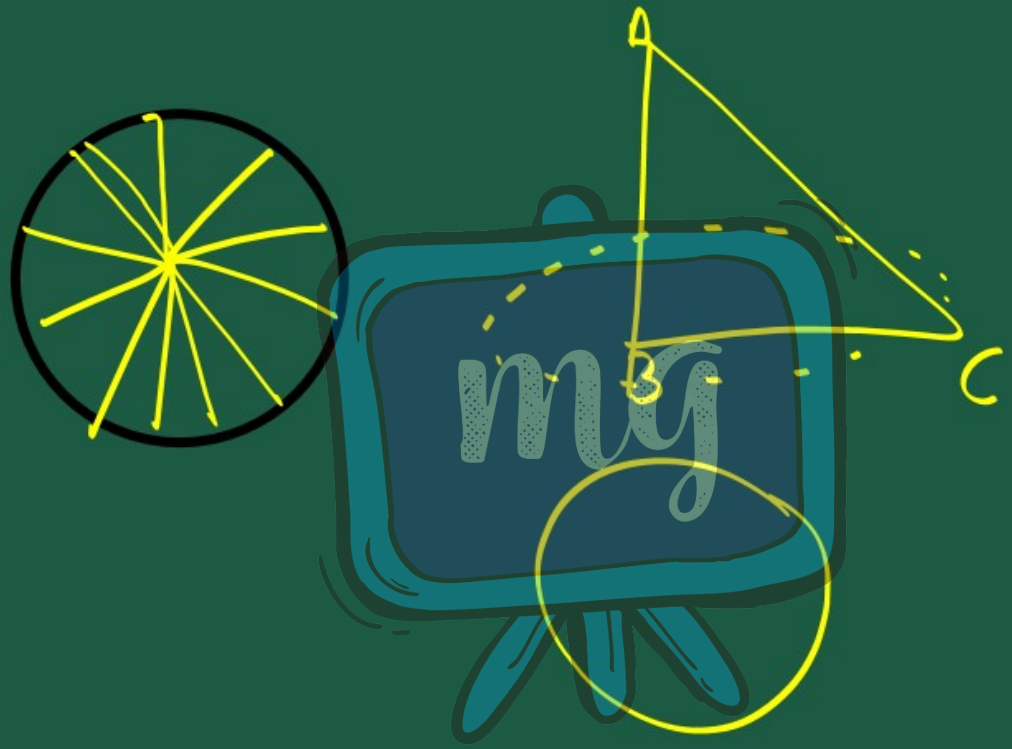

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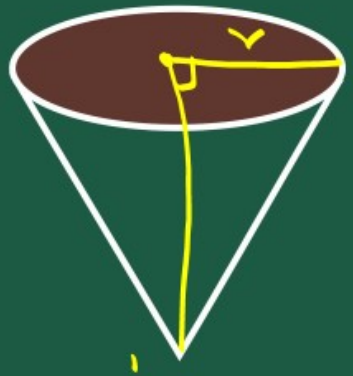
CONE

The solid figure obtained by rotating a right-angled triangle about its perpendicular/base is called a cone/right circular cone.



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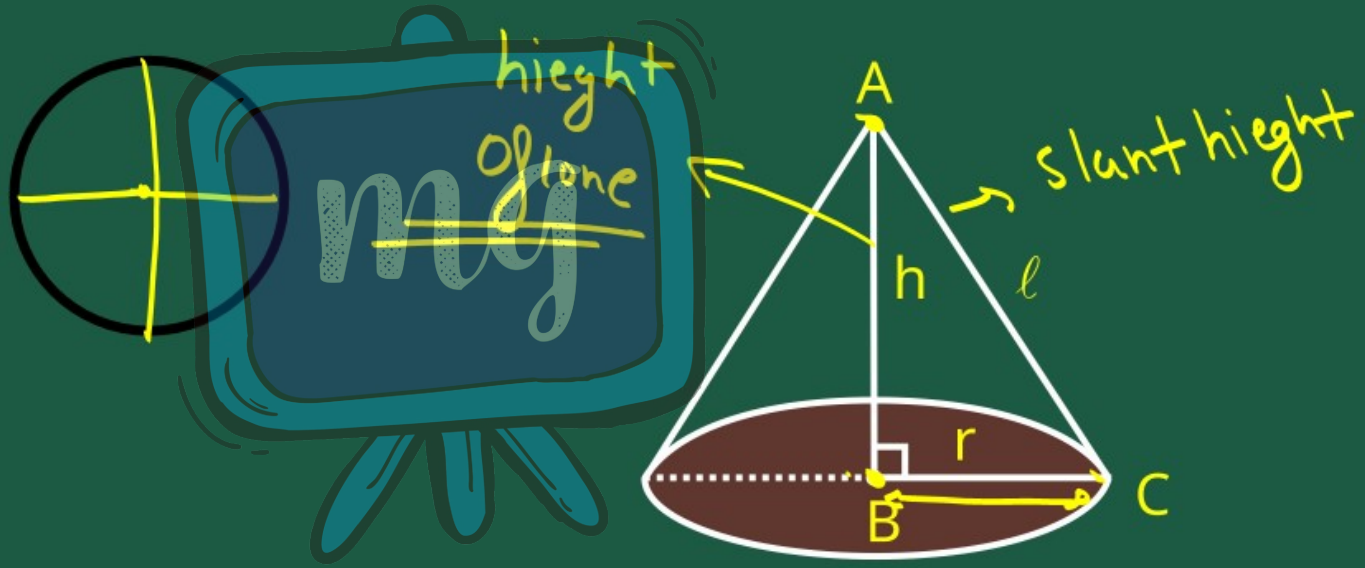

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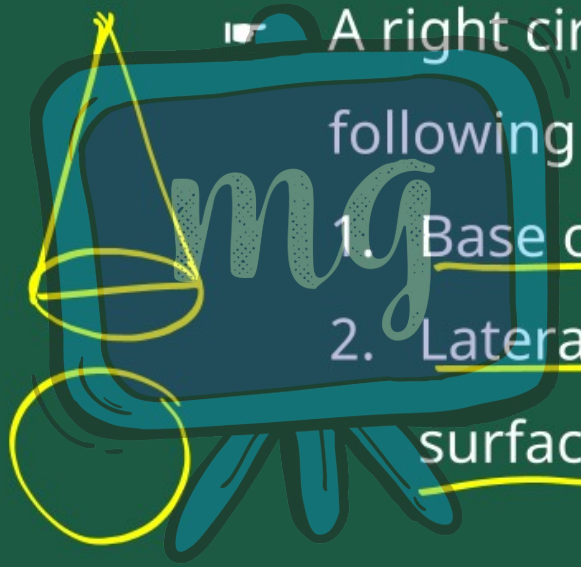
Note



- A right circular cone has the following two surfaces –
  1. Base of a cone/circular surface
  2. Lateral surface of a cone/ curved surface

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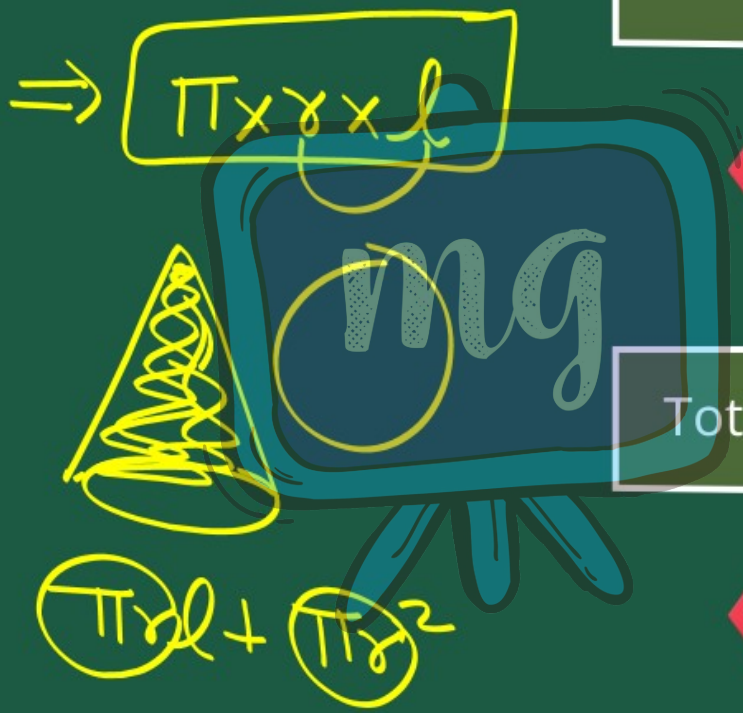

Curved surface area of a cone

$$\pi r \ell$$

Total surface area of a cone

$$\pi r (\ell + r) = \pi r \ell + \pi r^2$$

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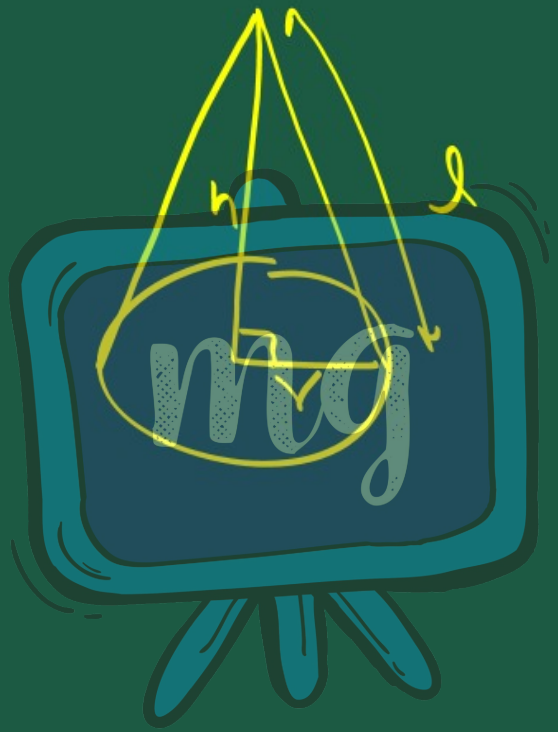

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Slant height of cone

$\ell^2 = r^2 + h^2$



$\ell^2 = r^2 + h^2$

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

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

$\rightarrow$ C.S.A $\rightarrow \pi r l$

$\rightarrow$ T.S.A $\rightarrow \pi r(l + r)$





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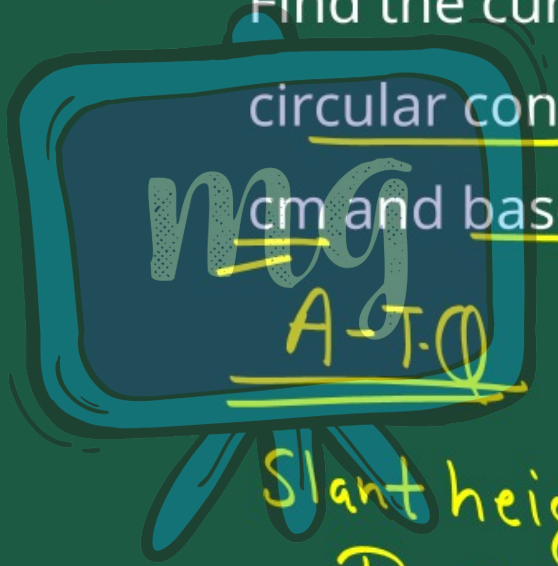
Example : 1

Find the curved surface area of a right circular cone whose slant height is 10 cm and base radius is 7 cm.



A - T - Q

Slant height = 10cm

Radius = 7cm

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Since we know that

Curved Surface area of cone $= \pi \times r \times l$

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

$= 22 \times 10$

$= 220\ cm^2$

$\pi = \frac{22}{7}$ or 3.14

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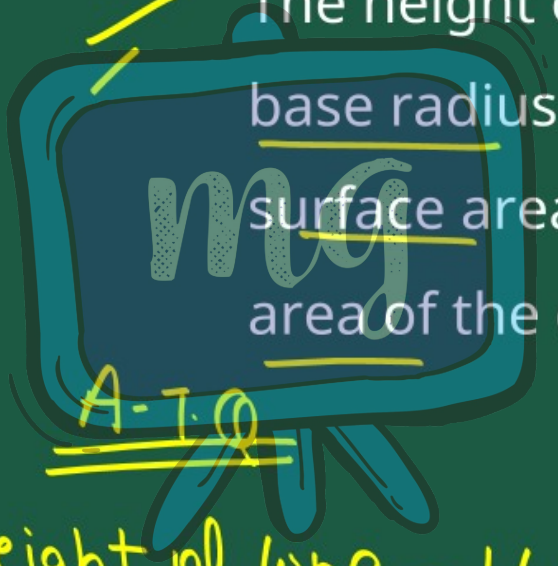
Example : 2

The height of a cone is 16 cm and its base radius is 12 cm. Find the curved surface area and the total surface area of the cone (Use $\pi = 3.14$).



A-T-Q

height of cone = 16 cm

Radius of cone = 12 cm.

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Sinle

Slant height = $\sqrt{(\text{radius})^2 + (\text{height})^2}$

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

$= \sqrt{(12)^2 + (16)^2}$

$= \sqrt{144 + 256} = \sqrt{400}$

$l = 20$ cm

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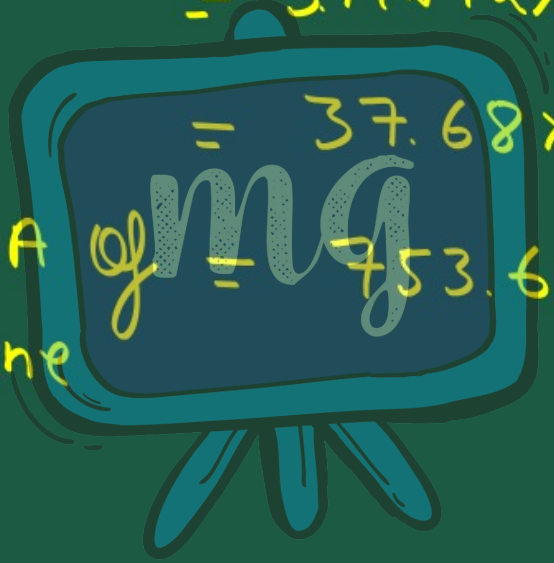
Since we know that

C.S.A of Cone $= \pi \times r \times l$

$= 3.14 \times 12 \times 20$

$= 37.68 \times 20$

C.S.A of Cone $= 753.6\ cm^2$



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T.S.A of cone : $\pi \times r \times (l + r)$

$= 3.14 \times 12 \times (20 + 12)$

$= 3.14 \times 12 \times 32$

$= 37.68 \times 32$

T.S.A of cone $= 1205.76 \text{ cm}^2$

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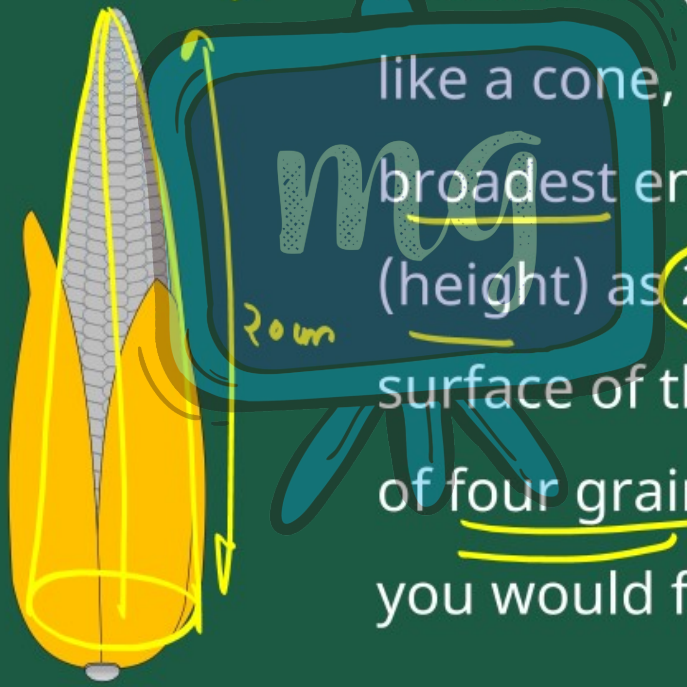
Example : 3



A corn cob (Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length (height) as 20 cm. If each 1 cm^2 of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob.

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A·T·Q

Radius of cob = 2.1cm

Height of cob = 20cm

Now, we know that

Slant height of cone $= \sqrt{(\text{Height})^2 + (\text{Radius})^2}$

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

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$$l = \sqrt{(4.1)^2 + (20)^2}$$

$$= \sqrt{4.41 + 400}$$

$$l = \sqrt{404.41}$$

$$l = 20.11 \text{ cm}$$

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Area of corn cob = C.S.A of cone

$= \pi \times r \times l$

$= \frac{22}{7} \times 2 \times 20.11$

$= 6.6 \times 20.11$

Area of corn cob $= 132.726\ cm^2$

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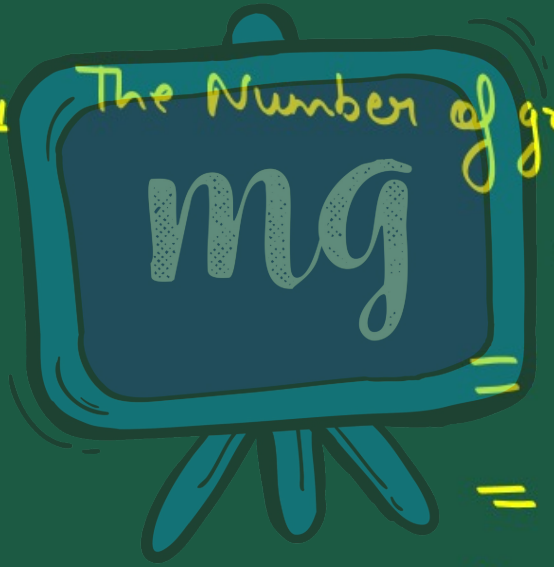
Since $1\ cm^2$ area of corn cob has 4 grains

So, The Number of grains whole cob has



$= \text{Area} \times 4$

$= 132.726 \times 4$

$= 530.904$

≈ 531 grains

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LEARNING OUTCOMES

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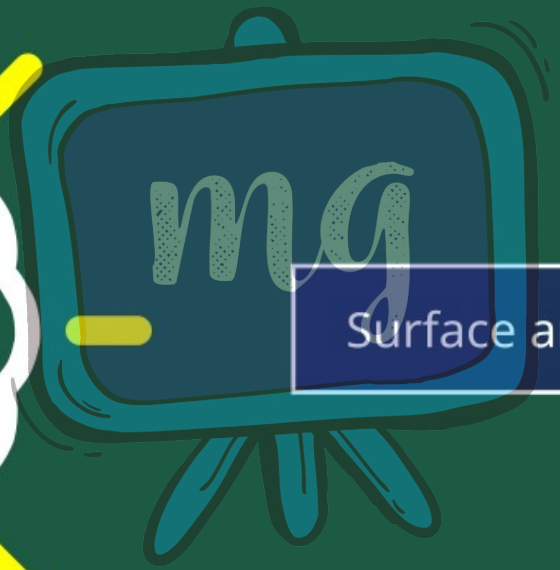

Surface area of a right circular cone

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ASSESSMENT

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1 The base radius of a cone is 10 cm and the slant height is 21 cm. The curved surface area of the cone is:

A $880\ cm^2$

B $660\ cm^2$

C $440\ cm^2$

D $2200\ cm^2$

(r) radius = 10 cm

(l) Slant height = 21 cm

C.S.A of cone = $\pi \times r \times l$

$= \frac{22}{7} \times 10 \times 21^3$

$= 66 \times 10$

$= 660\ cm^2$

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ASSESSMENT

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2 If the radius of the base of a cone is 5 cm and the total surface area is 660 cm^2, then the slant height of the cone is:

A 37 cm

B 40 cm

C 7 cm

D 42 cm

$R = 5\,cm$

$T.S.A = 660\ cm^2$

$l = ?$

$T.S.A = \pi \times r \times (l + r) = 660$

$\frac{22}{7} \times 5 \times (l + 5) = 660$

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$$\frac{22}{7} \times 5(l+5) = 660$$

$$l+5 = \frac{660 \times 7}{22 \times 5}$$

$$l+5 = 42$$

$$l = 42 - 5$$

$$l = 37$$



3 The full surface area of a cone of radius 3 cm and height 4 cm is–

A $24\pi\ cm^2$

B $3\pi\ cm^2$

C $40\pi cm^2$

D $36\pi\ cm^2$