

## NCERT/CBSE MATHEMATICS CLASS 10 textbook(OPTIONAL EXERCISE)

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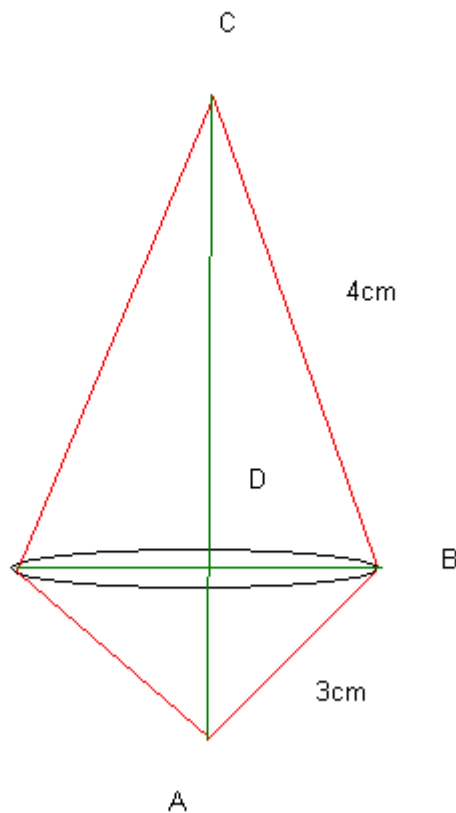
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Answers to NCERT/CBSE MATHEMATICS Class 10 (Class XI) textbook OPTIONAL EXERCISE

CHAPTER THIRTEEN  
SURFACE AREAS  
EXERCISES

2. A right triangle, whose sides are 3 cm and 4 cm (other than hypotenuse) is made to revolve about its hypotenuse. Find the volume and surface area of the double cone so formed. (Choose value of  $\pi$  as found appropriate.)

**SOLUTION :**



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ABC is a right triangle , right angled at B

AC is the hypotenuse.

Using pythagoras theorem, we have

$$AC^2 = AB^2 + BC^2$$

$$\Rightarrow AC^2 = 3^2 + 4^2$$

$$\Rightarrow AC^2 = 9 + 16$$

$$\Rightarrow AC^2 = 25$$

$$\Rightarrow AC = 5\text{cm}$$

$$\text{Ar}(\triangle ABC) = \frac{1}{2} \times BC \times AB = \frac{1}{2} \times 4 \times 3 = 6 \text{ sq cm}$$

$$\text{Also, Ar}(\triangle ABC) = \frac{1}{2} \times BD \times AC = \frac{1}{2} \times BD \times 5 = 6$$

$$\Rightarrow BD = \frac{12}{5} \text{cm}$$

ABD is a right triangle , right angled at D

AB is the hypotenuse.

Using pythagoras theorem, we have

$$AB^2 = AD^2 + BD^2$$

$$\Rightarrow AD^2 = AB^2 - BD^2$$

$$\Rightarrow AD^2 = 3^2 - \left(\frac{12}{5}\right)^2$$

$$\Rightarrow AD^2 = \left[3 - \frac{12}{5}\right] \cdot \left[3 + \frac{12}{5}\right]$$

$$\Rightarrow AD^2 = \left[\frac{3}{5}\right] \cdot \left[\frac{27}{5}\right] = \frac{81}{25}$$

$$\Rightarrow AD = \frac{9}{5} \text{cm}$$

$$\text{Now, } CD = AC - AD = 5 - \frac{9}{5} = \frac{16}{5} \text{cm}$$

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Volume of the smaller cone :

$$\begin{aligned} &= \frac{1}{3} \times \pi \times r^2 \times h = \frac{1}{3} \times \pi \times \left(\frac{12}{5}\right)^2 \times \frac{9}{5} \\ &= \frac{1}{3} \times \frac{22}{7} \times \frac{144}{25} \times \frac{9}{5} \\ &= \frac{9504}{875} \text{ cm}^3 \end{aligned}$$

Volume of the larger cone :

$$\begin{aligned} &= \frac{1}{3} \times \pi \times r^2 \times h = \frac{1}{3} \times \pi \times \left(\frac{12}{5}\right)^2 \times \frac{16}{5} \\ &= \frac{1}{3} \times \frac{22}{7} \times \frac{144}{25} \times \frac{16}{5} \\ &= \frac{16896}{875} \text{ cm}^3 \end{aligned}$$

Volume of the double cone formed =

Volume of the smaller cone + Volume of the larger cone

$$\begin{aligned} &= \frac{9504}{875} \text{ cm}^3 + \frac{16896}{875} \text{ cm}^3 \\ &= \frac{26400}{875} \text{ cm}^3 \\ &= \frac{1056}{35} \text{ cm}^3 \\ &= 30.17 \text{ cm}^3 \end{aligned}$$

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Surface area of the smaller cone :

$$=\pi rl$$

$$=\pi \cdot BD \cdot AB$$

$$=\frac{22}{7} \times \frac{12}{5} \times 3 \text{ cm}^2 = \frac{792}{35} \text{ cm}^2$$

Surface area of the larger cone :

$$=\pi rl$$

$$=\frac{22}{7} \times \frac{12}{5} \times 4 \text{ cm}^2 = \frac{1056}{35} \text{ cm}^2$$

$\therefore$  Surface area of the double cone formed =

= Surface area of the smaller cone + Surface area of the larger cone

$$= \frac{792}{35} \text{ cm}^2 + \frac{1056}{35} \text{ cm}^2$$

$$= \frac{1848}{35} \text{ cm}^2 = 52.8 \text{ cm}^2$$