

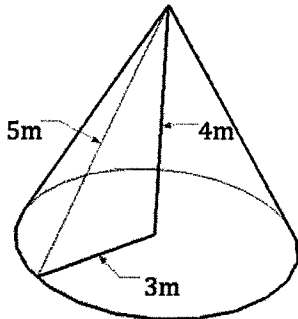
8.4/8.5 Volume and Surface Area of Cones Worksheet

MPM1D

Jensen

1. Find the volume and surface area of each cone:

a)



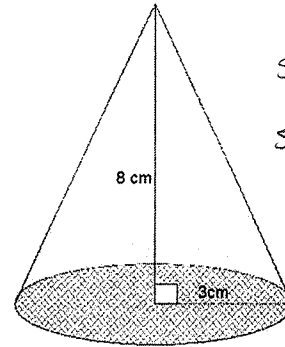
$$\begin{aligned}V &= \frac{1}{3} \pi r^2 h \\&= \frac{1}{3} \pi (3)^2 (4) \\&= 37.7 \text{ m}^3\end{aligned}$$

$$\begin{aligned}SA &= \pi r s + \pi r^2 \\&= \pi (3)(5) + \pi (3)^2 \\&= 47.1 + 28.3 \\&= 75.4 \text{ m}^2\end{aligned}$$

$$\text{Volume} = \underline{37.7 \text{ m}^3}$$

$$\text{Surface Area} = \underline{75.4 \text{ m}^2}$$

b)



$$s^2 = 8^2 + 3^2$$

$$s^2 = 73$$

$$s = 8.5$$

$$\begin{aligned}V &= \frac{1}{3} \pi r^2 h \\&= \frac{1}{3} \pi (3)^2 (8) \\&= 75.4 \text{ cm}^3\end{aligned}$$

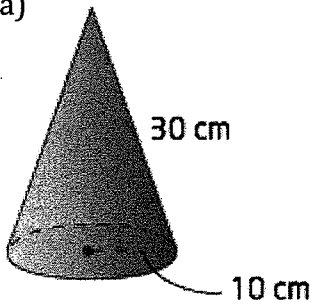
$$\begin{aligned}SA &= \pi r s + \pi r^2 \\&= \pi (3)(8.5) + \pi (3)^2 \\&= 80.1 + 28.3 \\&= 108.4 \text{ cm}^2\end{aligned}$$

$$\text{Volume} = \underline{75.4 \text{ cm}^3}$$

$$\text{Surface Area} = \underline{108.4 \text{ cm}^2}$$

2. Find the surface area and volume of each cone. Hint: You will have to use Pythagorean Theorem to solve for the missing measurement.

a)



$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (10)^2 (28.3) \\ &= 2963.6 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} SA &= \pi r s + \pi r^2 \\ &= \pi (10)(30) + \pi (10)^2 \\ &= 942.5 + 314.2 \\ &= 1256.7 \text{ cm}^2 \end{aligned}$$

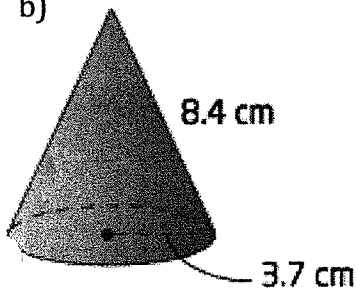
$$h^2 = 30^2 - 10^2$$

$$h^2 = 800$$

$$h = 28.3 \text{ cm}$$

Volume = <u>2963.6 cm³</u>
Surface Area = <u>1256.7 cm²</u>

b)



$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (3.7)^2 (7.5) \\ &= 107.5 \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} SA &= \pi r s + \pi r^2 \\ &= \pi (3.7)(8.4) + \pi (3.7)^2 \\ &= 97.6 + 43 \\ &= 140.6 \text{ cm}^2 \end{aligned}$$

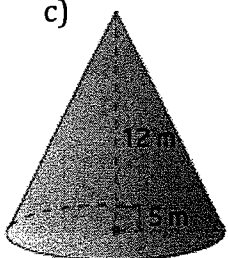
$$h^2 = 8.4^2 - 3.7^2$$

$$h^2 = 56.87$$

$$h = 7.5 \text{ cm}$$

Volume = <u>107.5 cm³</u>
Surface Area = <u>140.6 cm²</u>

c)



$$\begin{aligned} V &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi (5)^2 (12) \\ &= 314.2 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} SA &= \pi r s + \pi r^2 \\ &= \pi (5)(13) + \pi (5)^2 \\ &= 204.2 + 78.5 \\ &= 282.7 \text{ m}^2 \end{aligned}$$

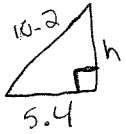
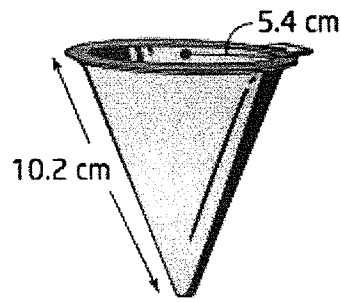
$$s^2 = 5^2 + 12^2$$

$$s^2 = 169$$

$$s = 13$$

Volume = <u>314.2 m³</u>
Surface Area = <u>282.7 m²</u>

3. Wesley uses a cone-shaped funnel to put oil in a car engine. The funnel has a radius of 5.4 cm and a slant height of 10.2 cm. How much oil can the funnel hold, to the nearest tenth of a cubic centimetre?



$$h^2 = 10.2^2 - 5.4^2$$

$$h^2 = 74.88$$

$$h = 8.7 \text{ cm}$$

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

$$= \frac{1}{3} \pi (5.4)^2 (8.7)$$

$$= 265.7 \text{ cm}^3$$

4. A cone-shaped paper cup has a volume of 67 cm^3 and a diameter of 6 cm. What is the height of the paper cup, to the nearest tenth of a centimetre?

$$r = 3$$

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

$$67 = \frac{1}{3} \pi (3)^2 h$$

$$67 = \frac{9}{3} \pi h$$

$$67 = 3\pi h$$

$$h = \frac{67}{3\pi}$$

$$h = 7.1 \text{ cm}$$

5. A cone just fits inside a cylinder with volume 300 cm^3 . What is the volume of the cone?

$$V_{\text{cone}} = \frac{1}{3} V_{\text{cylinder}}$$

$$= \frac{1}{3} (300)$$

$$= 100 \text{ cm}^3$$

6. A cone has a volume of 150 cm^3 . What is the volume of a cylinder that just holds the cone?

$$V_{\text{cylinder}} = 3 \times V_{\text{cone}}$$

$$= 3 (150)$$

$$= 450 \text{ cm}^3$$

7. The frustum of a cone is the part that remains after the top portion has been removed by making a cut parallel to the base. Calculate the surface area of this frustum, to the nearest square metre.

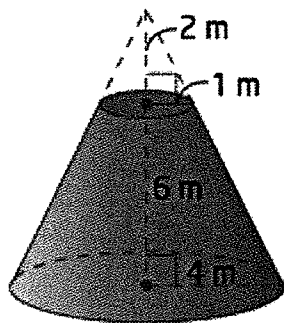
$$SA_{\text{large}} = \pi(4)(8.9) + \pi(4)^2$$

$$= 162.1 \text{ m}^2$$

$$SA_{\text{small}} = \pi r s$$

$$= \pi(1)(2.236)$$

$$= 7.0$$



$$c^2 = 2^2 + 1^2$$

$$c = 2.2$$

$$c^2 = 8^2 + 4^2$$

$$c = 8.9$$

$$SA_{\text{frustum}} = 162.1 - 7.0 + \text{area of circular top}$$

$$= 155.1 + \pi(1)$$

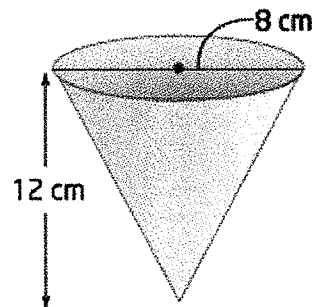
$$= 158.2 \text{ m}^2$$

8. Some paper cups are shaped like cones. How much paper, to the nearest square centimeter, is needed to make the cup?

$$SA = \pi r s$$

$$= \pi(4)(12.6)$$

$$= 158.3 \text{ cm}^2$$



Answers:

- 1) a) $V=37.7 \text{ m}^3$; $SA=75.4 \text{ m}^2$ b) $V= 75.4 \text{ cm}^3$; $SA= 108.4 \text{ cm}^2$ 2) a) $V= 2963.6 \text{ cm}^3$; $SA= 1256.7 \text{ cm}^2$
 b) $V= 107.5 \text{ cm}^3$; $SA= 140.6 \text{ cm}^2$ c) $V= 314.2 \text{ m}^3$; $SA= 282.7 \text{ m}^2$ 3) 265.7 cm^3 4) 7.1 cm 5) 100 cm^3
 6) 450 cm^3 7) 158.3 m^2 8) 158.3 cm^2