

Learning Goals

1. To understand what the surface area calculates.
2. To understand what slant height is and how to calculate it.
3. To understand that some surface area calculations use specific formulas and others are calculated by breaking down the shape down into its net and solving it in parts.

8.4 Surface Area of Right Pyramids and Cones

Surface Area of a Square-Based Pyramid

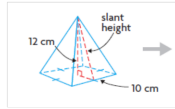
$$SA = 2bL + b^2, \text{ where}$$

"b" is the base side length

"L" is the slant height

Example One

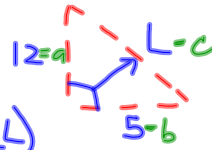
What is the total surface area of the following:



$$1. SA = 2bL + b^2$$

$$b = 10 \text{ cm (given)}$$

Calculate Slant Height (L)



$$a^2 + b^2 = c^2$$

$$12^2 + 5^2 = c^2$$

$$144 + 25 = c^2$$

$$\sqrt{169} = \sqrt{c^2}$$

$$c = 13 \text{ or } L = 13$$

Plug into S.A. formula

$$SA = 2(10)(13) + 10^2$$

$$= 260 + 100$$

$$= 360 \text{ cm}^2 \leftarrow \text{don't forget units!}$$

Surface Area of a Cone

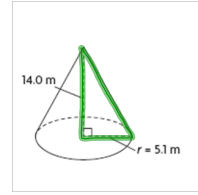
$$SA = \pi r^2 + \pi rL, \text{ where}$$

"r" is the radius of the circular base

"L" is the slant height

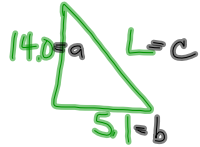
Example Two

Calculate the surface area of a cone with a radius of 5.1 m and a height of 14.0 m.



$$1. SA = \pi r^2 + \pi r L$$

2. Calculate Slant Height



$$\begin{aligned} a^2 + b^2 &= c^2 \\ 14^2 + 5.1^2 &= L^2 \\ 196 + 26.01 &= L^2 \\ \sqrt{L^2} &= \sqrt{222.01} \\ L &= 14.9 \text{ m} \end{aligned}$$

3. Plug r & L into formula & solve.

$$\begin{aligned} S.A. &= \pi(5.1)^2 + \pi(5.1)(14.9) \\ &= 320.07 \text{ m}^2 \end{aligned}$$

If the shape is NOT a square-based pyramid or cone then break the shape down into its net and solve in parts.

Example Three

Dallas wants to calculate the surface area of the following pyramid. The perimeter of its base is 80 cm.



Hint: First consider the net and then break the question down into two parts:

1. Solve the area of the base.
2. Solve the area of the sides.



1. Calculate the area of the base.



$$80 \text{ cm (perimeter)} \div 5$$

$$\begin{aligned} A &= (b \times h) \div 2 \\ &= (16 \times 24) \div 2 \\ &= 176 \div 2 \\ &= 88 \text{ cm}^2 \times 5 \text{ (because there are 5 triangles)} \\ &= 440 \text{ cm}^2 \end{aligned}$$

2. Calculate the area of the sides.

$$\begin{aligned} A &= (b \times h) \div 2 \\ &= (24 \times 16) \div 2 \\ &= 192 \text{ cm}^2 \times 5 \text{ (because there are 5 sides)} \\ &= 960 \text{ cm}^2 \end{aligned}$$

3. Calculate total S.A.

$$\begin{aligned} \text{S.A.} &= A_{\text{base}} + A_{\text{sides}} \\ &= 440 + 960 \\ &= 1400 \text{ cm}^2 \end{aligned}$$

Complete: p. 454 - 455 #1, 3 - 5, 7b.