What You Will Learn

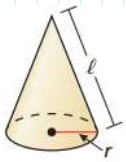
- Find surface areas of right cones.
- Find volumes of cones.
- Use volumes of cones.

Surface Area of a Right Cone

The surface area S of a right cone is

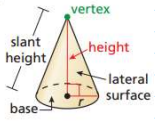
$$S = \pi r^2 + \pi r\ell$$

where r is the radius of the base and ℓ is the slant height.



Finding Surface Areas of Right Cones

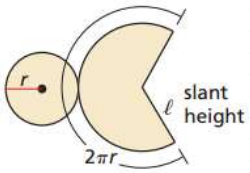
Recall that a *circular cone*, or *cone*, has a circular *base* and a *vertex* that is not in the same plane as the base. The *altitude*, or *height*, is the perpendicular distance between the vertex and the base. In a *right cone*, the height meets the base at its center and the *slant height* is the distance between the vertex and a point on the base edge.



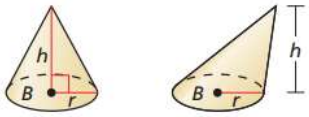
The **lateral surface of a cone** consists of all segments that connect the vertex with points on the base edge. When you cut along the slant height and lay the right cone flat, you get the net shown at the left. In the net, the circular base has an area of πr^2 and the lateral surface is a sector of a circle. You can find the area of this sector by using a proportion, as shown below.

$\frac{\text{Area of sector}}{\text{Area of circle}} = \frac{\text{Arc length}}{\text{Circumference of circle}}$	Set up proportion.
$\frac{\text{Area of sector}}{\pi\ell^2} = \frac{2\pi r}{2\pi\ell}$	Substitute.
$\text{Area of sector} = \pi\ell^2 \cdot \frac{2\pi r}{2\pi\ell}$	Multiply each side by $\pi\ell^2$.
$\text{Area of sector} = \pi r\ell$	Simplify.

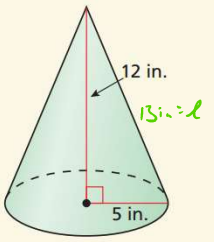
The surface area of a right cone is the sum of the base area and the lateral area, $\pi r\ell$.



What is a Right Cone?



Find the surface area of the right cone.



$S = \pi r^2 + \pi r\ell$

$\pi(5in)^2 + \pi(5in)(13in)$

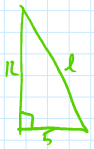
$25in^2\pi + 65in^2\pi$

$25x + 65x$

$90x$

$S = 90in^2\pi$ (in terms of π)

$S = 282.7in^2$



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

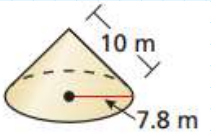
$(5in)^2 + (12in)^2 = \ell^2$

$25in^2 + 144in^2 = \ell^2$

$\sqrt{169in^2} = \sqrt{\ell^2}$

$13in = \ell$

Find the surface area of the right cone.



$S = \pi r^2 + \pi r\ell$

$\pi(7.8m)^2 + \pi(7.8m)(10m)$

$60.8m^2\pi + 78m^2\pi$

$S = 138.8m^2\pi$

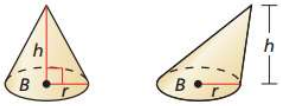
$S = 436.1m^2$

Volume of a Cone

The volume V of a cone is

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

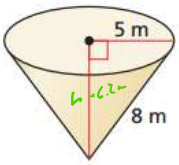
where B is the area of the base, h is the height, and r is the radius of the base.



- Same as Volume of Pyramid
- uses height, NOT length of cone.

Find the volume of the cone.

$V = \frac{1}{3}Bh$



$\frac{1}{3}(78.5\,m^2)(6.2\,m)$

$V = 162.7\,m^3$

$B = \pi r^2$

$\pi(5\,m)^2$

$\pi\,25\,m^2$

$B = 78.5\,m^2$

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

$(5)^2 + h^2 = (8)^2$

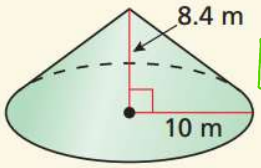
$25 + h^2 = 64$

$-25 \quad -25$

$\sqrt{h^2} = \sqrt{39}$

$h = 6.2\,m$

Find the volume of the cone.



$V = \frac{1}{3}Bh$

$\frac{1}{3}(314.2\,m^2)\,8.4\,m$

$V = 879.8\,m^3$

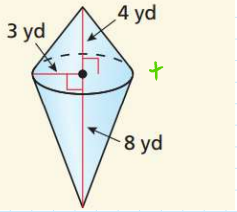
$B = \pi r^2$

$\pi(10\,m)^2$

$\pi\,100\,m^2$

$B = 314.2\,m^2$

Find the volume of the composite solid.



Break it up

Practice *sec 11.7* **pg. 645:**
1-3A, 5-11EO, 15, 16