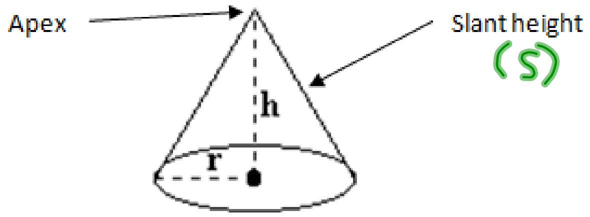
Section 1.4: Surface Areas of Right Pyramids and Cones Continued

A **right circular cone** is 3-Dimensional object that has a circular base and a curved surface.



The **Surface Area of a Right Cone** with slant height, s, and radius, r, is given by the formula:

$$SA = \text{lateral area} + \text{area of base}$$
$$SA = \pi rs + \pi r^2$$

Do not use 3.14 for π
Use the π on calculator.

Example 1: Determine the surface area of the cone to the nearest square millimeter.

use at least 2 dec places.

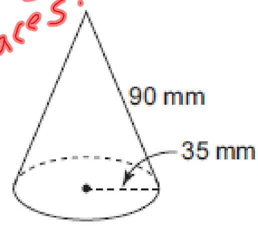
$SA = \pi rs + \pi r^2$

$SA = \pi(35)(90) + \pi(35)^2$

$SA = 9896.02 + 3848.45$

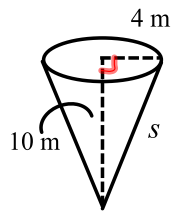
$SA = 13\ 744.47$

$SA = 13\ 744\ mm^2$



$\pi \times 35 \times 90 + \pi \times 35 \boxed{x^2}$

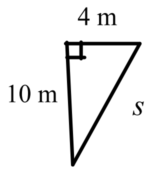
Example 2: A right cone has a base radius of 4 m and a height of 10 m. Calculate the surface area of this cone to the nearest square meter.



Sketch a diagram. Surface area of a cone is given by:

$SA = \pi rs + \pi r^2$

Step 1. Find the slant height of the cone.



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

$s^2 = 4^2 + 10^2$

$s^2 = 16 + 100$

$s^2 = 116$

$s = \sqrt{116}$ leave it.

Step 2. Find the surface area.

$SA = \pi rs + \pi r^2$

$SA = \pi(4)(\sqrt{116}) + \pi(4)^2$

$SA = 135.34 + 50.27$

$SA = 185.61$

$SA = 186\ m^2$

use at least 2 dec. places

$\pi \times 4 \times \sqrt{(116)} + \pi\ 4 \boxed{x^2}$

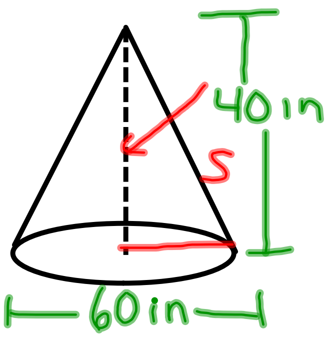
Note: the lateral area above is 135. 34 only!

Homework:

P. 34-35

6, 7, 8b

Example 3: A saltwater buoy is in the shape of a right cone. Determine the amount of reflective paint needed to cover the entire buoy if its diameter is 60 in. and its height must be 3 ft. 4in. (Note $r = \frac{1}{2}d$)



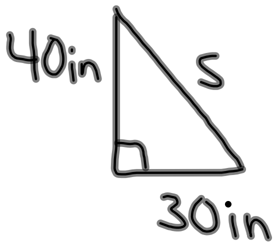
$r = 30\text{in}$

$h = 3\text{ft} \cdot 4\text{in}$
$= (3 \times 12)\text{ in} + 4\text{in}$
$= 36\text{in} + 4\text{in}$
$= 40\text{in}$

$SA = \pi r s + \pi r^2$

find

Slant Height, s.



$c^2 = a^2 + b^2$
$c^2 = 30^2 + 40^2$
$c^2 = 900 + 1600$
$c^2 = 2500$
$c = \sqrt{2500}$
$c = 50$

$SA = \pi r s + \pi r^2$
$SA = \pi(30)(50) + \pi(30)^2$
$= 7539.8 \text{ in}^2$
$= 7540 \text{ in}^2$

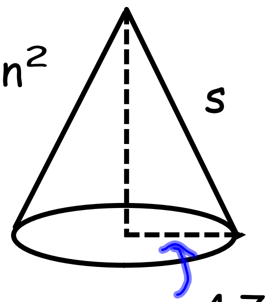
$\pi \times 30 \times 50 + \pi \times 30 \; \boxed{x^2}$

Finding Missing unknowns given the surface area of a Right Pyramid, Cone, Prism or cylinder.
(Major topic—study for LA)

Example 1: The surface area of a right cone is 125 in.^{2} and its radius is 4.7 in. What is the slant height of the right cone?

Step 1: Sketch a diagram. S.A = 125 in^2

$$SA = \pi r s + \pi r^2$$



Step 2: Use the formula for Surface Area to find the slant height, s.

$$SA = \pi r s + \pi r^2$$

$$125 = \pi(4.7)s + \pi(4.7)^2$$

$$125 = \underline{14.77s} + 69.40$$

$$2x + 3 = 6$$

6.9

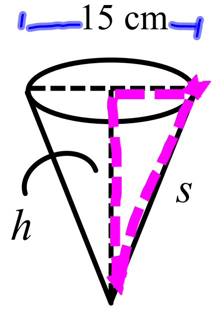
$$125 - 69.40 = 14.77s$$

$$\frac{55.6}{14.77} = \frac{\cancel{14.77}s}{\cancel{14.77}}$$

$$3.8 \text{ in} = s$$

Example 2: The lateral area of a cone is 450cm². The diameter of the cone is 15cm. Determine the height of the cone to the nearest tenth of a centimeter.

Step 1: Sketch a diagram.



$A_L = 450cm^2$

Recall: $A_L = \pi r s$ and $r = \frac{1}{2}d$

$r = \frac{1}{2}(15)$

$r = 7.5cm$

Step 2: Use the formula for lateral area to find the slant height, s.

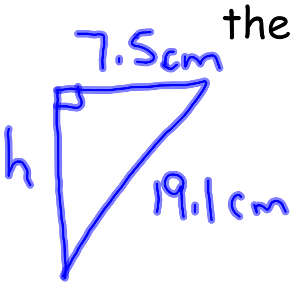
$A_L = \pi r s$

$450 = \pi(7.5)s$

$\frac{450}{23.56} = \frac{23.56s}{23.56}$

$19.1cm = s$

Step 3: Use Pythagorean Theorem to find the height of the cone.



$a^2 = c^2 - b^2$

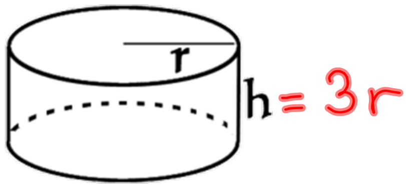
$h^2 = 19.1^2 - 7.5^2$

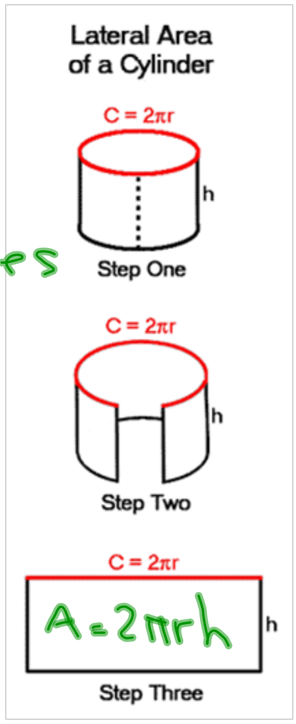
$h^2 = 308.56$

$h = \sqrt{308.56}$

$h = 17.6$ cm

Example 3: A cylinder has a surface area of 412 cm^2. The height is 3 times greater than the radius. Approximate the height of the cylinder.





SA = Lateral Area + Area of Bases

$SA = 2\pi rh + 2\pi r^2$

$412 = 2\pi r(3r) + 2\pi r^2$

$412 = 6\pi r^2 + 2\pi r^2$

$412 = 8\pi r^2$

$\frac{412}{25.13} = \frac{25.13 r^2}{25.13}$

$16.4 = r^2$

$\sqrt{16.4} = r$

$\boxed{4.05 = r}$

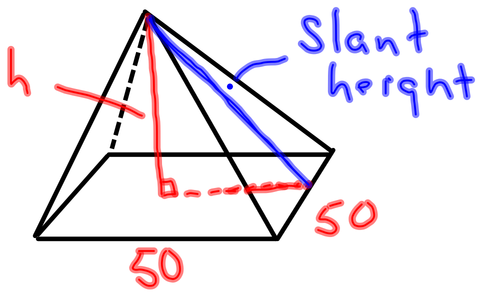
$\therefore h = 3r$

$= 3(4.05)$

$= 12.15 \text{ cm}$

$\doteq 12.2 \text{ cm}$

Example 4: A model of the Great Pyramid of Giza is constructed for a museum display. The surface area of the triangular faces is 3000 square inches. The side length of the base is 50 in. Determine the height of the model to a tenth of an inch.



$A_L = 4$ Area of the triangular faces

$A_L = 4\left(\frac{1}{2}bh\right)$

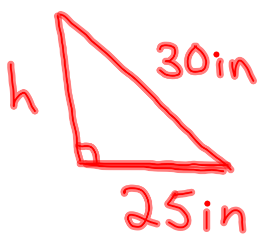
$A_L = 2bh$

$3000 = 2(50)h$

$\frac{3000}{100} = \frac{100h}{100}$

$\boxed{30\text{in} = h}$ * Slant height

Find height



$a^2 = c^2 - b^2$

$h^2 = 30^2 - 25^2$

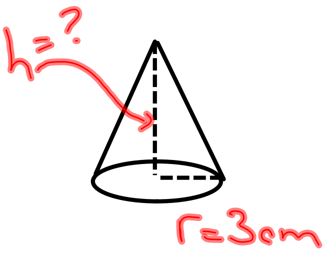
$h^2 = 275$

$h = \sqrt{275}$

$\boxed{h = 16.6\text{in}}$

Example 5: A right pyramid has a surface area of 154 cm^2. A right cone has a base radius of 3 cm. The cone and pyramid have equal surface area. What is the height of the cone to the nearest cm?

use formula for SA of a Cone



* Find "s" (slant height first)

$$SA = \pi r s + \pi r^2$$

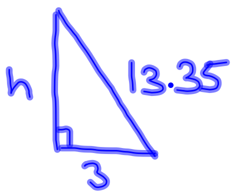
$$154 = \pi(3)s + \pi(3)^2$$

$$154 = 9.42s + 28.27$$

$$154 - 28.27 = 9.42s$$

$$\frac{125.73}{9.42} = \frac{9.42s}{9.42}$$

$$\boxed{13.35 = s}$$



$$a^2 = c^2 - b^2$$

$$h^2 = 13.35^2 - 3^2$$

$$h^2 = 169.22$$

$$h^2 = \sqrt{169.22}$$

$$h = 13 \text{ cm}$$