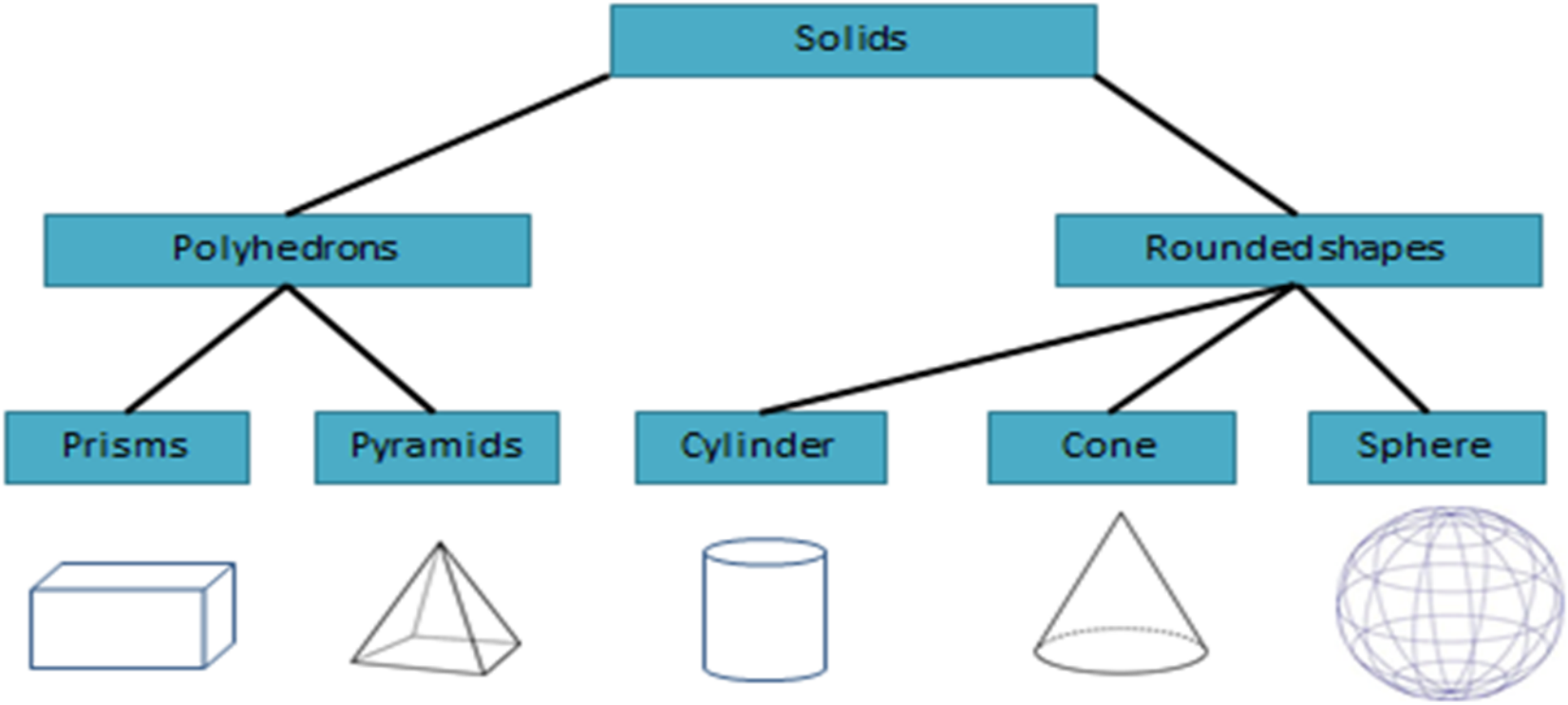
Good afternoon!

Today we will calculate the total surface area of polyhedrons and rounded shapes.

So that we can develop our brain's ability to analyze a 3D shape.

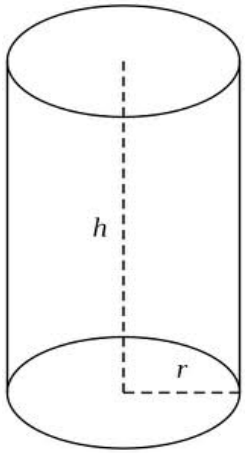
Keys to Success:

- I can identify the solid and correct formulas
- I can identify base(s) versus lateral area
- I can substitute numbers into the formula and use BEDMAS to calculate the total area


Solids
Polyhedrons
Roundedshapes
Prisms
Pyramids
Cylinder
Cone
Sphere

Area of A Cylinder

- Cylinders have two bases and a lateral surface so we can use the same formula we used for prisms!



$$A_T = 2A_b + A_L$$

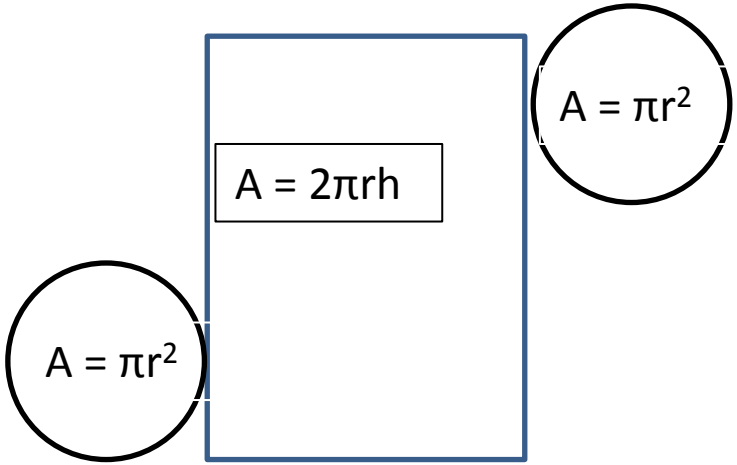
Area of 1 base: $A = \pi r^2$

Area of 2 bases: $A = 2\pi r^2$

Lateral Area: $A = 2\pi rh$

Putting it all together….

$A_T = 2A_b + A_L$ or $A_T = 2\pi r^2 + 2\pi rh$



Example:

- A cylinder has a radius of 4 m, and a height of 6 m. What is the lateral area? What is the total area?

Lateral Area: (Remember to show your formula each time!)

$A_L = 2\pi rh$

$= 2(3.14)(4m)(6m)$

$= \underline{150.72\ m^2}$

Area of 1 base:

$A_b = \pi r^2$

$= (3.14)(4)^2$

$= \underline{50.24\ m^2}$

Total area:

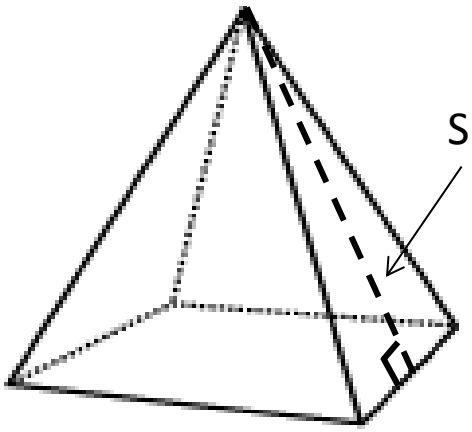
$A_L = 2A_b + A_L$

$= 2(50.24\ m^2) + 150.72\ m^2$

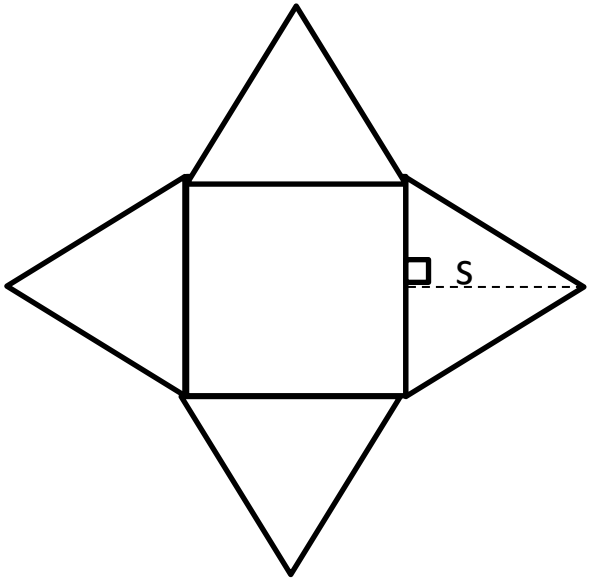
$= 100.48\ m^2 + 150.72\ m^2$

$= \underline{\mathbf{251.20\ m^2}}$

Area of Pyramids



Slant height (s)



Unlike prisms, there is only 1 base. So the area formula will look like this:

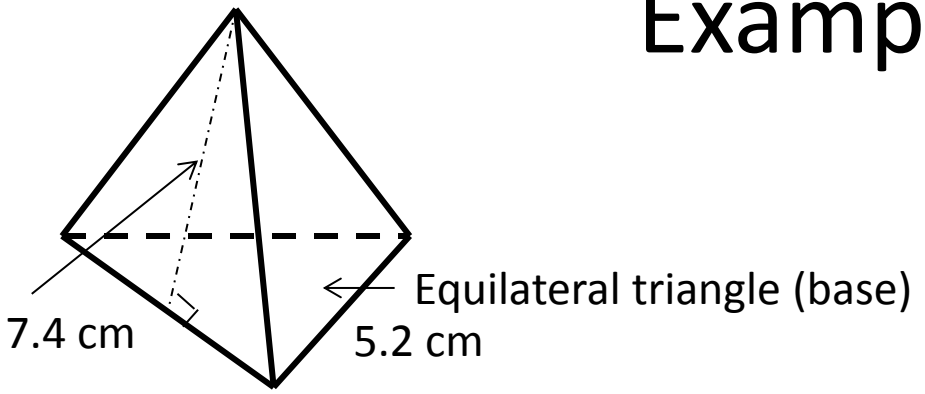
$$A_T = A_b + A_L$$

$$A_L = \frac{P_b \times s}{2}$$

(looks like the triangle formula, no?)

$$A_T = A_b + A_L \quad \text{OR} \quad A_T = A_b + \frac{P_b \times s}{2}$$

Example



What is the *lateral* area of this pyramid?

$$\mathbf{A_L} = \frac{\boldsymbol{P_b \times s}}{\mathbf{2}}$$

$$= \frac{(\mathbf{5.2 \times 3}) \times (\mathbf{7.4})}{\mathbf{2}}$$

$$= \underline{57.72 \text{ cm}^2}$$

SUMMARY*:

Cube: $A_T = 6a^2$

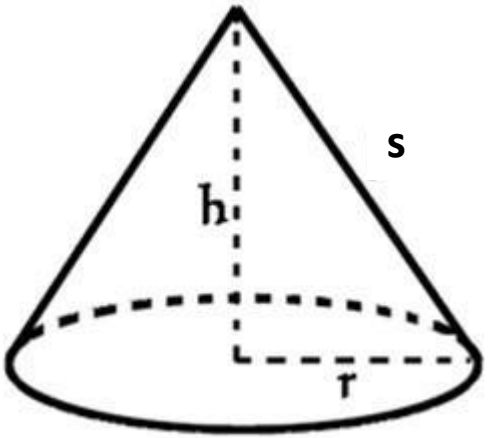
Prism: $A_T = 2A_b + A_L$ OR $A_T = 2A_b + P_b \times h$

Cylinder: $A_T = 2A_b + A_L$ OR $A_T = 2\pi r^2 + 2\pi rh$

Pyramid: $A_T = A_b + A_L$ OR $A_T = A_b + \frac{P_b \times s}{2}$

***Try it! Don't like these formulas? Breaking it up into the net still works. It just takes a little longer.**

Surface Area of Cones



The lateral area of a cone is:

$$A_L = \pi rs$$

Much like a pyramid, there's only ONE base, and the lateral area to deal with.

$$A_T = A_B + A_L$$
$$A_T = \pi r^2 + \pi rs$$

Example 1

Calculate the total area of a cone with a 20 cm diameter, and 10 cm slant height.

$$A_B = \pi r^2$$
$$= (3.14)(10\text{cm})^2$$
$$= 314\ \text{cm}^2$$

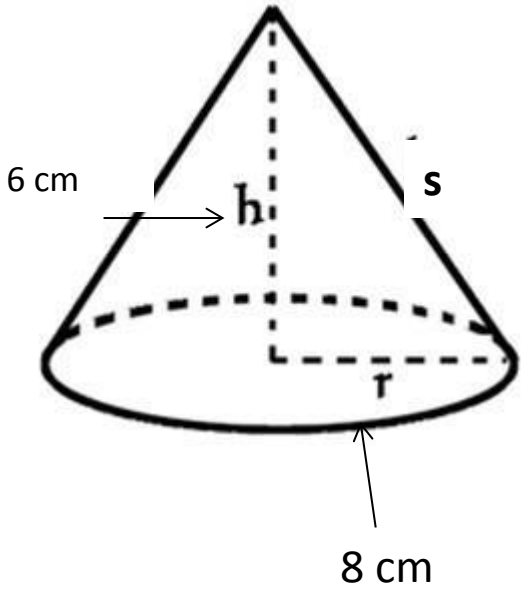
$$A_L = \pi rs$$
$$= 3.14\ (10\text{cm})(10\text{cm})$$
$$= 314\ \text{cm}^2$$

$$A_T = \pi r^2 + \pi rs$$
$$= 314\ \text{cm}^2 + 314\ \text{cm}^2$$
$$= 628\ \text{cm}^2$$

Example 2

Calculate the total area of a cone with an 8 cm radius, and 6 cm height.

What's MISSING from the above sentence?
That's right…we have the height, not the SLANT HEIGHT.



$a^2 + b^2 = c^2$ Can you use this to find the slant height?
Slant height = 10 cm!

$A_B = \pi r^2$
$= (3.14)(8cm)^2$
$= 200.96\ cm^2$

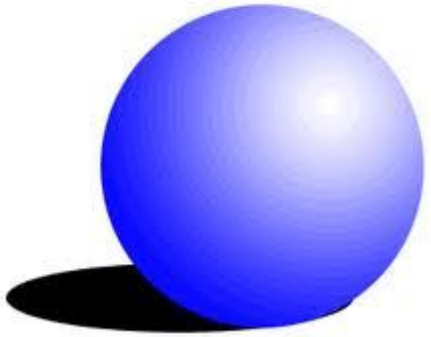
$A_L = \pi rs$
$= 3.14\ (8\ cm)(\ 10cm)$
$= 251.2\ cm^2$

$A_T = \pi r^2 + \pi rs$
$= 200.96\ cm^2 + 251.2\ cm^2$
$= 452.16\ cm^2$

Surface Area of a Sphere

- The good news is that you won't see where this formula comes from unless you take calculus in CEGEP or University. Until then….

$$A_T = 4\pi r^2$$



Example

- Calculate the surface area of a golf ball that has a diameter of 4.5 cm.

Step 1: find the radius!

$r = d/2 = 2.25$ cm

Step 2:

$$\mathbf{A_T = 4\pi r^2}$$
$$\mathbf{= 4\,(3.14)(2.25)^2}$$
$$\mathbf{= 4\,(3.14)(5.0625)}$$
$$\mathbf{A_T = 63.59\ cm^2}$$

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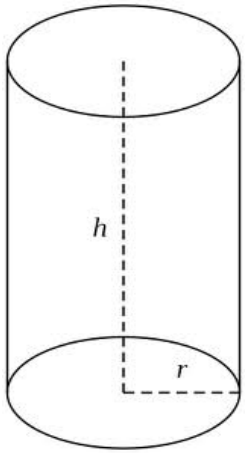

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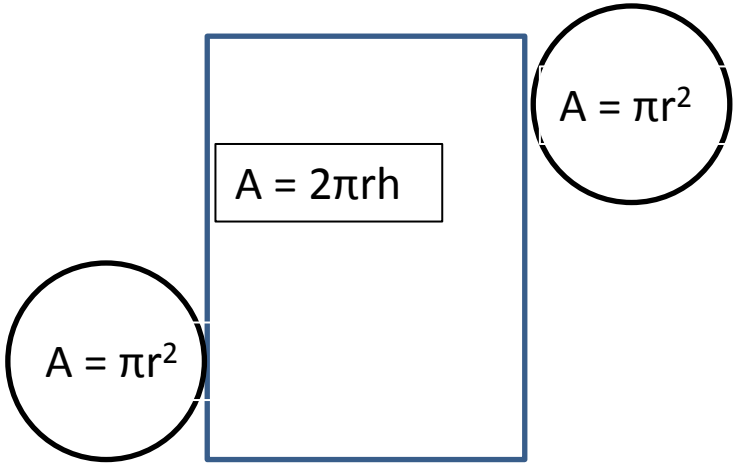

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Area of 1 base:

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$=$

$=$

Total area:

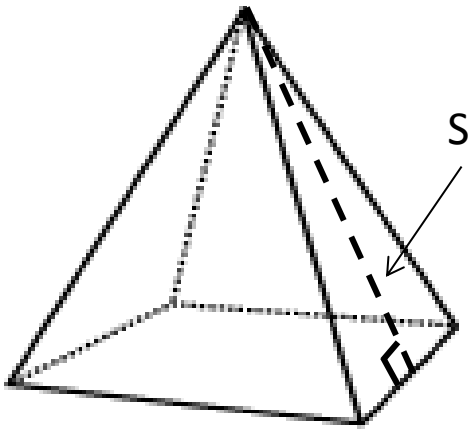
$A_L = 2A_b + A_L$

$=$

$=$

$=$

Area of Pyramids



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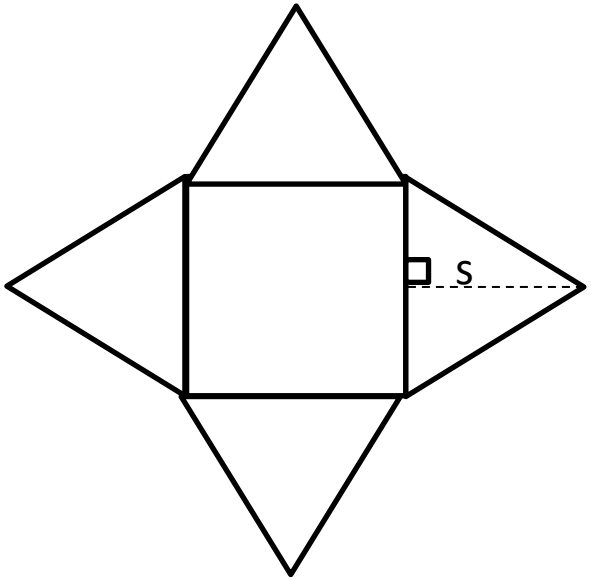

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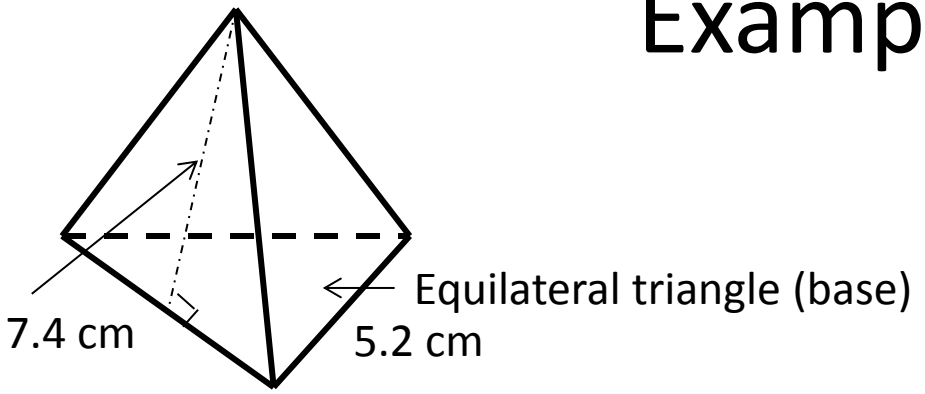

What is the *lateral* area of this pyramid?

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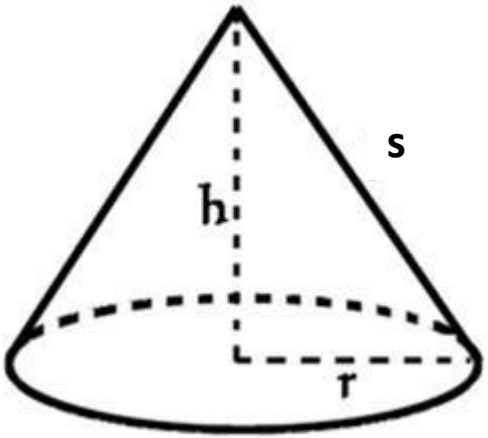
=

=

Surface Area of Cones



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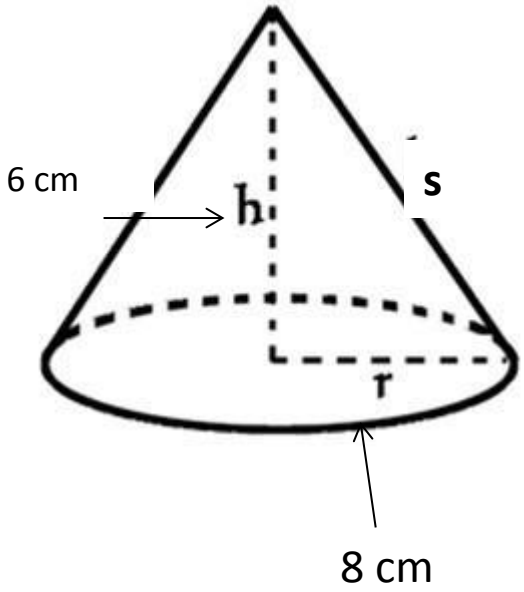

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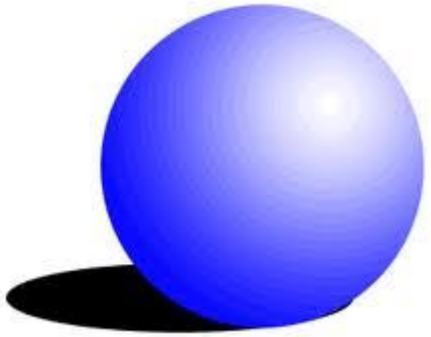

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