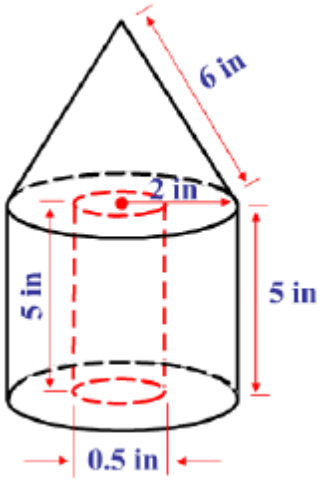
Math 1201 **Date:**_____

1.7 Surface Area and Volume of Composite Objects

You determined the surface area of composite objects involving right prisms and right cylinders in Grade 9. We will now determine the surface area and volume of composite objects made from **right prisms**, **right pyramids**, **right cylinders**, **right cones**, and **spheres**. When determining surface area, remember to keep the context of the problem in mind. For example, to determine the surface area of a straw, the shape of which is a cylinder, the top and bottom would not be included. hemishperes

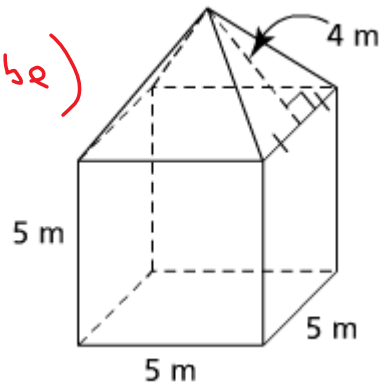
When decomposing a composite object, look for component parts such as right cones, right cylinders, right prisms, right pyramids and spheres. The focus here is for you to recognize that when calculating the surface area of a composite object, the area of overlap must be taken into consideration. The volume is determined by adding and subtracting the volumes independent of the overlap.

In the following diagram, for example, the volume of the composite object can be determined by subtracting the volume of the inside cylinder from the total volume of the cone and the larger cylinder.



Example 1:
Determine the surface area of the following object, to the nearest square metre.

Composite: right, square pyramid
right, square prism (cube)

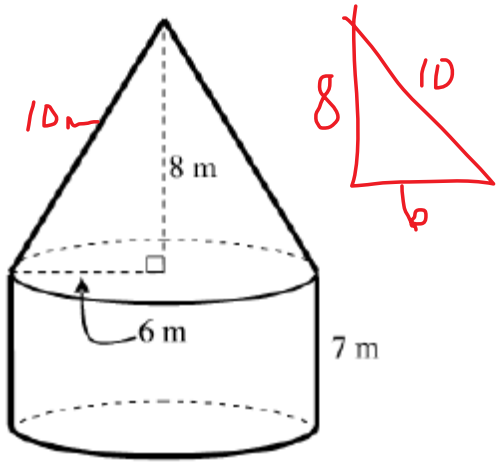


Pyramid: $SA = 4 \cdot \frac{bh}{2} = \frac{4 \cdot (5m)(4m)}{2} = 40m^2$

Cube: $SA = 5 \cdot s^2 = 5 \cdot (5m)^2 = 125m^2$

$SA_T = 40m^2 + 125m^2 = 165m^2$

Example 2:
Determine how much paint is needed to paint the outside of the following composite 3-D object.



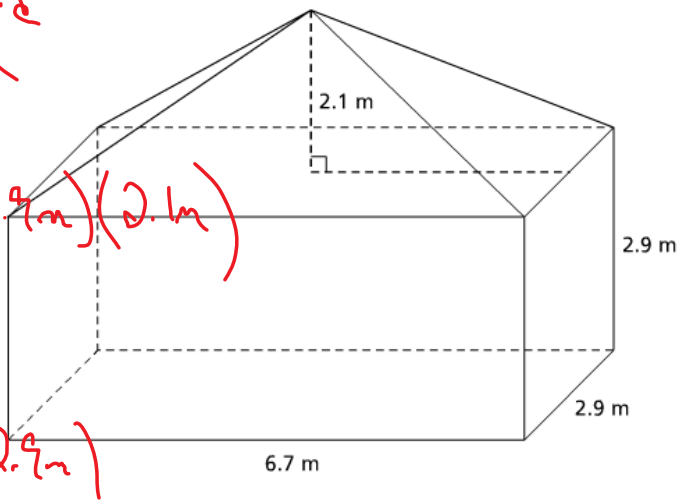
Composite: Cone, cylinder

Cone: $LA = \pi r s = \pi(6m)(10m)$
$= 188.5 m^2$

Cylinder: $2\pi rh + \pi r^2$
$= 2\pi(6m)(7m) + \pi(6m)^2$
$= 263.9 m^2 + 113.1 m^2$
$= 377.0 m^2$

$SA_T = 377 m^2 + 188.5 m^2$
$SA_T = 566 m^2$

Example 3:
Determine the volume of the following object, to the nearest tenth of a cubic metre.



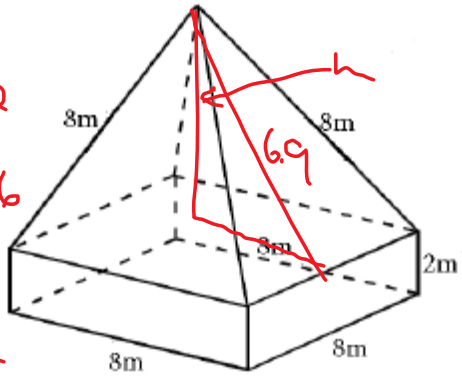
Composite: rectangular pyramid
rectangular prism

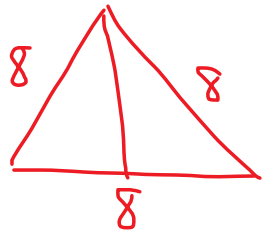
$V_{pyramid} = \frac{1}{3} l \cdot w \cdot h = \frac{1}{3}(6.7m)(2.9m)(2.1m)$
$= 13.6 m^3$

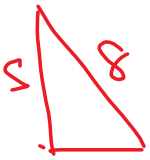
$V_{prism} = l \cdot w \cdot h = (6.7m)(2.9m)(2.9m)$
$= 56.3 m^3$

$V_T = 13.6 m^3 + 56.3 m^3 = 69.9 m^3$

Example 4:
Calculate the volume of the following figure:





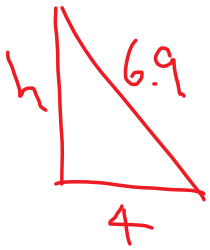


$s^2 + 4^2 = 8^2$

$s^2 = 64 - 16$

$\sqrt{s^2} = \sqrt{48}$

$s = 6.9\text{m}$



$h^2 + 4^2 = 6.9^2$

$h^2 = 47.61 - 16$

$\sqrt{h^2} = \sqrt{31.61}$

$h = 5.6$

$V_{pyramid} = \frac{1}{3} l \cdot w \cdot h = \frac{1}{3}(8\text{m})(8\text{m})(5.6\text{m}) = 119.5\text{m}^3$

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$V_{prism} = l \cdot w \cdot h = (8\text{m})(8\text{m})(2\text{m}) = 128\text{m}^3$

247.5m^3

Textbook Questions: page 59 – 61 #3 a, b, c, 4 a, b, c, 5 b, 6, 7, 8, 9, 10, 11