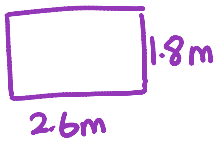
Ch.2 Notes

April-18-16
9:03 AM

2.1: Area and Volume

Examples:

a) Determine the area in square centimeters of a rectangle that is 1.8 m by 2.6 m.

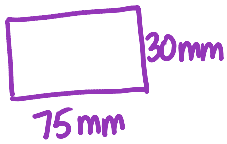


(cm²)

① Area = L × W
= 2.6m × 1.8m
$= 4.68\ m^2 \times \left(\frac{100\ cm}{1\ m}\right)^2$
= 46800 cm²

② Convert first Then find area.

b) Determine the area in square meters of a rectangle that is 75 mm by 30 mm.



$30\ mm \times \frac{1\ cm}{10\ mm} \times \frac{1\ m}{100\ cm} = 0.03\ m$

$75\ mm \times \frac{1\ cm}{10\ mm} \times \frac{1\ m}{100\ cm} = 0.075\ m$

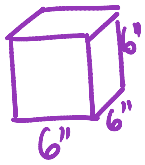
Area = 0.03m × 0.075m = 0.00225 m²

c) Tiles are often imported and have imperial measurements. A tile that has area 1 foot squared has what area in square centimeters?

$1\ ft^2 \times \left(\frac{30.48\ cm}{1\ ft}\right)^2 = 929\ cm^2$

d) Find the volume of a cube in cubic centimeters with dimensions 6in by 6in by 6in.

(cm³)



Volume = L × W × H
= 6in. × 6in. × 6 in.
$= 216\ in^3 \times \left(\frac{2.54\ cm}{1\ in.}\right)^3 = 3539.6\ cm^3$

Area Units: Square Units ($cm^2, ft^2, in^2, \ldots$)
(2-D)

Volume Units: Cube Units ($cm^3, ft^3, in^3, \ldots$)
(3-D)

2.2: Surface Area (part 1)

How is *surface area* different from *area*?

3-D 2-D

How does the shape of the figure change the way we calculate the surface area?

Formula for each shape changes.

What are the steps to calculating Surface Area?

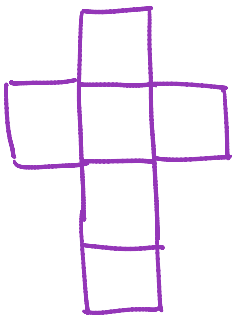
Find each area outside.

Find the total.

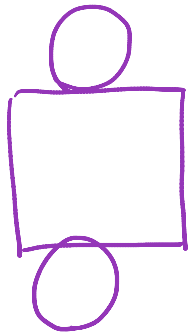
Nets: You have practiced drawing nets before in Math 9. A net is a 2-dimensional representation of a 3-dimensional object. It is what you would see if you unfolded a figure along its edges.

For example, we can draw a net for each of the following shapes:

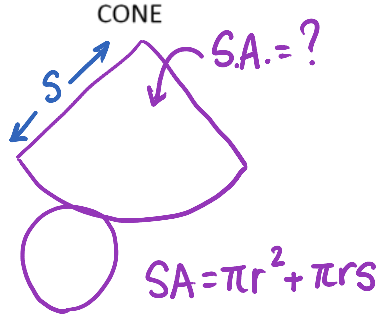
CUBE



CYLINDER

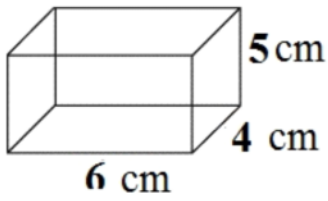


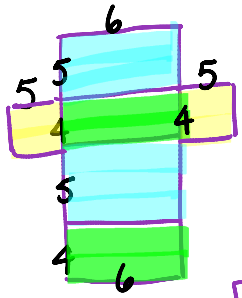
CONE



Ex.1: Draw the net of each figure and then calculate the surface area.

a) "Rectangular Prism"





= 6cm × 5cm = 30 cm²

= 5cm × 4cm = 20 cm²

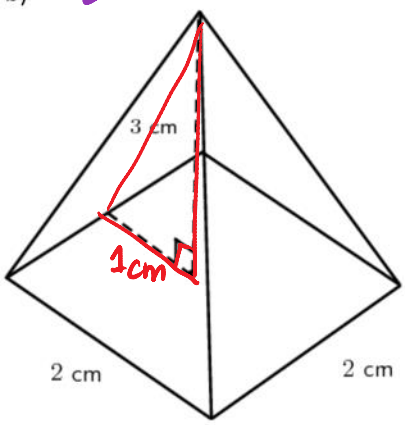
= 4cm × 6cm = 24 cm²

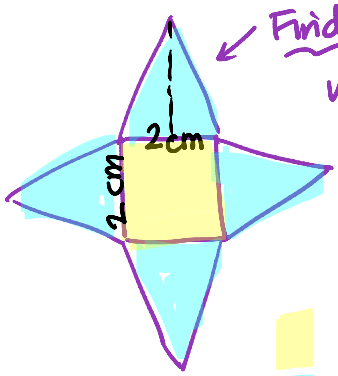
2 of each!

Total S.A. = 148cm²

Formula: S.A. = 2(wh + lw + lh)

b) "Square-Based Pyramid"





(slant)

Find height:

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

$1^2+3^2=c^2$

$10=c^2$

$\sqrt{10}=c$

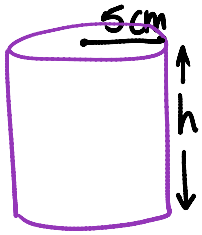
$3.16=c$

$= 2\,cm \times 2\,cm = 4\,cm^2$

$= \frac{bh}{2} = \frac{2cm \times 3.16cm}{2} = 3.16cm^2 \times 4$

Total = $16.64\,cm^2$

Ex.2: The surface area of a cylinder with radius 5 cm is $300\,cm^2$. Determine the height to the nearest tenth of a centimeter.



$S.A. = 2\pi r^2 + 2\pi rh$

$300 = 2\pi(5)^2 + 2\pi(5)h$

$300 = 157.08 + 31.42h$ *Solve for h

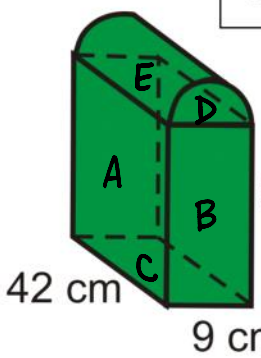
$-157.08 \quad -157.08$

$\frac{142.92}{31.42} = \frac{31.42h}{31.42}$

$h = 4.55\,cm$

Thinking of the surface areas, how would the process be different for composite shapes (figures made up of several parts)?

➔ Would we need to do anything differently?



A (2): $42\,cm \times 35\,cm = 1470\,cm^2$

B (2): $9\,cm \times 35\,cm = 315\,cm^2$

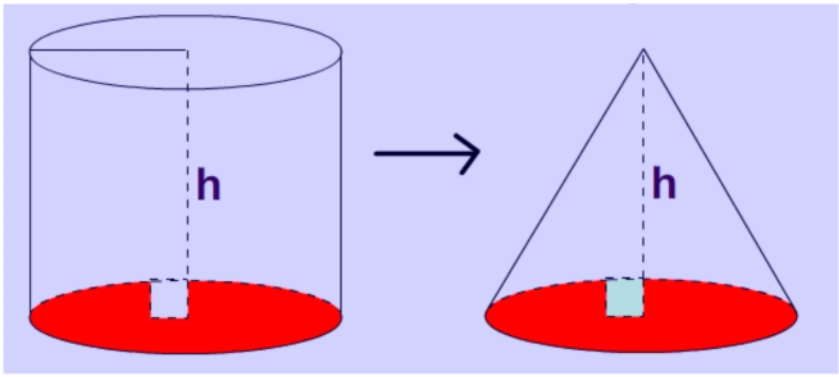
C (1): $9\,cm \times 42\,cm = 378\,cm^2$

2.3: Volume (part 1)

What is Volume?

Space inside an object.

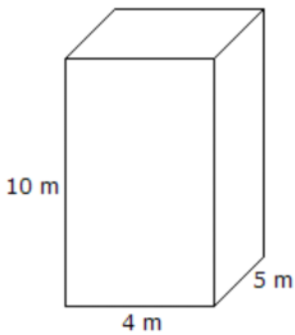
Predict the relationship between the volume of a cylinder (prism) and a cone (pyramid)?



http://www.youtube.com/watch?v=BjbilpBaA-U

Ex1: Determine the volume of each figure:

a)

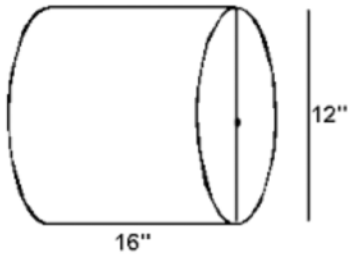


$V = W \times L \times H$

$= 4m \times 5m \times 10m$

$= 200\ m^3$

b)



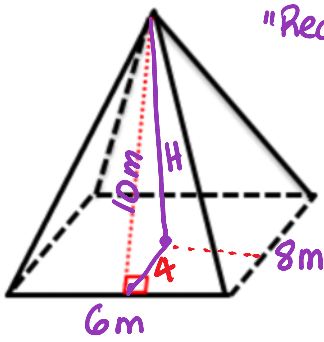
$V = (\text{Area of Base}) \times H$

$= \pi r^2 \times H$

$= \pi (6\ in.)^2 \times 16\ in.$

$= 1809.6\ in^3$

c) Base = 6m x 8m, Slant Height = 10m



"Rectangular-Based Pyramid"

$V = \frac{1}{3} \times (\text{area of base}) \times H \rightarrow = \frac{1}{3} \times (6m \times 8m) \times 9.17m$

$= 146.6\ m^3$

Find H: $a^2 + b^2 = c^2$

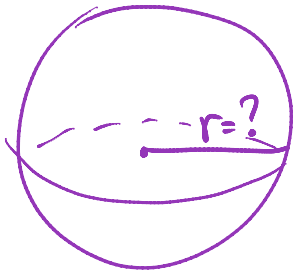
$4^2 + H^2 = 10^2$

$16 + H^2 = 100$

$H^2 = 84$

$H = 9.17m$

Ex.2: Find the radius of a sphere with a volume of 6135.6 cm^3



$V = \frac{4}{3}\pi r^3$

$\frac{6135.6}{\left(\frac{4}{3}\pi\right)} = \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi}$

$\sqrt[3]{1464.77} = \sqrt[3]{r^3}$

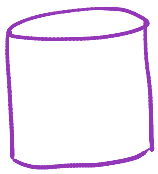
$11.4cm = r$

Ex.3: An object has a volume of exactly 216 cm^3. What could the object be?

List 3 possibilities, and their dimensions.

→ Infinite Possibilities!

eg. Cylinder:



$V = (\text{area of base}) \times h$

$V = (\pi r^2) \times h$

$216 = (\pi r^2) \times h$

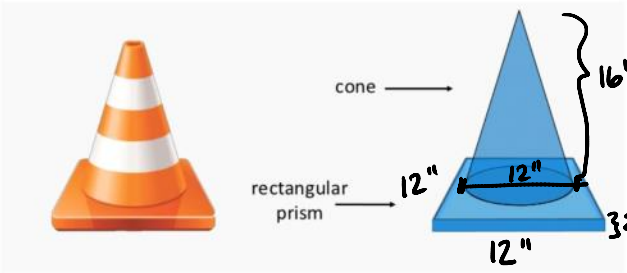
→ choose either r or h

2.3: Volume of Composite Figures (part 2)

To find the volume of composite figures, we will: add up individual volumes.

Examples:

1. Calculate the volume of the traffic cone if the base is 12"x12"x2" and the height of the entire figure is 18".



Cone

$V = \frac{1}{3} \times \text{area of base} \times h$

$= \frac{1}{3} \times \pi (6)^2 \times 16$

$= 603.19 \text{ in.}^3$

rec. prism

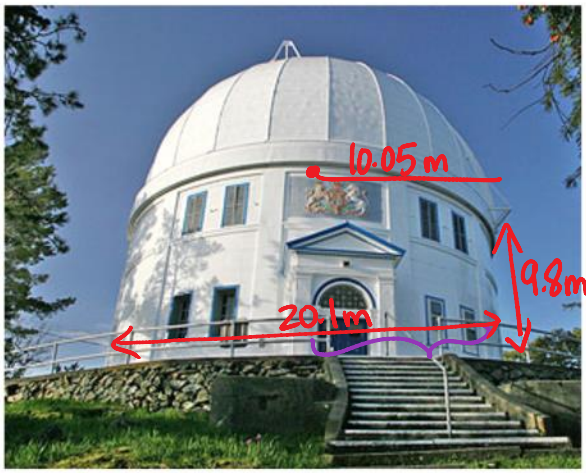
$V = \text{area of base} \times h$

$= 12 \times 12 \times 2$

$= 288 \text{ in.}^3$

TOTAL: 891.2 in^3

2. Calculate the volume of the Dominion Astrophysical Observatory in Saanich, BC. It has a cylindrical base with a diameter of 20.1 m and a height of 9.8 m. The dome is half a sphere with the same diameter as the base.



Volume:

Cylinder: $V = (\text{area of base}) \times h$

$= \pi r^2 \times h$

$= \pi (10.05)^2 \times 9.8$

$= 3109.63 \text{ m}^3$

Sphere (half): $V = \frac{4}{3} \pi r^3$

$= \frac{4}{3} \pi (10.05)^3$

$= \frac{4251.94}{2} = 2125.97 \text{ m}^3$

TOTAL: 5235.6 m^3