Volume of Prisms | MEL4E

Today, we are going to start talking about the **volume** of 3-dimensional objects.

Volume is.... the amount of 3D space inside an object. Units: m^3, in^3, cm^3, ...

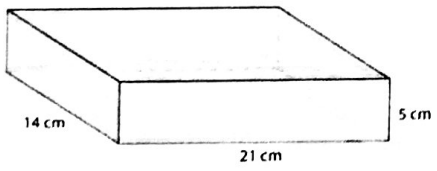
One certain type of 3-dimensinal objects are called prisms. A **prism** is.... A 3D object with 2 identical parallel sides (bases)

KEY IDEA: To find the ~~area~~ volume of **any prism**...

Volume of Prism = Area of Base × Height

Consider the following 4 prisms. We will find their volumes.

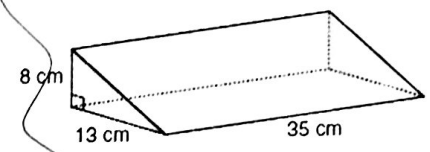
a) A rectangular prism



$A_{base} = lw$
$= 21 \times 14$
$= 294\ cm^2$

$V = A_{base} \times h$
$= 294 \times 5$
$= 1,470\ cm^3$

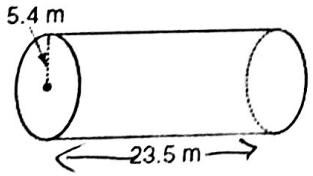
b) A triangular prism



$A_{base} = b \times h \div 2$
$= 13 \times 8 \div 2$
$= 52\ cm^2$

$V = A_{base} \times h$
$= 52 \times 35$
$= 1,820\ cm^3$

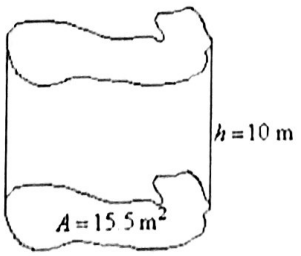
c) A circular prism (cylinder)



$A_{base} = \pi \times r^2$
$= 3.14 \times 5.4^2$
$= 91.56\ cm^2$

$V = A_{base} \times h$
$= 91.56 \times 23.5$
$= 2,151.66\ m^3$

d) A prism with an irregular base



$V = A_{base} \times h$
$= 15.5 \times 10$
$= 155\ m^3$

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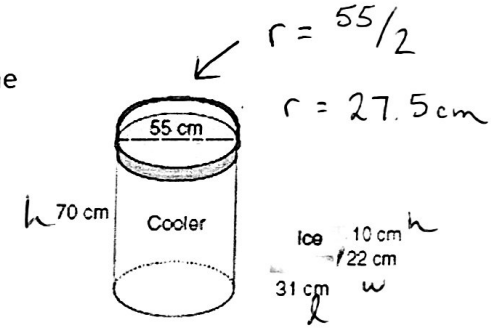
Summary: Using the fact that $Volume\ of\ a\ Prism = Area\ of\ Base \times Height$ you can find the volume of any prism. Moreover, this motivates specific formulas:

Shape	Area of Base	Volume Formula
Rectangular Prism	$A = l \times w$	$V = \boldsymbol{l \times w \times h}$
Triangular Prism	$A = \frac{b \times h}{2}$	$V = \frac{\boldsymbol{b \times h \times l}}{\boldsymbol{2}}$
Cylinder	$A = \pi \times r^2$	$V = \boldsymbol{\pi \times r^2 \times h}$

You just need to be able to recognize which shape you are dealing with, and know how to apply the formula correctly.

2) Mr. Smith is filling up a cooler with bags of ice. Given the measurements in the diagram...



$r = 55/2$

$r = 27.5\ cm$

a) Find the volume of a bag of ice

$V = l \times w \times h$

$= 31 \times 22 \times 10$

$= 6,820\ cm^3$

b) Find the volume of the cooler (you will need to find the radius)

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

$= 3.14 \times 27.5^2 \times 70$

$= 166,224\ cm^3$

c) How many bags will it take to fill up the cooler?

$\frac{166,224}{6,820} \div 24$ bags

Did you know: 1 cm^3 is equivalent to 1 mL, which is equivalent to 1 c.c. in medical applications.

Example: Determine the volume of a can of pop. Mr. Smith will take the measurements at the front of the room. Capacity = 354 mL.

$h = 12.1\ cm$

$r = 3.1\ cm$

$A_{base} = \pi \times r^2$

$= 3.14 \times 3.1^2$

$= 30.18\ cm^2$

$V = A_{base} \times h$

$= 30.18 \times 12.1$

$= 365.18\ cm^3$

(MORE)