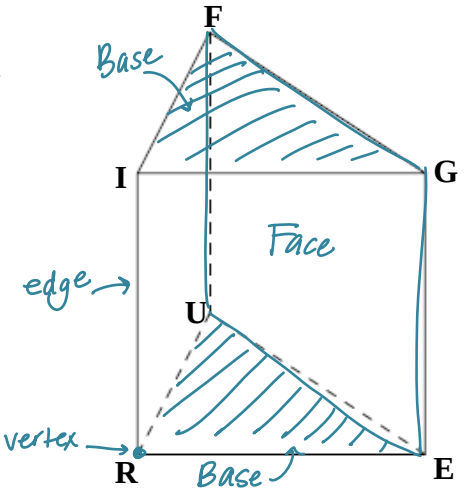
Day 1 Notes

VOLUME OF PRISMS & CYLINDERS

Key Vocabulary: Label each vocabulary word on the prism below:



A **prism** is formed by 2 parallel, congruent polygonal bases connected by faces that are parallelograms.

2 Bases → △FIG, △URE

Face: 3 Faces → □IGER, □FIRU, □FGEU

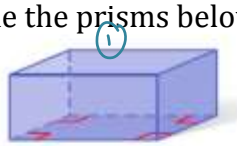
Edge: line segment where 2 faces meet

Vertex: the point where 3 or more faces &/bases meet

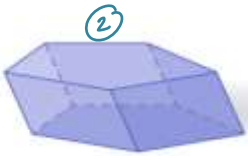
Name this prism: Triangular Prism

Target 1: Classifying 3-D Figures

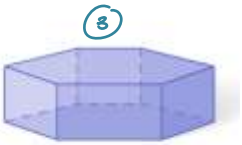
Directions: Name the prisms below.



Rectangular Prism



Oblique Pentagonal Prism



Hexagonal Prism

Think-Pair-Share: What are some similarities you notice between the figures? Differences?

Similarities:
* prisms
  - faces are parallelograms
  - 2 ≅ + ∥ bases

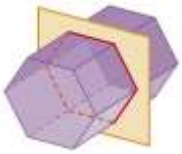
Differences:
* 1 and 3 are standing straight up while #2 is "tilted"

Target 1: Identifying Cross Sections of 3-D Figures

A **cross section** is the intersection of a 3-D figure and a plane.

Helpful visuals: http://www.mathopenref.com/prism.html & http://www.mathsisfun.com/geometry/prisms.html

Directions: Name each prism. Then describe the shape of each cross section.

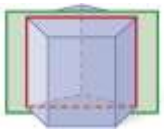


Name: Hexagonal Prism

Cross Section: Hexagon

Name: Triangular Prism

Cross Section: Triangle



Name: Pentagonal Prism

Cross Section: Rectangle

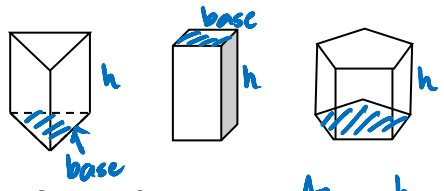
Think-Pair-Share: Which example above is different from the other two? Justify your answer.

The pentagonal prism, b/c the cross section is drawn ⊥ to the base. In the other two 3-D solids, the cross section is drawn ∥ to the base.

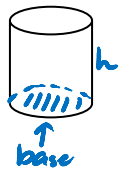
Complete the Statement: When the cross section of a prism is drawn *parallel to the bases*, then the cross section is… the same shape as the base.

Target 2: Find the Volume of Prisms and Cylinders

Volume is: # of cubic units required to exactly fill the inside of a 3-D figure.



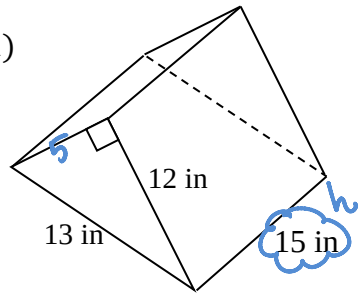
Volume of Prism = $A_{Base} \cdot h$



Volume of Cylinder = $A_{Base} \cdot h$ (πr^2)

Directions: Find the volume of each 3-D solid below. (LEVEL 1)

1)



Name of 3-D Solid: Triangular Prism

Parallel Cross Section: Δ

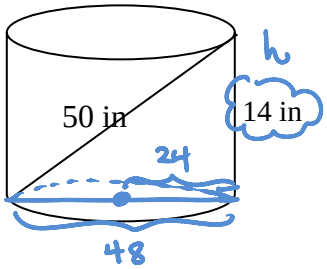
Volume = 450 in^3

$V = A_{Base} \cdot h$
$= 30 \cdot 15$
$= 450$

# of 11 cross sections stacked on top of each other

$A_{Base} = \frac{b \cdot h}{2}$
$= \frac{5 \cdot 12}{2}$
$= 30$

2)



Name of 3-D Solid: Cylinder

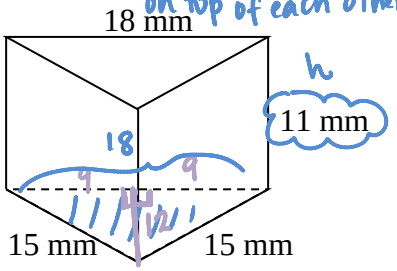
Parallel Cross Section: Circle

Volume = $17{,}472\pi \text{ in}^3$

$V = A_{Base}\, h$
$= 576\pi \cdot 14$

$A_{\bigcirc Base} = \pi r^2$
$= \pi(24)^2$
$= 576\pi$

3)



Name of 3-D Solid: Triangular Prism

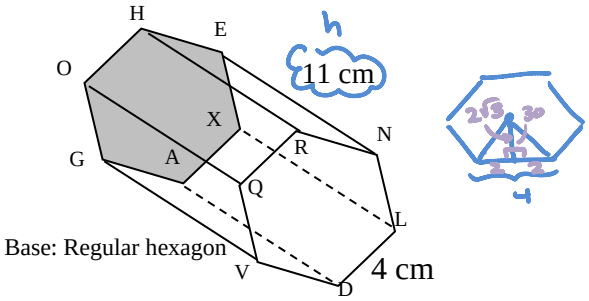
Parallel Cross Section: Δ

Volume = $1{,}188 \text{ mm}^3$

$V = A_{Base} \cdot h$
$= 108 \cdot 11$
$= 1188$

$A_{\Delta Base} = \frac{b \cdot h}{2}$
$= \frac{18 \cdot 12}{2}$
$= 108$

4)



Name of 3-D Solid: Hexagonal Prism

Parallel Cross Section: Hexagon

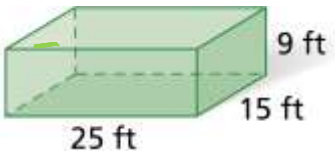
Volume = $264\sqrt{3} \text{ cm}^3$

$V = A_{Base} \cdot h$
$= 24\sqrt{3} \cdot 11$

$A_{\hexagon Base} = \frac{1}{2} ap$
$= \frac{1}{2} \cdot 2\sqrt{3} \cdot 24$
$= 24\sqrt{3}$

Application Problems: (LEVEL 2)

5. A swimming pool is in the shape of a rectangular prism.



a) Find the amount of water the pool can hold.

$V = A_{Base} \cdot h$ $\quad A_{Base} = 25 \cdot 15 = 375$

$= 375 \cdot 9$

$= 3{,}375\ ft^3$

b) Estimate the number of gallons of water in the pool when it is completely full if 1 gallon of water is approximately 0.134 ft³.

$\frac{gal}{ft^3}$ $\quad \frac{1}{.134} = \frac{x}{3{,}375}$

$.134x = 3{,}375$

$x \approx 25{,}186.567\ gal$

OR

$3{,}375\ \cancel{ft^3} \times \frac{1\ gal}{.134\ \cancel{ft^3}} = 25{,}186.567\ gal$

c) If the density of water is about 8.33 pounds per gallon, approximately how many pounds does the water weigh?

$\frac{lbs}{gal}$ $\quad \frac{8.33}{1} = \frac{x}{25{,}186.567}$

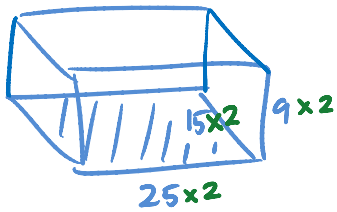
$x = 209{,}804.103\ lbs$

or

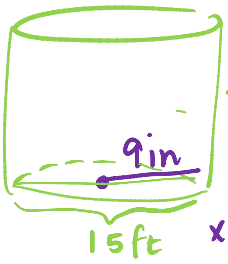
$25{,}186.567\ \cancel{gal} \times \frac{8.33\ lbs}{1\ \cancel{gal}} = 209{,}804\ lbs$

d) **Effects of Changing Dimensions:**
What do you think would happen to the amount of water the pool could hold if we:

- Double the width of the pool?
  Amount of water would double!
- Double the width and the length of the pool?
  Amount of water would quadruple!
- Double the width, length, and height of the pool?
  Amount of water would be multiplied by 8 !



6. A large cylindrical cooler is 2.5 feet high and has a diameter of 1.5 feet. It is filled ¾ high with water for athletes to use during their soccer game. Estimate the volume of the water in the cooler in gallons, if 1 gallon is approximately 231 in³.



$2.5ft \times 12in$ 30in

$\times 12in$ 18in

1st $V = A_{Base} \cdot h$

$= \pi r^2 \cdot h$

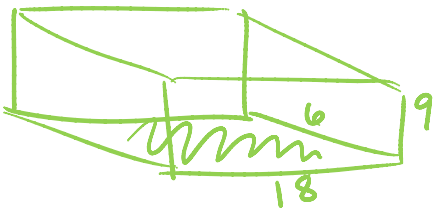
$= \pi(9)^2 \cdot 30$

$= 2430\pi\ in^3$, but only 3/4 full... so $2430 * \pi * \frac{3}{4} \approx 5725.55\ in^3$

2nd $\frac{1\ gal}{231\ in^3} = \frac{x}{5725.55}$

$x \approx 24.79\ gal$

7. How many 3-cm cubes can be placed inside a rectangular box with dimensions 18 cm by 6 cm by 9 cm?



$V = A_{Base} \cdot h$

$= (18 \cdot 6) \cdot 9$

$= 972\ cm^3$

$V = A_{Base}$

$= (3)^2 \cdot 3$

$= 27\ cm^3$

so $\frac{972}{27}$

36 cubes