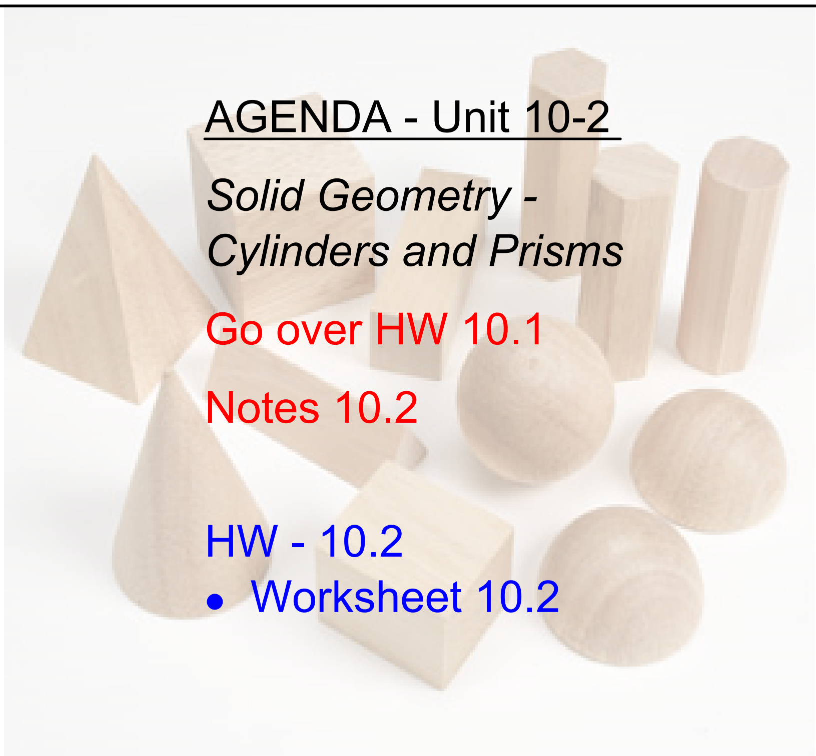


AGENDA - Unit 10-2

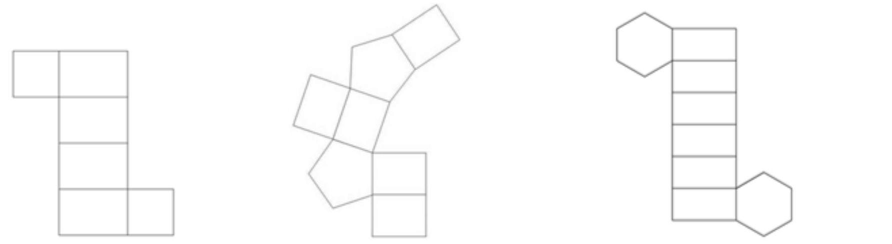
Solid Geometry - Cylinders and Prisms

Go over HW 10.1

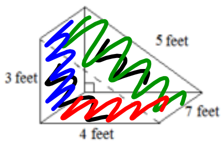
Notes 10.2

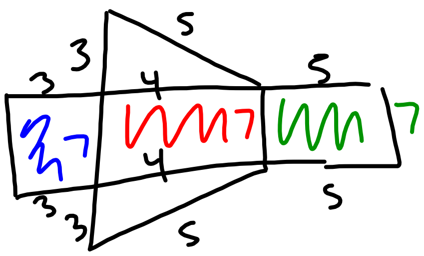
HW - 10.2
- Worksheet 10.2

7. Identify the right regular prism that could be made from each of the following nets:

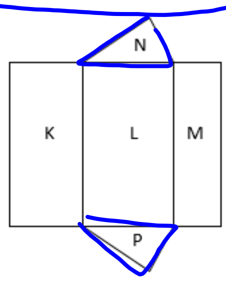


8. Draw a net for the following right prism:





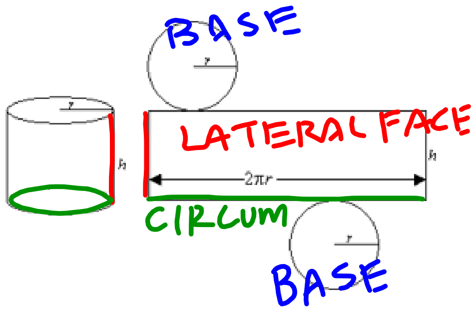
9. Which can be a true statement about the right triangular prism whose net is shown?
   a. Faces L and M are perpendicular
   b. Faces N and P are perpendicular
   c. Faces K and L are parallel
   d. Faces N and P are parallel



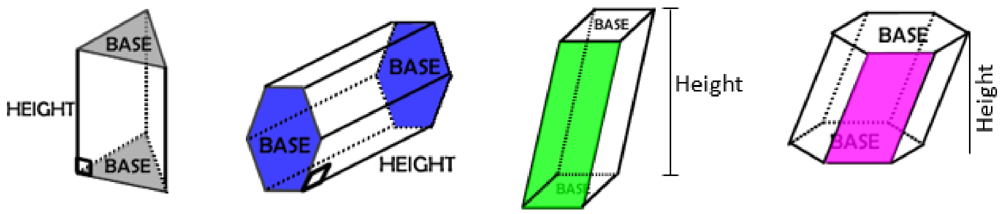
Geometry Name ______________________ Section __________ Date________

10-2 Notes: Cylinders & Prisms

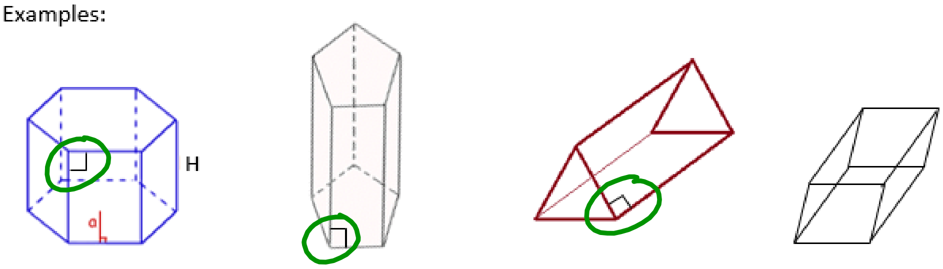
THE CYLINDER - A cylinder has two identical parallel bases with a lateral face of a parallelogram formed by a translation vector from a point on the circle and the circumference of the circle. Recall that the lateral face is a parallelogram, and if the cylinder is right, the lateral face will be a rectangle.



THE PRISM - Remember the bases are the two congruent parallel polygons that are the pre-image and image and which name the prism. It does not matter what face the prism is 'sitting on'.

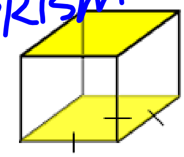


Recall: A **REGULAR** prism is one in which the **base is a regular polygon**, meaning the edges of the base are all congruent. If a prism is regular, then the lateral faces are all CONGRUENT. Prisms can be regular *and* either **right or oblique**. Examples:



Base Shape	Regular Hexagon	Regular Pentagon	Equilateral Triangle	Square
Solid Name	RIGHT REGULAR HEXAGONAL PRISM	RIGHT REGULAR PENTAGONAL PRISM	RIGHT REGULAR TRIANGULAR PRISM	OBLIQUE REG. RECT PRISM

A regular right rectangular prism in which all the edges are the same length is a CUBE.

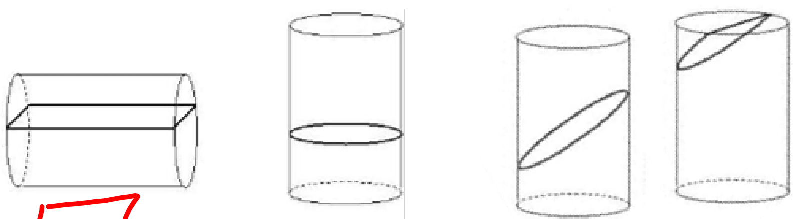


SLICES / CROSS SECTIONS

Recall that slices/cross sections are the planar figures created by the intersection of plane and a solid.

CYLINDERS

Describe the shape of the cross section in each of the following:

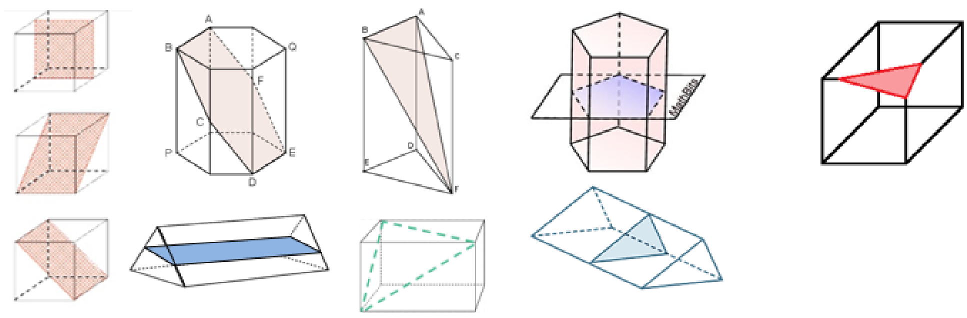


Shape of Cross Section	P	CIRCLE	ELLIPSE	PARABOLA
Special Conditions	IF ⊥ TO BASES → RECTANGLE	≅ TO BASE IF ∥ TO BASES	THROUGH LATERAL FACE	THROUGH BASE & LATERAL FACE

PRISMS

Slices are intersections of planes with a prism. When the plane is parallel to the bases, the slice is specifically a cross section. Draw examples of slices on the prisms below and what the planar figure would look like:

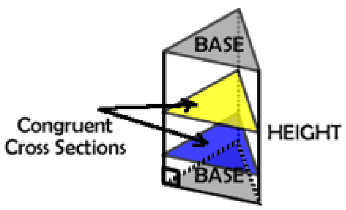
Base to Base/Vertex | Through Lateral Area | Through Corner



Summary: the slices of a prism are PLANAR figures that are polygons with a range of shapes from 3 vertices up to the number of vertices of the base shape. They may be the same basic polygon shape as the BASE, which will be congruent only if the intersecting plane is PARALLEL to the base.

CYLINDER VOLUME – THE STACKING PRINCIPLE USING CROSS-SECTIONS and CAVALIERI's PRINCIPLE

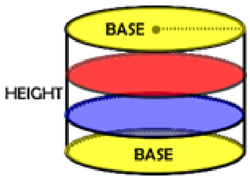
Since a cylinder or prism can be formed by stacking images of the base with an infinitesimally small heights until the parallel plane is reached, then every cross section parallel to the pre-image base will be congruent and have the same area. How they are stacked determines whether the prism is right or oblique.

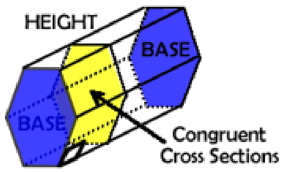


This leads to the formula for calculating the volume for either a cylinder or a prism:

$$VOLUME_{CYLINDER} = BH = \pi r^2 H$$

$$VOLUME_{PRISM} = BH$$

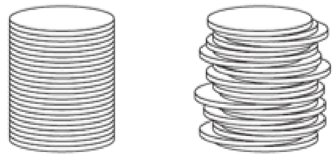


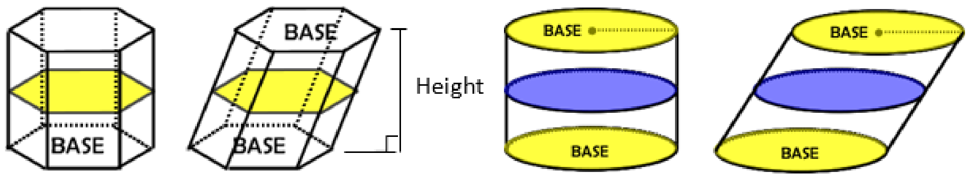


Where B = AREA OF BASE and H = ALTITUDE HEIGHT OF SOLID

The formula is the same for both right and oblique cylinders. Why?

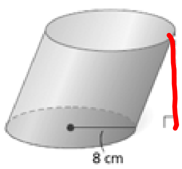
Cavalieri's Principle: Given two solids that are included between two parallel planes, if every plane parallel to the two planes intersects both solids in cross-sections of equal area, then the volumes of the two solids are equal. This can be applied to two different solids as well as long as the base areas and heights are equal.





Practice:

1) Find the volume of the cylinder in terms of π.



H

$V = BH = (64\pi)(12)$

$\quad\quad\quad\;\; cm^2 \quad cm$

$\boxed{V = 768\pi \ cm^3}$

C

$A = \pi r^2 = \pi 8^2 = 64\pi$

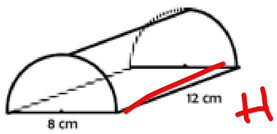
cm^2

B

$\boxed{R = 8 \ cm}$

D

2) Find the volume of the half cylinder to the nearest tenth.



$\frac{1}{2}V_{CYL} = \frac{1}{2}(BH)$

$= \frac{1}{2}(16\pi)(12)$

$= 96\pi$

$= 301.5928$

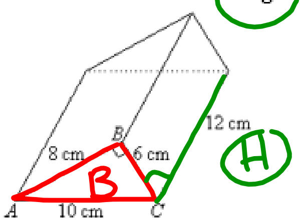
$\boxed{V_{\frac{1}{2}CYL} = 301.6\ cm^3}$

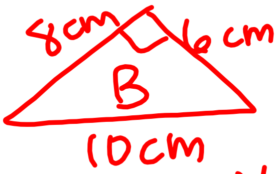
C
$A = \pi r^2 = \pi 4^2 = 16\pi\ cm^2$ B

$R = 4\ cm$

$\boxed{D = 8\ cm}$

3) Find the volume of the right triangular prism.





$V = BH = (24)(12)$
$\quad\quad\quad\quad cm^2 \quad cm$

$\boxed{V = 288\ cm^3}$

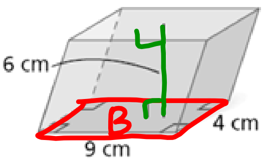
$B = A_\Delta = \frac{bh}{2} = \frac{(8)(6)}{2}$

$= 24\ cm^2$

4) Find the volume of the oblique rectangular prism.

$V = BH = \underset{cm^2}{(36)}\underset{cm}{(6)}$

$\boxed{V = 216\ cm^3}$



H

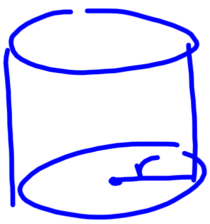
$\boxed{B}$ 4 cm, 9 cm

$B = A_{RECT} = bh = 9(4)$
$= 36\ cm^2$

H = 3r

LET r = RADIUS

5) A cylinder has a circumference of 14π inches and a height equal to three times the radius. Find the volume of the cylinder in terms of π.



$H = 3r$
$= 3(7)$
$= 21$ IN

$\boxed{C = 14\pi} = 2\pi r \quad r = 7$

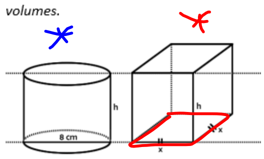
A $= \pi r^2 = \pi 7^2 = 49\pi$ B IN^2

R $= r = 7$ IN

D

$V = BH = \underset{IN^2}{(49\pi)}\underset{IN}{(21)} = \boxed{1029\pi\ IN^3 = V}$

6) Comparing volumes is a big emphasis: A rectangular prism and a cylinder have the same height and the same volume. What is the length of the side of the prism's square base? *Hint: you can leave h in your volumes.*



$V = BH$ $V = BH$

BY CAVALIERI'S PRINC, THE EQUAL VOLUMES W/ EQUAL HEIGHTS MEANS THE CROSS SECTION AREAS =. SET $B = B$.

C

$A = \pi r^2 = \pi 4^2 = 16\pi \text{ cm}^2$ B

$R = 4 \text{ cm}$

$\boxed{D = 8}\text{ cm}$

$B = A_{SQ} = bh = x \cdot x = x^2$

$16\pi \text{ cm}^2 = x^2 \text{ cm}^2$

$\pm\sqrt{16\pi} = x$

$4\,\cancel{\sqrt{16}}\,\sqrt{\pi} = x$

$\boxed{4\sqrt{\pi} \text{ cm} = \text{SIDE OF SQUARE}}$