AGENDA - Unit 10.2

Cylinders

Go over HW 10.1

- Notes 10.2

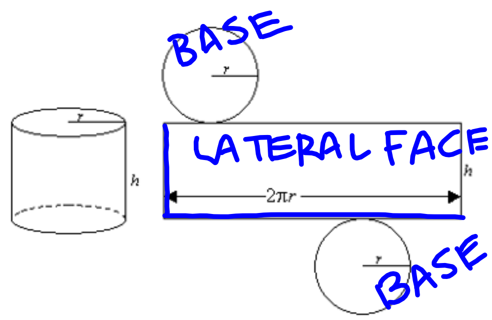
HW - 10.2 - Worksheet

Geometry LAB Name ______________________ Section __________ Date________

10-2 Notes: Cylinders

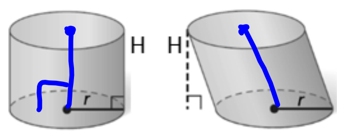
THE CYLINDER

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. If the cylinder is right, then the lateral area is specifically a rectangle. Think of unwrapping a soup can label or pulling the label from a water bottle - the two dimensional form is a rectangle.



RIGHT VS. OBLIQUE

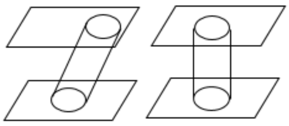
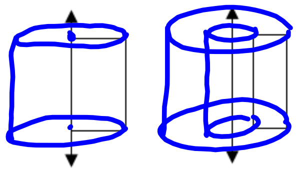
The height (altitude) of the prism is the perpendicular distance between the two congruent bases. If a translation vector is also the height (that is, it is perpendicular to the base), then the cylinder is **RIGHT.** If the base and translation vectors are NOT PERPENDICULAR, then the cylinder is **OBLIQUE**. This means the lateral face will be a PARALLELOGRAM IF OBLIQUE



RECT IF RIGHT

CREATING A CYLINDER

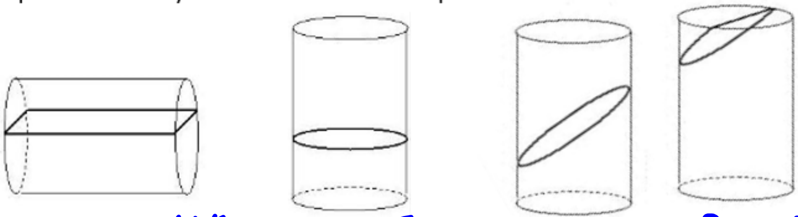
Cylinders can be created by:

TRANSLATING a circle into a PARALLEL plane *(Lesson 10-1)*	STACKING congruent and parallel circles to create the height	ROTATING a planar figure around an axis/line.
Examples: 	Example: 	Examples: 

CYLINDER HOLLOWED OUT CYLINDER

SLICES / CROSS SECTIONS

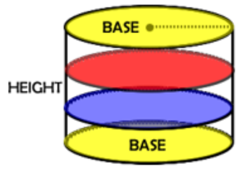
Slices are intersections of planes with a cylinder. Describe the shape of the cross section in each of the following:

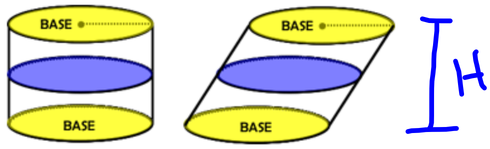


Shape of Cross Section	RECTANGLE	CIRCLE	ELLIPSE	PARABOLA
Special Conditions	IF ⊥ TO BASES OTHERWISE $\boxed{?}$	≅ TO BASE IF PARALLEL	THRU LATERAL SPACE	BASE + LATERAL FACE

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

Another way to form a prism is by stacking images of the base with an infinitesimally small height until the parallel plane is reached. Since the pre-image base was translated, every cross section parallel to the pre-image base will be congruent. How they are stacked determines whether the prism is right or oblique.



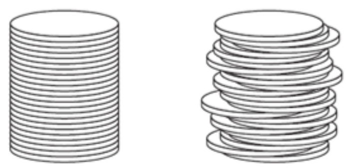


This leads to the formula for calculating the volume:

$$\boxed{\text{VOLUME}_{\text{CYLINDER}} = BH = \pi r^2 H}$$

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

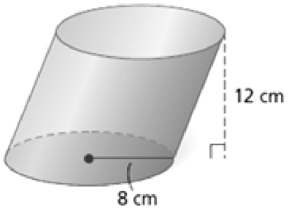
The formula is the same for both right and oblique cylinders. Why?



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.

Examples:

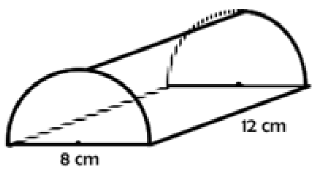
1) Find the volume of the cylinder in terms of π.



$V = BH$
$= (64\pi)(12)$
cm^2 cm
$\boxed{V = 768\pi \text{ cm}^3}$

C
$A = \pi r^2 = \pi 8^2 = 64\pi$
cm^2
$\boxed{R = 8 \text{ cm}}$
D

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

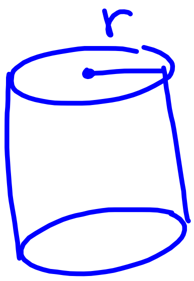


$\frac{1}{2}V = \frac{1}{2}(BH)$
$= \frac{1}{2}(16\pi)(12)$
$= 96\pi$
$= 301.5928....$
$\boxed{\frac{1}{2}V = 301.6 \text{ cm}^3}$

C
$A = \pi r^2 = \pi 4^2 = 16\pi$
B
$R = 4$ cm
$\boxed{D = 8 \text{ cm}}$

LET r = RADIUS   H = 3r

3) 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.



$V = BH$

$= (49\pi)(21)$

$\boxed{V = 1029\pi \text{ IN}^3}$

$3r = 21$

$\boxed{C = 14\pi \text{ IN}} = 2\pi r$

$\frac{14\cancel{\pi}}{2\cancel{\pi}} = \frac{\cancel{2}\cancel{\pi}r}{\cancel{2}\cancel{\pi}}$

$7 = r$

$A = \pi r^2 = \pi 7^2 = 49\pi \text{ IN}^2$

R = 7

D