Date: 4/11/18

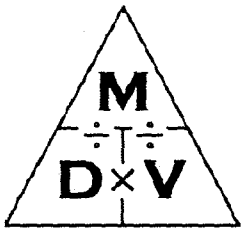
TROICI

QUIZ 8.2 REVIEW – THREE-DIMENSIONAL GEOMETRY

ICATIONS OF DENSITY ADD- KHDUDCM

mass	is commonly measured by how much something weighs
volume	is the amount of 3 dimensional space an object occupies (capacity)
Density	how much mass per unit of volume.

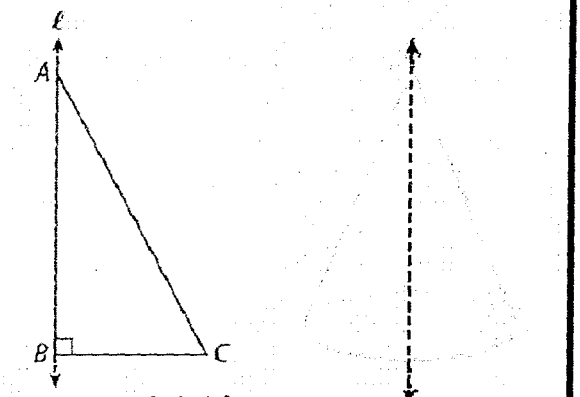
Formulas: $D = \frac{m}{V}$ $V = \frac{m}{D}$ $M = D \cdot V$



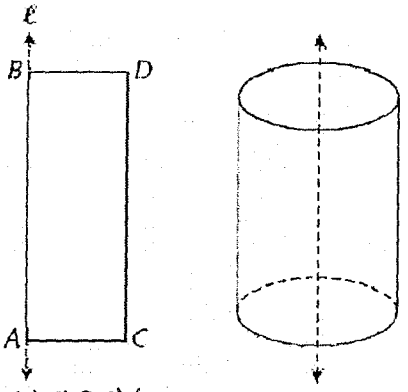
**** Be careful with your units****

TOPIC #2 REVOLUTIONS

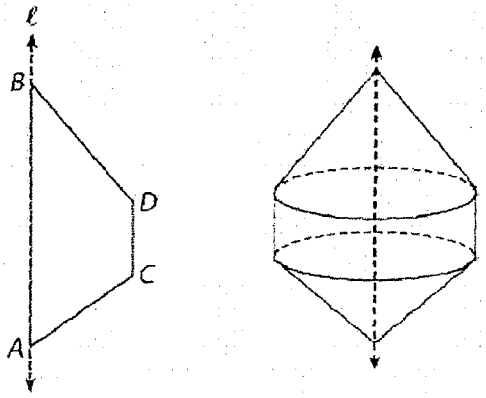
A revolution represents the solid figure created by rotating ~~the~~ a 2D figure.

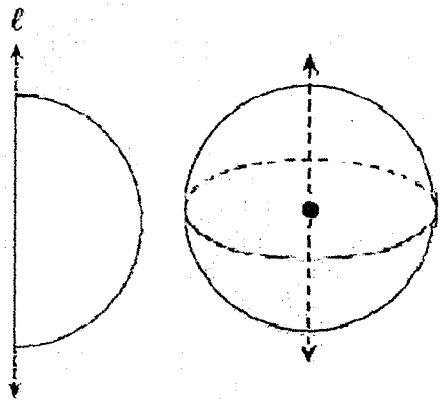


Triangle → cone



rectangle → cylinder



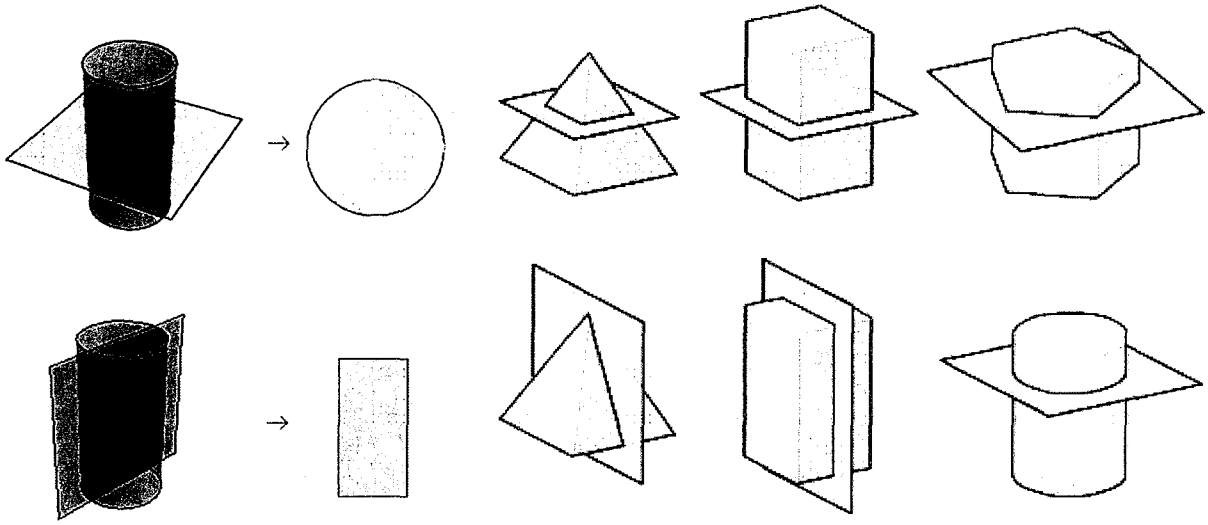


circle → sphere

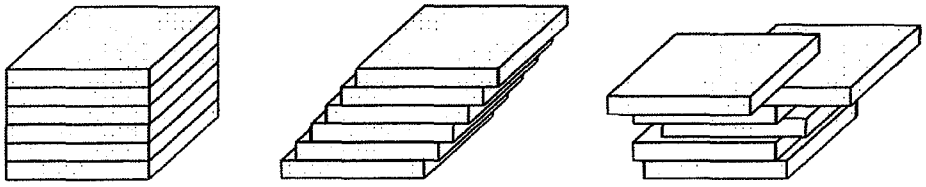
TOPIC #3: CROSS SECTIONS

THINK FRUIT NINJA!

A cross section is the 2-D shape when a solid is cut by a plane.



TOPIC #4: CAVALIERI'S PRINCIPLE



The six pieces maintain their same volume regardless of how they are moved

TWO CONDITIONS:	1. solid figures must have the same height
	2. cross sectional areas are equal

STATION #1: APPLICATIONS OF DENSITY

1. The density of the American white oak tree is 752 kilograms per cubic meter. If the trunk of an American white oak tree has a circumference of 4.5 meters and the height of the trunk is 8 meters, what is the approximate number of kilograms of the trunk?

1) 13
2) 9694
3) 13,536
4) 30,456

want – mass!
$m = D \cdot V$
↳ need
$V = \pi r^2 h$
↑ need
$C = 2\pi r$
$\frac{4.5}{2\pi} = \frac{2\pi r}{2\pi}$
$r = .7161$
$V = \pi(.7161)^2(8)$
$V = 12.8915$
$m = 752 \times 12.8915$
$m = 9694.4458$

2. Molly wishes to make a lawn ornament in the form of a solid sphere. The clay being used to make the sphere weighs .075 pound per cubic inch. If the sphere's radius is 4 inches, what is the weight of the sphere, to the *nearest pound*?

1) 34
2) 20
3) 15
4) 4

$m = D \cdot V$
↑ need!
$V = \frac{4}{3}\pi r^3$
$V = \frac{4}{3}\pi(4)^3$
$V = 268.0825$
$m = .075 \cdot 268.0825$
$m = 20.1061$

3. A hemispherical tank is filled with water and has a diameter of 10 feet. If water weighs 62.4 pounds per cubic foot, what is the total weight of the water in a full tank, to the *nearest pound*?

1) 16,336
2) 32,673
3) 130,690
4) 261,381

$m = D \cdot V$
↓ need!
$V = \frac{4}{3}\pi r^3 \cdot \frac{1}{2}$
$V = \frac{4}{3}\pi(5)^3 \cdot \frac{1}{2}$
$V = 261.7993$
$m = 62.4 \cdot 261.7993$
$m = 16336.2818$

4. A wooden cube has an edge length of 6 centimeters and a mass of 137.8 grams. Determine the density of the cube, to the *nearest thousandth*. State which type of wood the cube is made of, using the density table below.

Type of Wood	Density (g/cm^3)
Pine	0.373
Hemlock	0.431
Elm	0.554
Birch	0.601
Ash	0.638
Maple	0.676
Oak	0.711

$D = \frac{m}{V}$ → need!
$V = l \cdot w \cdot h$
$V = 6 \cdot 6 \cdot 6$
$V = 216 cm^3$
$D = \frac{137.8}{216}$
$D = .6379$
$D = .638$
Ash!

★ laptop and rectangle/square

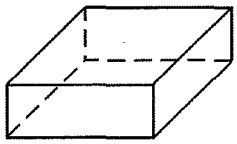
STATION #2: REVOLUTIONS AND CROSS SECTIONS

1. The cross section of a regular pyramid contains the altitude of the pyramid. The shape of this cross section is a

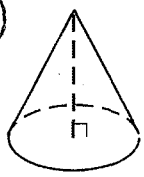
1) circle
2) square
3) triangle
4) rectangle

2. Which figure can have the same cross section as a sphere?

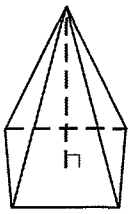
1)



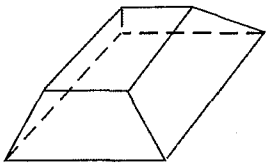
2)



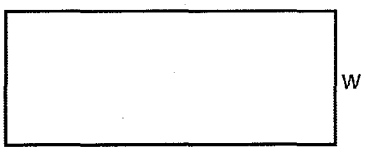
3)



4)

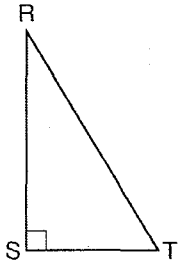


3. If the rectangle below is continuously rotated about side *w*, which solid figure is formed?



1) pyramid
2) rectangular prism
3) cone
4) cylinder

4. Which object is formed when right triangle *RST* shown below is rotated around leg $\overline{RS}$?



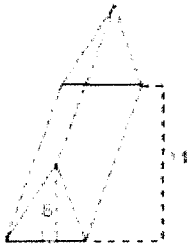
1) a pyramid with a square base
2) an isosceles triangle
3) a right triangle
4) a cone

STATION #3: CAVALIERIE'S PRINCIPLE

1. The diagram below shows two figures. Figure A is a right triangular prism and Figure B is an oblique triangular prism. The base of Figure A has a height of 5, a base of 8 and the height of the prism is 14. The base of Figure B has a height of 8, a base of 5 and the height of the prism is 14. Use Cavalieri's Principle to explain why the volumes of these two triangular prisms are equal.

Figure A

Figure B

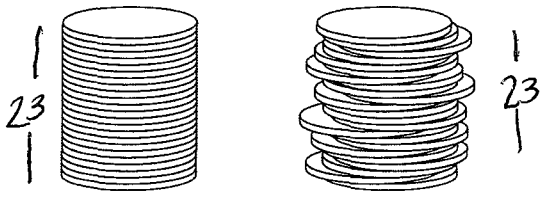


The volumes are equal b/c the prism's have the same height and their cross sectional bases have the same area which satisfies cavalieri's principle

$A = \frac{1}{2}(5)(8)$ $A = \frac{1}{2}(8)(5)$

$A = 20 \leftrightarrow A = 20$

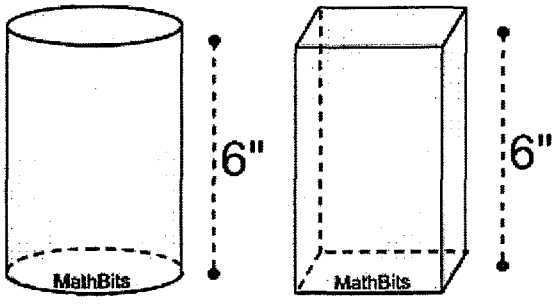
2. Two stacks of 23 quarters each are shown below. One stack forms a cylinder but the other stack does not form a cylinder.



Use Cavalieri's principle to explain why the volumes of these two stacks of quarters are equal.

The volumes will be equal b/c they have the same height and their cross sectional bases have the same area. (All quarters have same area) which satisfies cavalieri's principle

3. Rob says that although the solid figures below have the same height, they can never have the same volume because they are two different solids. Do you agree? Why or why not?



NO! The solids can have the same volume if the heights are equal and their cross sectional base areas are the same, even if the shapes are not the same!

$A_{circle} = A_{rectangle}$

+ same height

same volume!

Name: Key
CC GEOMETRY

Date: 4/11/18
TROICI

APPLICATIONS OF DENSITY: ADDITIONAL PRACTICE

1.) A shipping container is in the shape of a right rectangular prism with a length of 12 feet, a width of 8.5 feet, and a height of 4 feet. The container is completely filled with contents that weigh, on average, 0.25 pound per cubic foot. What is the weight, in pounds, of the contents in the container?

per → density!

↳ mass = D · V
↳ need!

$V = l \cdot w \cdot h$
$V = 12 \cdot 8.5 \cdot 4$
$V = 408\ ft^3$

$m = .25 \cdot 408$
$m = 102\ lbs$

2.) The 2010 U.S. Census populations and population densities are shown in the table below.

Illinois, Florida, New York, Pennsylvania

Popdensity = Pop / Area

State	Population Density $\left(\frac{\text{people}}{\text{mi}^2}\right)$	Population in 2010
Florida	350.6	18,801,310
Illinois	231.1	12,830,632
New York	411.2	19,378,102
Pennsylvania	283.9	12,702,379

Based on the table above, ~~which~~ list ~~has~~ the states' areas, in square miles, in order from largest to smallest?

Florida = (2) $\frac{18,801,310}{x} = \frac{350.6}{1}$

$350.6x = 18801310$
$x = 53626.0981$

Illinois = (1) $\frac{12830632}{x} = \frac{231.1}{1}$

$231.1x = 12830632$
$x = 55519.8269$

New York = (3) $\frac{19378102}{x} = 411.2$

$411.2x = 19378102$
$x = 47125.7344$

Pennsylvania = (4) $\frac{12702379}{x} = \frac{283.9}{16}$

$283.9x = 12702379$
$x = 44742.441$

3.) A machinist creates a solid steel part for a wind turbine engine. The part has a volume of 1015 cubic centimeters. Steel can be purchased for $0.29 per kilogram, and has a density of 7.95 g/cm^3. If the machinist makes 500 of these parts, what is the cost of the steel, to the *nearest dollar*?

① Find mass

$m = 1015 \cdot 7.95$

$m = 8069.25$ g

K H D U D (M)

Kg g

$m = 8.069\,25$ Kg for 1 part

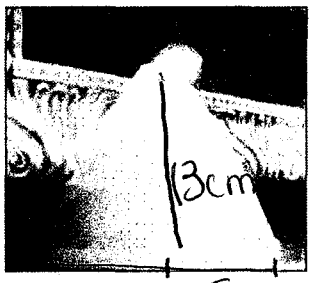
$\times 500$

4034.625 kg for 500 parts

$\times \ .29$

$1170

4.) A candle maker uses a mold to make candles like the one shown below.



$C = 2\pi r$

$\frac{31.416}{2\pi} = \frac{2\pi r}{2\pi}$

$r = 5.0000$

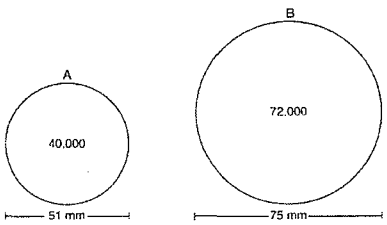
The height of the candle is 13 cm and the circumference of the candle at its widest measure is 31.416 cm. Use modeling to approximate how much wax. to the *nearest cubic centimeter*. is needed to make this candle. Justify your answer.

$V = \frac{1}{3}\pi(5)^2(13)$

$V = 340.3392$

$V = 340\ cm^3$

5.) During an experiment, the same type of bacteria is grown in two petri dishes. Petri dish *A* has a diameter of 51 mm and has approximately 40,000 bacteria after 1 hour. Petri dish *B* has a diameter of 75 mm and has approximately 72,000 bacteria after 1 hour.



$D=51$ $D=75$

$R=27.5$ $R=37.5$

Determine and state which petri dish has the greater population density of bacteria at the end of the first hour.

$A_A = \pi(27.5)^2$

$A_A = 756.25\pi$

$PD_A = \frac{40,000}{756.25\pi}$

$= 16.8362$

$A_B = \pi(37.5)^2$

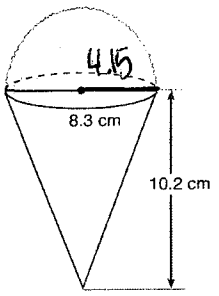
$A_B = 1406.25\pi$

$PD_B = \frac{72,000}{1406.25\pi}$

$= 16.2974$

Petri DISH A has the greater population density.

6.) A snow cone consists of a paper cone completely filled with shaved ice and topped with a hemisphere of shaved ice, as shown in the diagram below. The inside diameter of both the cone and the hemisphere is 8.3 centimeters. The height of the cone is 10.2 centimeters.



$V_{cone} + V_{hemisphere}$

$\frac{1}{3}\pi(4.15)^2(10.2) + \frac{1}{2}\left(\frac{4}{3}\pi(4.15)^3\right)$

$183.96006 + 149.6934$

$V = 333.6541\ cm^3$

$.000697\ kg/cm^3$

$m = D \cdot V$

$m = .000697 \times 333.6541$

$m = .2325\ kg$ for 1 cone

$\times 50$

$11.6278\ kg$ for 50 cones

$\times 3.83$

$\$44.53$

The desired density of the shaved ice is 0.697 g/cm^3, and the cost, per kilogram, of ice is \$3.83. Determine and state the cost of the ice needed to make 50 snow cones.

K H D U D C M

kg g