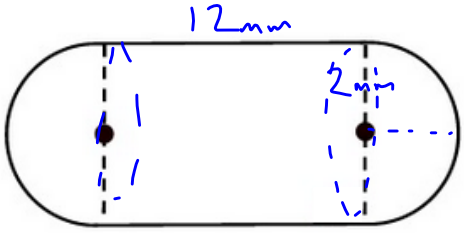
DO NOW

A pharmacist is filling medicine capsules. The capsules are cylinders with half spheres on each end. If the length of the cylinder is 12 mm and the radius is 2 mm, how many cubic mm of medication can one capsule hold? (Round answer to the *nearest tenth* of a cubic mm.)



Sphere

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(2)^3$

$V = 33.510\ldots$

Cylinder

$V = \pi r^2 h$

$V = \pi(2)^2(12)$

$V = 150.796\ldots$

$184.30\ldots$

$184.3\ mm^3$

Density is a measure of how much mass is located within a specific volume of space.

$D = \frac{m}{V}$

Labels for density

g / cm^3; lbs / ft^3; kg / m^3

Population Density is the quantity of something per unit measure (unit length, area, or volume).

"people per square mile" can be written "people/square mile"
(divide the number of people by the number of square miles)

"BTUs per cubic foot of air" can be written "BTUs/cubic foot of air"
(divide the number of BTUs by the cubic feet of air space)

1) As of 2015, the most densely populated state in the US was New Jersey. The 2015 population of New Jersey was 8,957,907 people with 1218.1 people per square mile. Which choice is the approximate land area of the state of New Jersey to the *nearest square mile*?

1) 7,135 square miles
2) 10,912 square miles
3) 7,354 square miles
4) 12,354 square miles

$$\frac{8,957,907 \text{ people}}{1} \cdot \frac{1 \text{ mi}^2}{1218.1 \text{ people}}$$

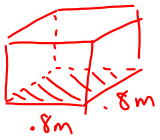
$$7,354 \text{ mi}^2$$

2) Ninety-eight cut boulders are being brought in to help prevent further erosion on a portion of a coastline. Each boulder has been roughly cut into a cube with sides of length 0.8 meters. The stone in the boulders has an average density of 3000 kg/m³. → $3000 \text{ kg} = 1 \text{ m}^3$

$D = \frac{m}{V}$

a) Find the average weight (mass) of each boulder in pounds. (Round to *the nearest ten* pounds.)

1 kilogram = 2.2 pounds



$V = Bh$

$V = (.8)(.8)(.8)$

$* \ V = .512 \text{ m}^3$

$$\frac{.512 \text{ m}^3}{1} \cdot \frac{3000 \text{ kg}}{1 \text{ m}^3}$$

$1,536 \text{ kg}$

$$\frac{1,536 \text{ kg}}{1} \cdot \frac{2.2 \text{ lbs}}{1 \text{ kg}}$$

$3,379.2 \text{ lbs}$

$3,380 \text{ lbs}$

b) A dump truck with a carrying capacity of 28,000 pounds is used to transport the boulders to the coastline. How many trips will the truck need to make to transport all of the boulders? Assume the truck does not exceed its carrying capacity.

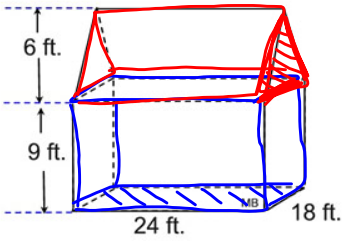
$98(3,380) = 331,240 \text{ lbs}$

$$\frac{331,240}{28,000} = 11.8\ldots$$

12 trips

3) An air conditioner is being purchased for the room shown below. The room has an open ceiling that follows the roof trusses. According to the US Department of Energy, to determine the cooling requirement of a room, use 2.5 BTUs per cubic foot of air space. To this value, add an additional 1000 for each window in the room. This room has 4 windows.

Determine the number of BTUs needed to cool this room.



Rectangular Prism

$V = Bh$

$V = (24)(18)(9)$

Δ Prism

$V = Bh$

$V = \frac{1}{2}(18)(6)(24)$