Name: Key Class: _____

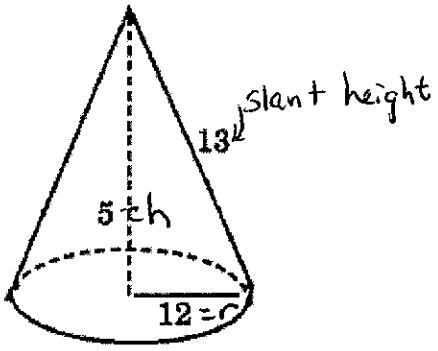
M8-U8: Notes #2 - Volume of 3-D Figures - Cones Date: _____

A. Cone – has one base that is a circle and then meets at a common vertex.

Formula: $V = \frac{Bh}{3}$ $V = \frac{\pi r^2 h}{3}$ (what is the base in a cone?)

For Examples 1 and 2, find the volume of each cone.

Example 1a:



$V = \frac{\pi(12)^2(5)}{3}$

$= \frac{144(5)\pi}{3}$

$= \frac{720\pi}{3} =$

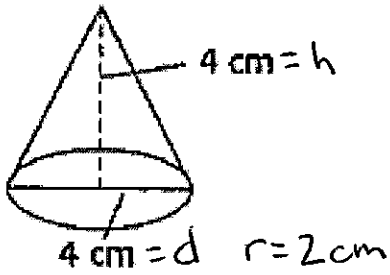
Volume = 240π units^3

Find the volume to the nearest tenth.

≈ 753.9822369

Volume ≈ 754.0 units^3

Example 1b: (Hint: What's the radius?)



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

$= \frac{16\pi}{3}$

Volume = $\frac{16}{3}\pi$ cm^3

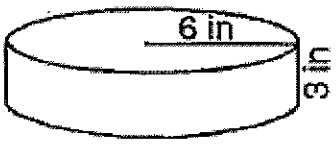
≈ 16.755160082

Volume ≈ 16.8 cm^3

B. Comparing/Analyzing volumes.

Example 2:

a) Given the following figure, find the volume (leave in terms of π).



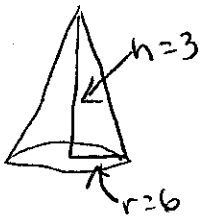
$\pi r^2 h$

$V = \pi (6)^2 (3)$

$= \pi (36)(3)$

$= 108\pi \text{ in}^3$

b) Draw a cone with the same dimensions as the figure above, what is the cones volume (leave in terms of π)?



$V = \frac{\pi r^2 h}{3}$

$= \frac{\pi (6)^2 (3)}{3}$

$= 36\pi \text{ in}^3$

c) How do the two volumes compare?

$\frac{108\pi}{36\pi} = 3$; the cylinder is 3 times larger

or

the cone is $\frac{1}{3}$ the size.

Example 3:

What would have a greater effect on the volume of a cone: doubling its radius or doubling its height? *(Use the information from 2b to get started)*

a) Double radius:

$V = \frac{\pi (12)^2 (3)}{3}$

$= \frac{\pi (144)(3)}{3}$

$= 144\pi \text{ in}^3$

$\frac{144\pi}{36\pi} = 4$ times larger

b) Double height:

$V = \frac{\pi (6)^2 (6)}{3}$

$= \frac{\pi (36)(6)}{3}$

$= 72\pi \text{ in}^3$

$\frac{72\pi}{36\pi} = 2$ times larger

C. Determining missing lengths.

Example 4:
The volume of a cone is 405π in^3 with a diameter of 18in. Find the height of the cone.

$d=18,\ r=9$

$V=\frac{\pi r^2 h}{3}$

$\frac{405\pi}{1}=\frac{\pi(9)^2 h}{3}$

$\frac{1215\pi}{81\pi}=\frac{81\pi h}{81\pi}$

$h=15$in

Example 5:
An ice cream shop designs a new ice cream cone. He wants the volume to be about 240cm^3. The cone is 14cm tall. What is its radius to the nearest whole number?

$V=\frac{\pi r^2 h}{3}$

$\frac{240}{1}=\frac{\pi r^2(14)}{3}$

$\frac{720}{(14\pi)}=\frac{14\pi r^2}{14\pi}$

$\sqrt{r^2}=\sqrt{16.370222 72}$

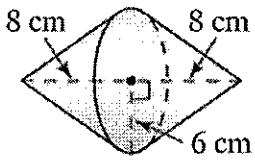
$r\approx 4.046013188$

$r\approx 4$cm

D. Composite Volume

Find the volume of each solid in terms of pi.

Example 6:



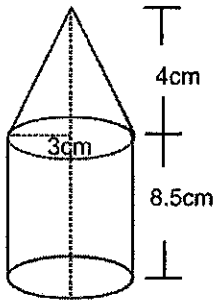
$V=\frac{\pi r^2 h}{3}$

$=\frac{\pi(6)^2(8)}{3}$

$=96\pi$

But double since there are two cones so 192π cm^3

Example 7:



$V_{cy}=\pi(3)^2(8.5)$

$=76.5\pi$

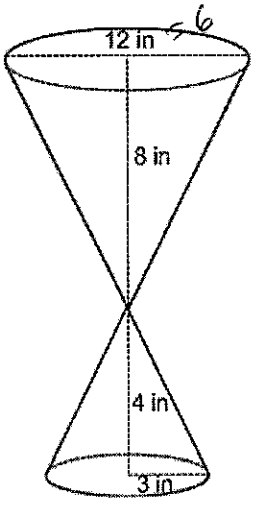
$V_{cone}=\frac{\pi(3)^2(4)}{3}$

$=12\pi$

Total $=76.5\pi$
$+12\pi$
88.5π cm^3

Additional Practice:
Show all work.

1. Find the volume.



$$V_{cone1} = \frac{\pi(3)^2(4)}{3}$$

$$= 12\pi$$

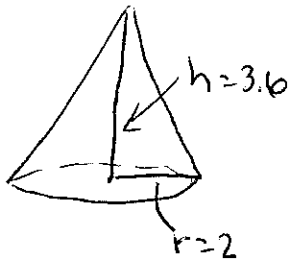
$$V_{cone2} = \frac{\pi(6)^2(8)}{3}$$

$$= 96\pi$$

$$\text{Total} = 96\pi + 12\pi$$

$$\boxed{108\pi \text{ in}^3}$$

2. Bob is building a storage shed in a conical shape. The base of the shed is 4 meters in diameter and the height of the shed is 3.6 meters. What is the volume?



$$V = \frac{\pi r^2 h}{3}$$

$$= \frac{\pi(2)^2(3.6)}{3}$$

$$= \boxed{4.8\pi \text{ m}^3}$$

3. A machine uses a funnel in the shape of a cone to fill soda cans on an assembly line. The funnel has a height 10cm and a diameter of 8cm. How many times would the machine need to fill the cone to then fill a can of the same dimensions? *(Show work to prove the answer.)*

$V_{cone} = \frac{\pi r^2 h}{3}$

$= \frac{\pi(4)^2(10)}{3}$

$= \frac{160\pi}{3}$

$V_{cy} = \pi r^2 h$

$= \pi(4)^2(10)$

$= 160\pi$

It would need to fill it 3 times!

4. Find the diameter, to the nearest unit, of a cone with an approximate volume of 22 ft^3 and a height of 21ft.

$V = \frac{\pi r^2 h}{3}$

$22 = \frac{\pi r^2 (21)}{3}$

$\frac{66}{21\pi} = \frac{\pi r^2 (21)}{21\pi}$

$\sqrt{r^2} = \sqrt{1.000402499}$

$r \approx 1.000201229$

$d = 2r$

so double

it would be approximately 2ft.

5. The human eye contains "cones", primarily responsible for color vision, which have an approximate diameter and length of 1.0×10^{-7} meters and 5.0×10^{-5} meters respectively. What is the approximate volume of the solid?

$d = 1.0\times10^{-7}$

$r = 5\times10^{-8}$

$V = \frac{\pi(5\times10^{-8})^2(5.0\times10^{-5})}{3}$

$= \frac{\pi(2.5\times10^{-15})(5.0\times10^{-5})}{3}$

$= \frac{1.25\times10^{-19}\pi}{3}$

$= 4.16666667\times10^{-20}\pi\ m^3$

or $1.308996939\times10^{-19}$