Module 16b: Volumes of Cylinders

Math Practice(s):

-Model with mathematics.

-Look for & make use of structure.

Learning Target(s):

- Apply the formulas for volume to solve problems in real-world context.

Homework:

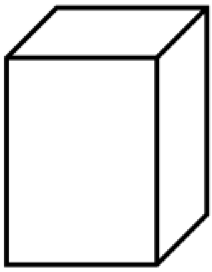
HW#9: 16b #1-4

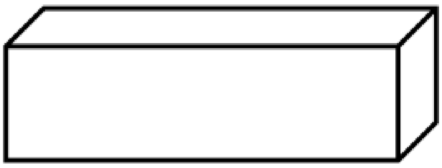
Nov 20-12:32 PM

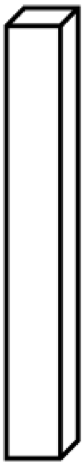
Warm-up:

Kaulana is building an outdoor shed in the shape of a rectangular prism. He would like the shed to have a volume of 60 cubic meters, and the measurements must be in whole number units.

A) List 3 different possible dimensions (length, width, and height) for the shed that will meet Kaulana's requirements.

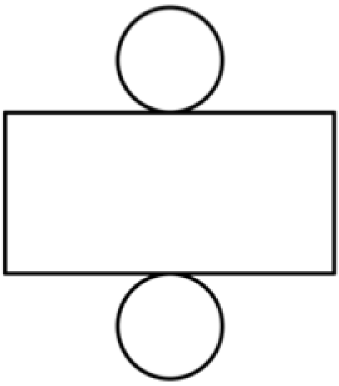






B) Which of 3 dimensions that you stated above would you recommend that Kaulana should select? Explain why.

C) Kaulana decided to take your recommendation (your answer to question B, above). However, he will construct only the 4 walls and the ceiling of the shed (he will not construct a floor for the shed). Determine how much wood Kaulana will need to construct the shed.

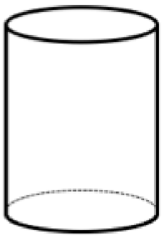


(erase to show)

Cylinder (#VOC)

A __3__-dimensional figure with __2__ __≅__, __||__ __circular__ bases.

Volume of a Cylinder (#THM)



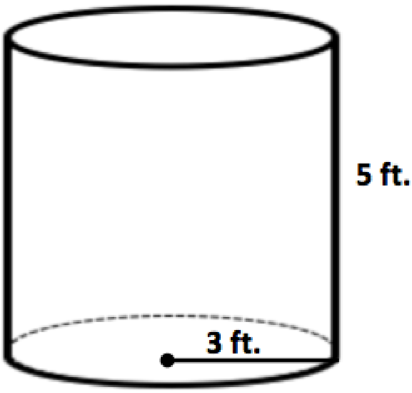
$V = Bh$

B = area of the base

Example 1:

The cylinder shown to the right has a height of 5 feet and its base has a radius of 3 feet. Determine the cylinder's volume.

Express your answers in exact form AND as an approximation rounded to the nearest hundredths place



$V = Bh$

$= (9\pi)(5)$

$\boxed{V = 45\pi \text{ ft}^3 \quad V \approx 141.37 \text{ ft}^3}$

base

$r = 3$ ft

$B = \pi r^2$

$= \pi(3)^2$

$B = 9\pi \text{ ft}^2$

Example 2: An official U.S. quarter has a diameter of 24.26 mm. and a thickness of 1.75 mm. When quarters are stacked directly on top of another, they form a cylinder. What would be the volume of the cylinder formed by a stack of 20 quarters? Express your answer as an approximation rounded to the nearest hundredths place.

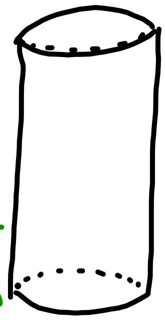
$d = 24.26\text{ mm}$

$\underline{r = 12.13\text{ mm}}$

base ○

$B = \pi r^2$

$\underline{B = \pi(12.13)^2}$



$20(1.75)$

35 mm

$V = Bh$

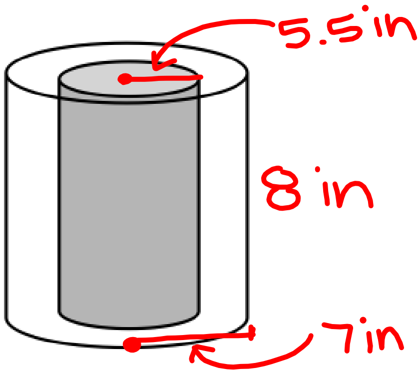
$= (\pi(12.13)^2)(35)$

$$\boxed{V \approx 16{,}178.55\text{ mm}^3}$$

Example 3: A can of tuna is a cylinder that has a diameter of 85 mm. and a height of 40 mm. The paper label on the can is placed 2 mm. from the top edge of the can and 2 mm. from bottom edge of the can. Determine the area of the paper label that goes around the can. Express your answer in exact form AND as an approximation rounded to the nearest hundredths place.

Example 4: An artist created structure using several hollowed-out cylinders (as shown in the picture on the left) made of cement:

- Each of the hollowed-out cylinders has a height of 8 inches.
- The radius of the base of the inner cylinder (the hollow part) is 5.5 inches.
- The radius of the base of the outer cylinder (the solid/cement part) is 7 inches.



The diagram on the right is an example of each of the hollowed-out cylinders. Label the diagram using the given dimensions and determine the volume of the solid part of the cylinder. Express your answer as an approximation rounded to the nearest hundredths place.

$V_{\text{outer cylinder}}$

$V = Bh$ $\quad B = \pi(7)^2$

$= (49\pi)(8)$ $\quad = 49\pi$

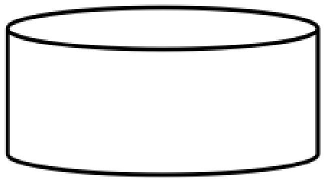
$V_{\text{hollowed out cylinder}}$

$V = Bh$ $\quad B = \pi(5.5)^2$

$= (\quad)(8)$

Practice:

1. The cylinder shown to the right has a height of 4 meters and the radius of its base is 5 meters.



A) Determine the volume of the cylinder. Express your answer in exact form only.

$V = Bh$

$V = (25\pi)(4)$

$\boxed{100\pi\ m^3}$

B) A new cylinder will be created by doubling the height of the cylinder shown. Determine the volume of this new cylinder. Express your answer in exact form only.

$V = Bh$

$= (25\pi)(8)$

$\boxed{200\pi\ m^3}$

The volume doubled.

C) Another cylinder will be created by doubling the radius of the base of the ORIGINAL cylinder shown above. Determine the volume of this new cylinder. Express your answer in exact form only.

$V = Bh$

$= (100\pi)(4)$

$B = 10^2\pi$

$= 100\pi$

$\boxed{400\pi\ m^3}$

The volume is multip. by 2^2.

D) Compare your answer for 7B to your answer for 7A. How is the volume of a cylinder affected when you double its height?

The volume is also doubled. (multiplied by 2)

E) Compare your answer for 7C to your answer for 7A. How is the volume of a cylinder affected when you double the radius of its base?

The volume is multiplied by 2^2 (4).