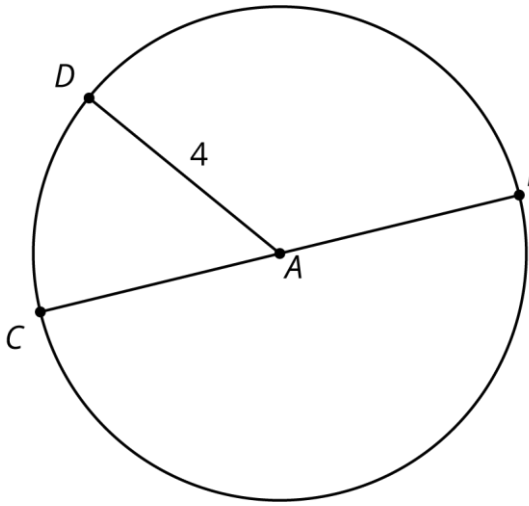## Unit 5, Lesson 13: The Volume of a Cylinder

13.1: A Circle's Dimensions

Here is a circle. Points A, B, C, and D are drawn, as well as Segments $\overline{AD}$ and $\overline{BC}$.
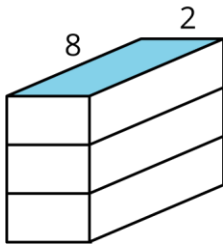
1. What is the area of the circle, in square units? **Select all that apply.**
   a. 4π
   b. $\pi 8$
   c. 16π
   d. $\pi 4^2$
   e. approximately 25
   f. approximately 50

2. If the area of a circle is 49π square units, what is its radius? Explain your reasoning.
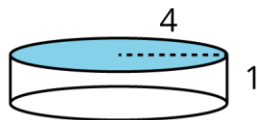
13.2: Circular Volumes

What is the volume of each figure, in cubic units? Even if you aren't sure, make a reasonable guess.
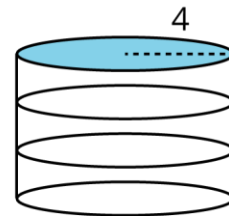
A   B   C

1. Figure A: A rectangular prism whose base has an area of 16 square units and whose height is 3 units.

2. Figure B: A cylinder whose base has an area of 16π square units and whose height is 1 unit.

3. Figure C: A cylinder whose base has an area of 16π square units and whose height is 3 units.

13.3: A Cylinder's Dimensions

1. Earlier you learned how to sketch a cylinder. Sketch one short and wide cylinder and sketch one tall and skinny cylinder. Label each one's radius and height.

13.4: A Cylinder's Volume

1. Here is a cylinder with height 4 units and diameter 10 units.
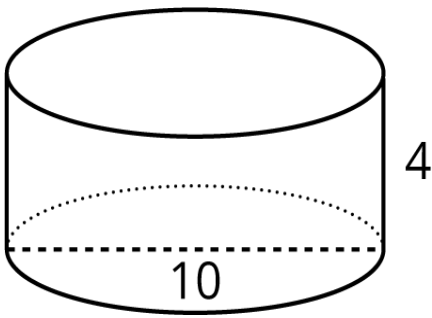
a. Shade the cylinder's base.

b. What is the area of the cylinder's base? Express your answer in terms of π.

c. What is the volume of the cylinder? Write your answer with π.

d. A silo is a cylindrical container that is used on farms to hold large amounts of goods, such as grain. On a particular farm, a silo has a height of 18 feet and diameter of 6 feet. Make a sketch of this silo and label its height and radius. How many cubic feet of grain can this silo hold? Use 3.14 as an approximation for π.

Volume of a Cylinder

We can find the volume of a cylinder with radius r and height h using two ideas we've seen before:

- The volume of a rectangular prism is a result of multiplying the area of its base by its height.

The volume of a cylinder is the area of the base (πr^2) times the height.
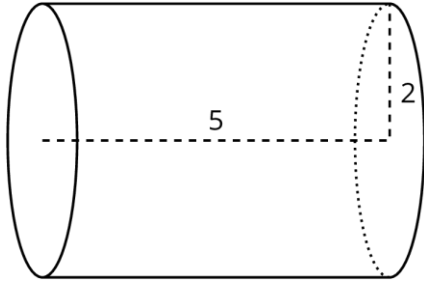
For example, take a cylinder whose radius is 2 cm and whose height is 5 cm.The base has an area of 4π cm² (since $\pi \cdot 2^2 = 4\pi$), so the volume is 20π cm³ (since $4\pi \cdot 5 = 20\pi$). Using 3.14 as an approximation for π, we can say that the volume of the cylinder is approximately 62.8 cm³.

In general, the base of a cylinder with radius r units has area πr^2 square units and then we multiply by the height to get Volume.
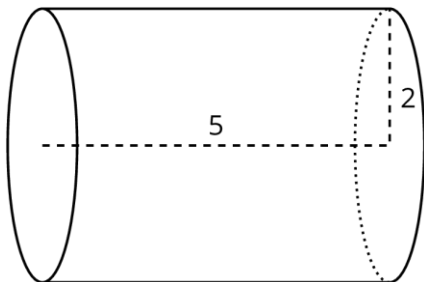
$$V = \pi r^2 h$$

Volume of a Cylinder

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$$V = \pi r^2 h$$