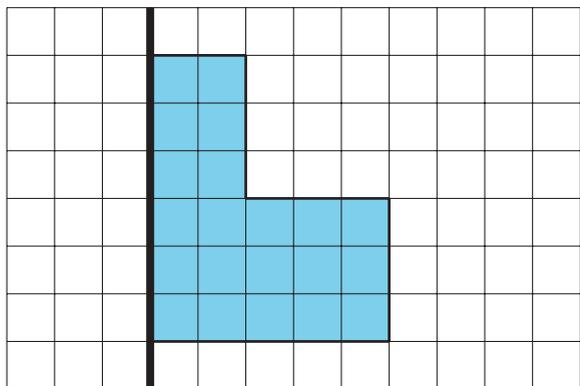


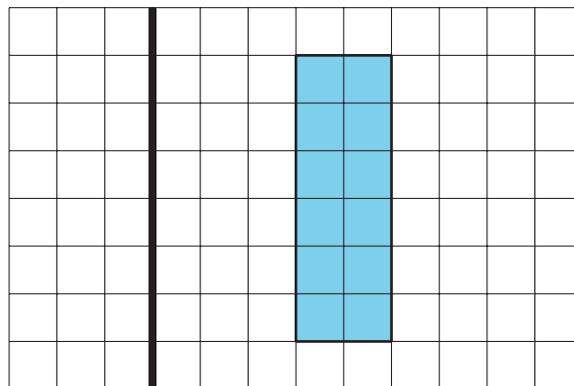
9.3: Revisiting Rotation

Suppose each two-dimensional figure is rotated around the vertical axis shown. Each small square in the grid represents 1 square centimeter.

A



B



For each solid:

1. Either sketch **or** describe in words the three-dimensional solid that would form.

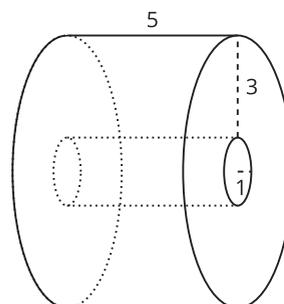
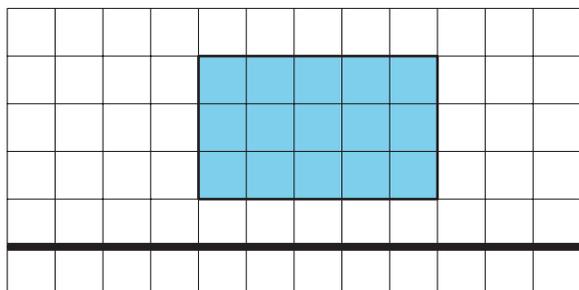
2. Find the solid's volume.

Are you ready for more?

1. Given a cylinder with radius r and height h , write an expression for the volume if each of these changes were made.
 - a. The height is tripled to $3h$ and the radius remains r .
 - b. The radius is tripled to $3r$ and the height remains h .
2. Given a cube of side length s , write an expression for the volume if the side length were tripled to $3s$.
3. Which change affected the shape's volume the most? The least? Explain or show your reasoning.

Lesson 9 Summary

Cylinder and prism volumes can be found by multiplying the area of the figure's base by its height. The formula $V = Bh$, where V represents volume, B is the area of the base, and h is height, captures this concept. Consider the solid formed by rotating this rectangle around the horizontal axis shown. The result is a hollow cylinder of height 5 units with inner radius 1 unit and outer radius 4 units.



To calculate the volume of the outer cylinder, start by finding the area of the circular base. The circle's radius measures 4 units, so its area is 16π square units because $\pi(4)^2 = 16\pi$. Multiply that by the cylinder's height of 5 units to get 80π cubic units.

For the inner cylinder, the area of the base is π square units, because $\pi(1)^2 = \pi$. The volume is therefore 5π cubic units. Now subtract the volume of the inner, hollow part from the volume of the outer cylinder to get the volume of the solid: 75π cubic units because $80\pi - 5\pi = 75\pi$.