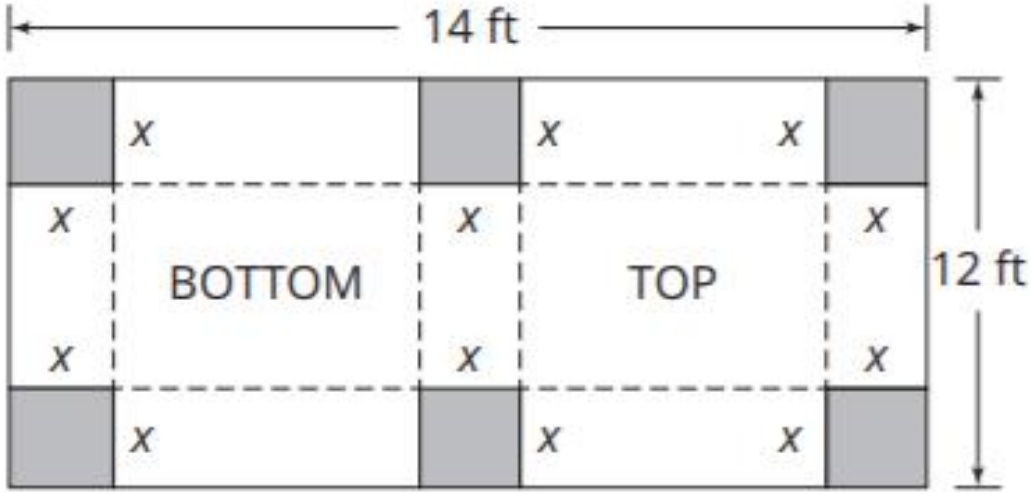
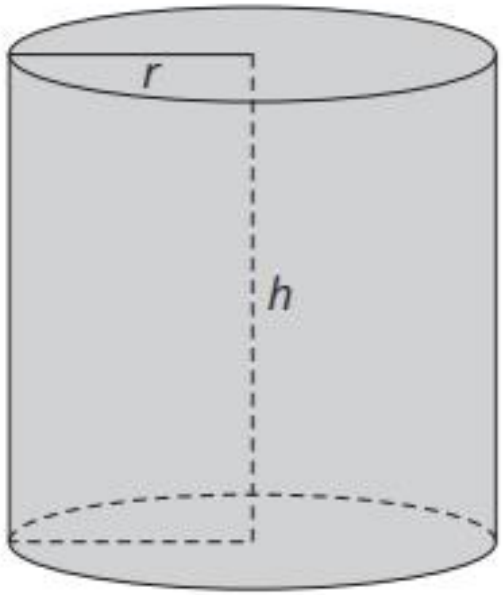
WARM UP

Stretch

1. Nikki is an engineer at a manufacturing plant. Her boss asks her to use rectangular sheets of metal to build storage bins with the greatest possible volume. Each rectangular sheet is 14 feet by 12 feet. Nikki's sketch shows the squares to be removed from each sheet. The dashed lines indicate where the metal sheets will be folded before they are welded to form the prism-shaped storage bins with tops.



   a. Write a function $V(x)$ to represent the volume of a bin in terms of the side length, x, of the removed squares. Explain your reasoning.



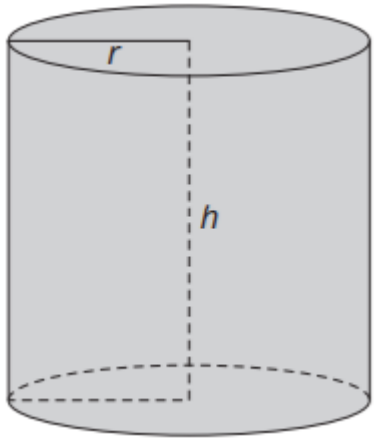
The Plant-A-Seed Company also makes cylindrical planters for city sidewalks and store fronts. The cylindrical planters come in a variety of sizes, but all have a height that is twice the radius.

1. **Why do you think Plant-A-Seed might want to manufacture different sizes of a product, but maintain a constant ratio of height to radius?**

2. Consider differently sized cylindrical planters.

a. Complete the table.

Radius	Height (inches)	Base Area (square inches)	Volume (cubic inches)
0			
1			
2			
3			
4			
			2000
x			



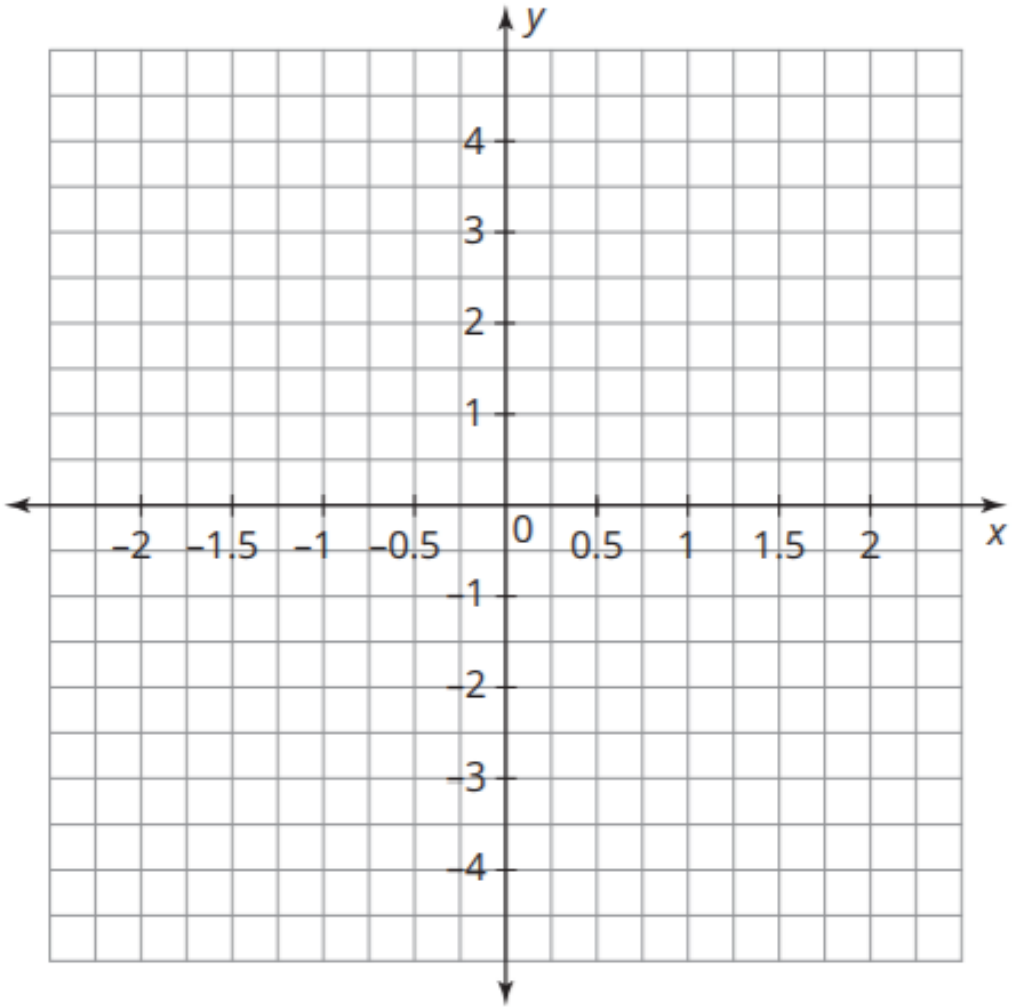
Volume of a cylinder:
V = (base area)(height)
Area of a circle: $A = \pi r^2$

b. Describe how you determined the volume when you are given the radius.

c. **Describe your method to determine the base area and the height when you are given the volume.**

d. **Analyze your table of values. For every unit increase in the radius, describe the rate of change in the height, area of the base, and volume of each planter.**

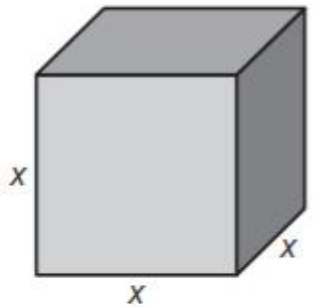
3. **Use technology to sketch and label the functions $A(x)$, $h(x)$, and $V(x)$ on the coordinate plane shown.**



TALK the TALK

Cubism

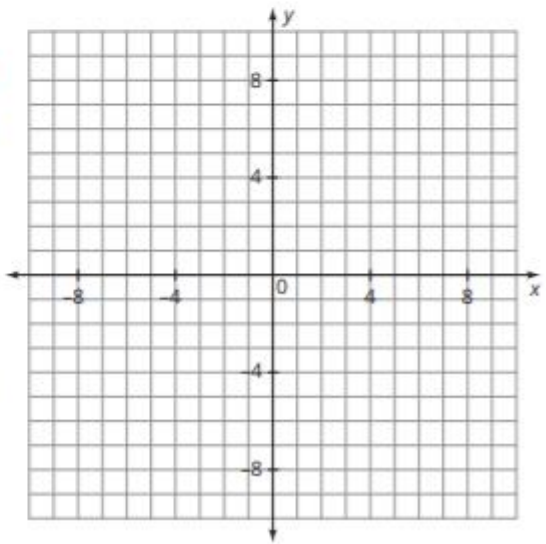
Consider a cube, which has equal length, width, and height, x.



1. **Recall that one way to determine the volume of a cube is to multiply the area of the base by its height.**

   a. **Sketch a graph of the function that represents the area of the base of the cube.**

   b. **Sketch a graph of the function that represents the height of the cube.**



c. Sketch a graph of the function that represents the volume of the cube.

2. Which general shape does this cubic function match? Explain your reasoning.