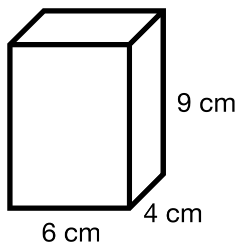
Volume of Prisms and Cylinders

Use What You've Learned
Answers and Explanations

For each of the following three-dimensional shapes, determine the area of the base, identify the height, and determine the volume. Remember, a shape does not have to "sit" on the base.

1.

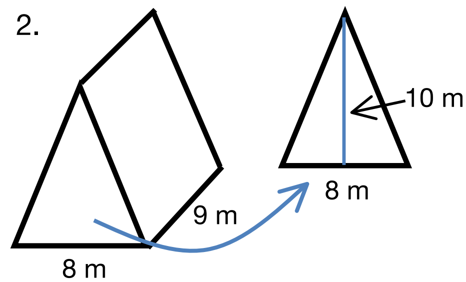


area of the base = 6 • 4
= 24 sq. cm
height = 9 cm
volume = Bh
= 24 • 9
= 216 cubic centimeters

Note: A rectangular prism has three different sets of bases and corresponding heights. You could also use a 4 cm by 9 cm face as the base or a 6 cm by 9 cm face as the base.

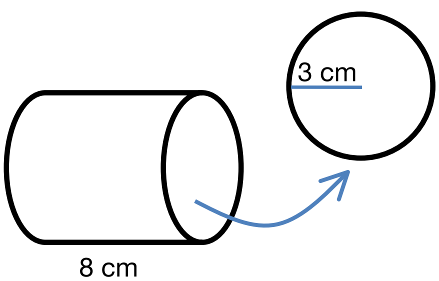
V = Bh	V = Bh
= (4 • 9) 6	= (6 • 9) 4
= 216 cubic centimeters	= 216 cubic centimeters

2.



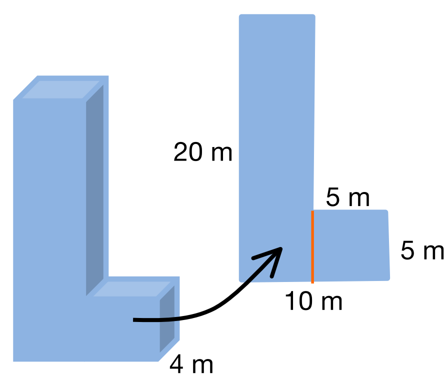
area of the base = ½ • 8 • 10
= 40 sq. m
height = 9 m
volume = Bh
= 40 • 9
= 360 cubic meters

3.



area of the base = $\pi \cdot 3^2$
≈ 28.27 sq. cm
height = 8 cm
volume = Bh
≈ 28.27 • 8
≈ 226.19 cubic centimeters

4.



area of the base = (5 • 5) + (5 • 20)
= 125 sq. m
height = 4 m
volume = Bh
= 125 • 4
= 500 cubic meters

Note: The base was divided into the 2 rectangular regions shown above, but it could also be divided in other ways.

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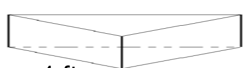
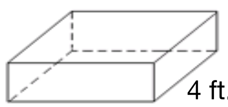
5. Matt is building a sandbox for a shop project. He found plans for sandboxes with a triangular base, a square base, and a circular base. The depth of each sandbox shown is 6 inches, but Matt could revise the plans to make the depth of each box 9 inches or 12 inches. Before Matt selects a plan, he wants to know the volume of each sandbox. Determine the volume of each sandbox and record your answers in the table.

Sandbox	Volume when the depth is…		
	6 inches or $\frac{1}{2}$ foot	9 inches or $\frac{3}{4}$ foot	12 inches or 1 foot
 4 ft. 4 ft. Base: right triangle	V = Bh $= (\frac{1}{2} \cdot 4 \cdot 4)\ \frac{1}{2}$ $= (8)\ \frac{1}{2}$ = 4 cubic feet	V = Bh $= (\frac{1}{2} \cdot 4 \cdot 4)\ \frac{3}{4}$ $= (8)\ \frac{3}{4}$ = 6 cubic feet	V = Bh $= (\frac{1}{2} \cdot 4 \cdot 4)\ 1$ $= (8)\ 1$ = 8 cubic feet
 4 ft. 4 ft. Base: square	V = Bh $= (4 \cdot 4)\ \frac{1}{2}$ $= (16)\ \frac{1}{2}$ = 8 cubic feet	V = Bh $= (4 \cdot 4)\ \frac{3}{4}$ $= (16)\ \frac{3}{4}$ = 12 cubic feet	V = Bh $= (4 \cdot 4)\ 1$ $= (16)\ 1$ = 16 cubic feet
 r = 2 ft. Base: circle	V = Bh $= (\pi \cdot 2^2)\ \frac{1}{2}$ $\approx (12.56)\ \frac{1}{2}$ ≈ 6.28 cubic feet	V = Bh $= (\pi \cdot 2^2)\ \frac{3}{4}$ $\approx (12.56)\ \frac{3}{4}$ ≈ 9.42 cubic feet	V = Bh $= (\pi \cdot 2^2)\ 1$ $\approx (12.56)\ 1$ ≈ 12.56 cubic feet

6. How could you use the volume of each 6-inch deep sandbox to determine the volume of the 12-inch deep and 9-inch deep sandboxes?
   The 12-inch deep sandbox is two times the height of the 6-inch sandbox, so the volume is twice as large. The 9-inch deep sandbox is 1½ times the height of the 6-inch sandbox, so the volume is 1½ times as large. You could determine the volume of the 6-inch sandbox and multiply by 2 to determine the volume of the 12-inch sandbox and multiply by 1½ to find the volume of the 9-inch sandbox.

7. How could you use the volume of each square-based prism to determine the volume of each triangular-based prism?
   The triangular-based prisms are ½ the volume of the square-based prisms with the same height. This is because the area of the triangular base is ½ the area of the square base.