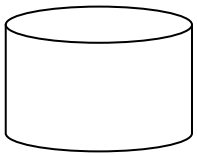
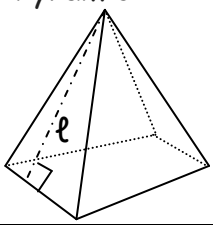
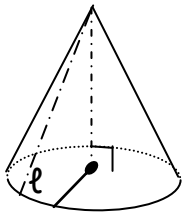
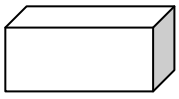
Name: _____ Date:_____

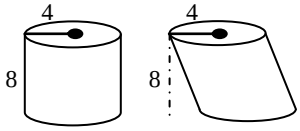
Geometric Measurement: Using Volume Formulas

Volume refers to the amount of space taken up by a three-dimensional object. Here is a brief listing of volume formulas.

Item	Surface Area	Volume Formula
Cylinder 	$B = \pi r^2$ $L = 2\pi rh$ $S = L + 2B$	$V = \pi r^2 h$ Sphere: πr^3
Regular Pyramid 	$B = \ell \cdot w$ $L = \frac{1}{2}P\ell$ $S = \frac{1}{2}P\ell + B$	$V = Bh$
Cone 	ℓ = slant height $L = \pi r\ell$ $S = L + B$, or $\pi r\ell + \pi r^2$	$V = \pi rh$
Prism 	$S = 2(\ell_1 \cdot w_1) + 2(\ell_2 \cdot w_2) + 2(\ell_3 \cdot w_3)$	$V = \ell \cdot w \cdot h$

A famous mathematician, Cavalieri, argued that if the cross-section of two three-dimensional objects consistently had the same area, then those objects have the same volume.

Example: Two cylinders are laid out side-by-side but look different. Explain how we can use Cavalieri's principle to show they have the same volume.

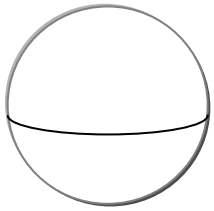


Answer: A cross-section of both objects determines that they have the same area: 16π. Cavalieri proposed that if a cross-section of two objects consistently had the same surface area, then the two objects would be the same volume.

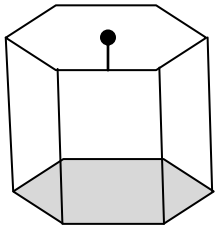
Name: _____ Date:_____

Practice. Determine what information you will need in order to find the volume for each object.

1.



2.



Solve. Find the volume of each figure.

3. Pyramid
   h = 6
   B = 9

4. Cone
   h = 5
   r = 2

5. Cylinder
   h = 10
   d = 4

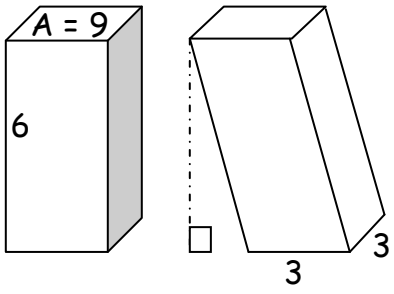
6. Sphere
   d = 6

7. Prism
   h = 3
   l = 5
   w = 6

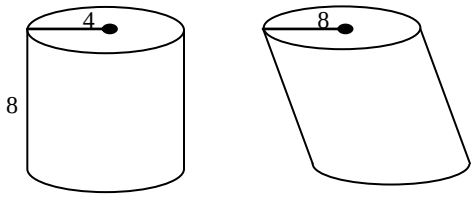
8. Cube
   h = 4

Use Cavalieri's principle to determine whether the objects pictured have the same volume. Explain your answer.

9.



10.



Name: _____ Date:_____

Answer Key

Geometric Measurement: Using Volume Formulas

1. Radius
2. Area of base and the height
3. 54
4. 31.4
5. 125.6
6. 84.78
7. 90
8. 64
9. Yes. A cross-section of the two objects would render the same area measurements throughout.
10. No. A cross-section of the two objects would render different area measurements.