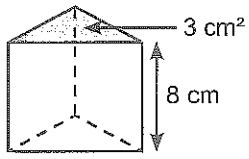
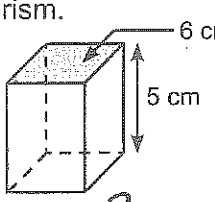
ME8-13 Volume of Cylinders

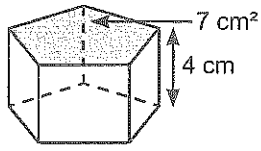
1. Calculate the volume of the prism.

a) 

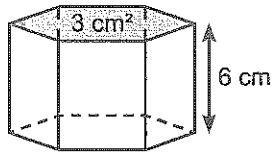
$V =$ 24 cm³

b) 

$V =$ 30 cm³

c) 

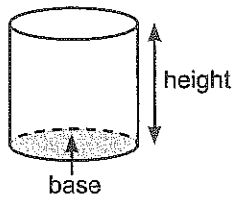
$V =$ 28 cm³

d) 

$V =$ 18 cm³

A **cylinder** is like a prism, but with circles for bases.

INVESTIGATION ▶ What is the formula for the volume of a cylinder?



A. Predict the formula for the volume of a cylinder in terms of its base and height. Explain your prediction. Volume = base x height

B. The volume of a can of food is given on the label. Bilal estimates the inside radius and inside height of four cans, and creates this table.

Can	Inside Radius (r)	r^2	Inside Height (h)	$h \times r^2$	Volume of Food (V)	$\frac{V}{hr^2}$
pea soup	4.8 cm	23.04	11 cm	253.44	796 cm³	3.141
pasta sauce	4.1 cm	16.81	13 cm	218.53	680 cm³	3.112
mixed beans	4 cm	16	10.8 cm	172.8	540 cm³	3.12
tomato paste	2.5 cm	6.25	8 cm	50	156 cm³	3.12

Bilal measured the outside height of the pea soup can to be 11.8 cm. Why did he estimate a smaller number for the inside height? To account for the thickness of the can.

Bilal measured the outside diameter of the pea soup can to be 10 cm. What is the outside radius? 5 cm Why did he estimate 4.8 cm for the inside radius? Same reason

C. Complete Bilal's table.

D. Which column has values always close to $\pi \approx 3.14$? V/hr^2

E. Use your answer in part D to write a formula for the volume of a can.

$\pi \approx V \div ($ hr^2) so the formula is: $V = \pi \times$ hr^2

F. The base of a cylinder is a circle with radius r. The area of the circle is πr^2.

G. Use your answer in F to rewrite your formula from E for the volume of a cylinder:

$V =$ (area of base circle) $\times$ height

H. How is the formula for the volume of a cylinder like the formula for the volume of a prism? Why does this make sense? Hint: Think about how cylinders are like prisms.

They both multiply the area of the base by the height. This makes sense since a cylinder is like a prism with a round base.

I. Was your prediction in part A correct? Yes / No

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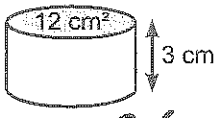
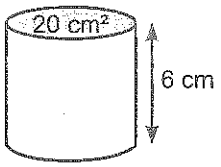
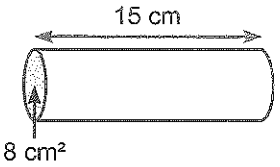
2. The volume of a cylinder is equal to (area of base) × height. Find the volume (V) of the cylinder.

a) 

$V =$ 36 cm³

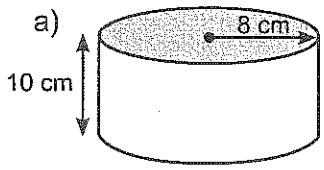
b) 

$V =$ 120 cm³

c) 

$V =$ 120 cm³

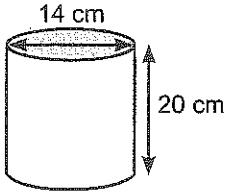
3. Use the radius or diameter to find the area of the base and the volume of the cylinder.

a) 

area of base ≈ 201 cm² (πr^2)

height = 10 cm

volume ≈ 2010 cm³

b) 

area of base ≈ 154 cm² (πr^2)

height = 20 cm

volume ≈ 3080 cm³

4. Tina has a jar 20 cm high. She can fit 30 candies flat on the bottom of the jar. Each candy is 1 cm high. How many candies can she fit into the jar if...

a) the jar is a cylinder? 600

b) the jar is a right prism? 600

Are the two answers the same? Why does this happen? Yes, regardless of shape, both jars have the same base area and height, and so the same area.

5. Regular polygons with many sides look a lot like circles. Some Canadian pennies are circular, but some are polygonal.

a) Estimate the volume of a penny by pretending all pennies are perfect cylinders.

Step 1: Measure the diameter of a penny. Diameter = 19 mm

Step 2: Calculate the radius of the penny. Radius = 9.5 mm

Step 3: Measure the height of the penny.

First, measure the height of one coin individually. 1.5 mm.

Next, measure the height of 10 coins by stacking them. 15

Then divide your answer by 10.

Height of 1 coin = Height of 10 coins ÷ 10

= _____ cm ÷ 10

= _____ mm

Which answer for the height of one coin is more accurate? Explain.

Step 4: Calculate the volume of the penny using the radius and height you found.

_____

b) Sara fills a graduated cylinder to the 30 mL mark. She then adds 10 pennies. Where should the water level be now?

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