CHAPTER 7

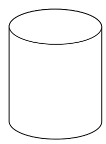
Volume

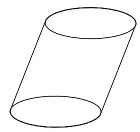
Name: ______________________________ Date: ____________

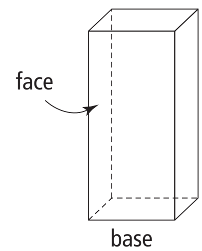
Get Ready

Identifying Right Cylinders and Right Prisms

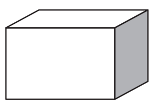
Right prisms and right cylinders have faces that meet the base at 90°.

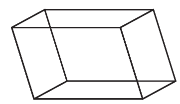

This is a right cylinder.

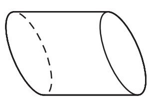

This is not a right cylinder.

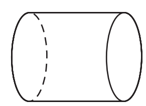


1. Is each object a right prism or right cylinder? Circle YES or NO.

a)  YES or NO

b)  YES or NO

c)  YES or NO

d)  YES or NO

Using Mental Math

Use mental math to estimate answers.
To estimate 58 × 3.7, round each number.

58 × 3.7
↓ ↓
60 × 4 = 240 Use relative size estimation.
or
50 × 3 = 150 Use front-end estimation.

The answer to 58 × 3.7 is between 150 and 240.

Use numbers that are easy to multiply.

2. Estimate each answer. Show your thinking.

a) 96 × 8.1

_______ × _______ = _______

b) 2.9 × 68

_______ × _______ = _______

c) 7.6 × 24

____

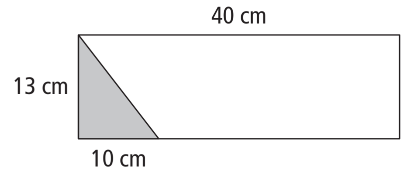
d) 43 × 4.9

____

Name: ____ Date: ____________

Calculating Area

Area is the number of square units inside a shape.
This rectangle has a shaded triangle.



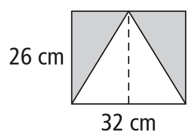
Find the area of the *unshaded* part of the rectangle.

Area of rectangle = $l \times w$
$A = 40 \times 13$
$A = 520\text{ cm}^2$

Area of triangle = $(b \times h) \div 2$
$A = (10 \times 13) \div 2$
$A = 130 \div 2$
$A = 65\text{ cm}^2$

Area of unshaded part = area of rectangle − area of triangle
$A = 520 - 65$
$A = 455\text{ cm}^2$

3. Find the area of the *shaded* part.



Area of rectangle = $l \times w$

$A = 32 \times$ ______________

$A =$ ______________ cm^2

Area of triangle = $(b \times h) \div 2$

$A = (32 \times$ ______________ $) \div 2$

$A =$ ______________ $\div 2$

$A =$ ______________ cm^2

Area of shaded part = area of rectangle – area of triangle

$A =$ ______________ – ______________

$A =$ ______________

Repeated Multiplication

6^2 can be written as 6×6.
$6^2 = 6 \times 6$
$= 36$

6^2 is read as "6 squared" or "6 to the power of 2."

2^3 can be written as $2 \times 2 \times 2$.
$2^3 = 2 \times 2 \times 2$
$= 8$

2^3 is read as "2 cubed" or "2 to the power of 3."

4. Write as repeated multiplication. Then, find the answer.

a) $7^2 =$ ______________ × ______________

= ______________

b) $5^2 =$ ______________ × ______________

= ______________

Name: ______________________________________ Date: ____________

MATH LINK

Park Design

Think of your favourite park.

a) What types of objects are in the park? (e.g., picnic table, garbage can, etc.)

____

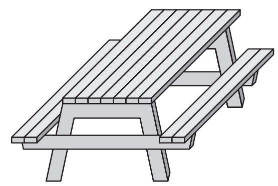
____

b) Estimate the length and width of a real picnic table.

Length: ____________

Width: ____________

Measure the teacher's desk or a table to help you.

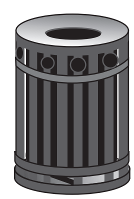


c) What is the area of the top of your picnic table?

Area = $l \times w$

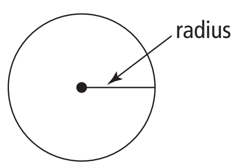
A = ____________ × ____________

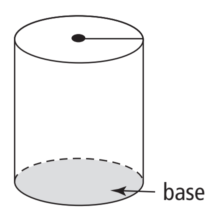
A = ____________ cm^2



d) Estimate the radius of a real garbage can.

radius (r): ____________ cm





e) What is the area of the base of the can?

Area = $\pi \times r^2$

A = ____________ × ____________ × ____________

A = ____________ × ____________

A = ____________ cm^2

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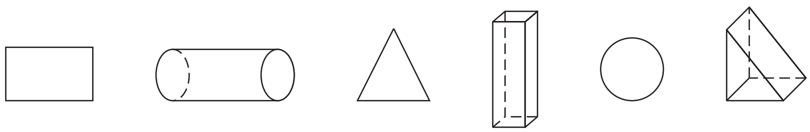
7.1 Warm Up

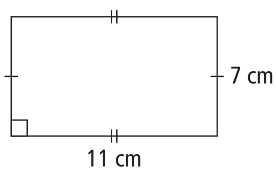
1. Circle the 3-dimensional objects.
Draw an X through the 2-dimensional shapes.



2. Area is measured in ____________________ units.

3. Find the area of each shape using the formula.

a) Rectangle

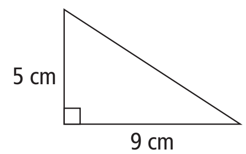


$A = l \times w$

$A =$ ____________ $\times$ ____________

$A =$ ____________ cm^2

b) Triangle

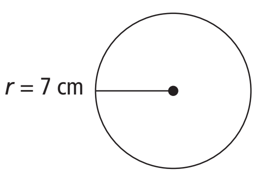


$A = b \times h \div 2$

$A =$ ____________ $\times$ ____________ $\div 2$

$A =$ ____________

c) Circle

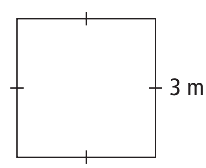


$A = \pi \times r^2$

$A =$ ________ $\times$ ________ $\times$ ________

$A =$ ____________

d) Square



$A = s^2$

$A =$ ____________ $\times$ ____________

$A =$ ____________

4. Estimate each answer.

a) 22×7

$\approx 20 \times 10$

$\approx$ ____________

b) 39×4

c) 12×18

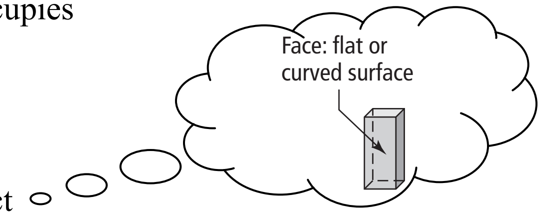
d) 7×41

Name: ____ Date: ____________

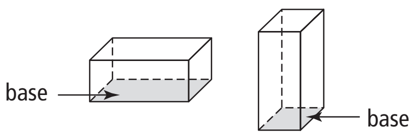
7.1 Understanding Volume

Working Example 1: Determine the Volume Using the Base and the Height

volume (*V*)
- the amount of space an object occupies
- measured in cubic units (cm^3)
- Volume = area of base × height

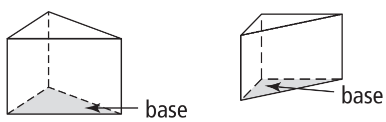


base
- the face that helps name the object
- the base of a rectangular prism is any face because they are all rectangles

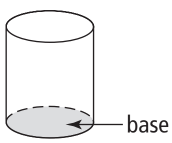


FOLDABLES™ Study Tool

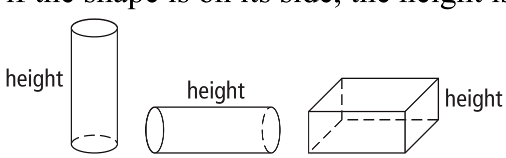
- the base of a triangular prism is a triangular face



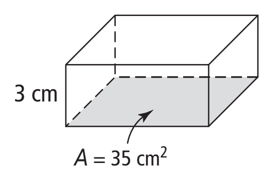
- the base of a cylinder is a circular face



height
- the distance between the 2 faces that name the shape
- if the shape is on its side, the height is still the distance between the 2 faces



a) Find the volume of the right rectangular prism using the area of the base and the height.



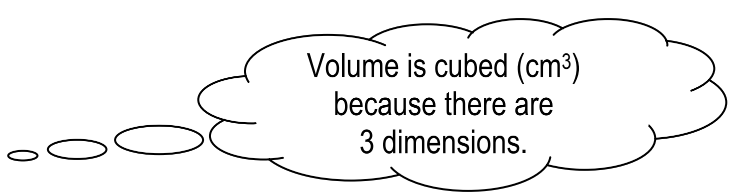
Solution

The area of the base is 35 cm^2.
The height is 3 cm.

Volume = area of base × height

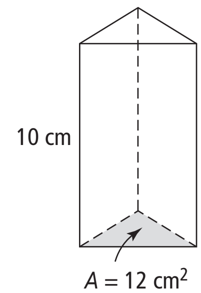
V = 35 × ______________

V = ______________ cm^3



Name: ____ Date: ____________

b) Find the volume of the right triangular prism using the area of the base and the height.



Solution

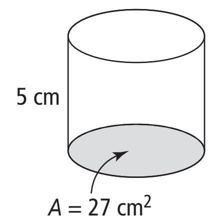
The area of the base is 12 cm^2.
The height is 10 cm.

Volume = area of base × height

V = ______________ × 10

V = ______________ cm^3

c) Find the volume of the cylinder using the area of the base and the height.



Solution

The area of the base is ______________ cm^2.

The height is ______________ cm.

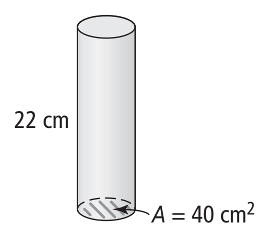
Volume = area of base × height

V = ______________ × ______________

V = ______________ cm^3

Show You Know

What is the volume of the right cylinder?



Volume = area of base × ______________

V = ______________ × ______________

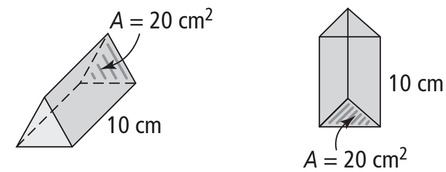
V = ______________

Name: ____ Date: ____________

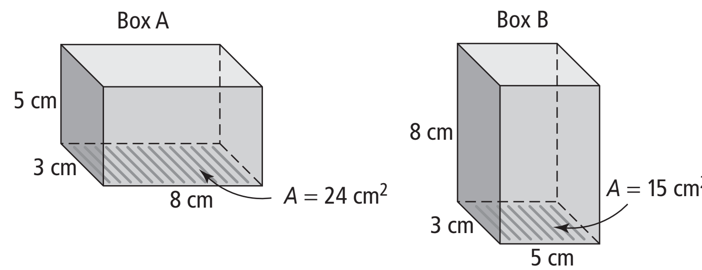
Working Example 2: Determine the Volume Using Different Orientations

FOLDABLES™ Study Tool

orientation
- the position or view of an object
- example: turning an object on its side



Both boxes are the same size, with the same measurements: 5 cm × 3 cm × 8 cm.
The boxes have different **orientations**
(1 is on its base, and the other is on its side).
Do the boxes have the same volume?



Solution

Find the volume of each rectangular prism.

Box A:

Volume = area of base × height

V = ______________ × ______________

V = ______________ cm^3

Box B:

Volume = area of base × height

V = ______________ × ______________

V = ______________

The boxes ________________________ have the same volume.
(do or *do not)*

Does orientation affect the volume? Circle YES or NO.

Show You Know

Which box has the greater volume?

Volume = area of base × ______________

V = ______________ × ______________

V = ______________

Volume = ______________ × ______________

V = ______________ × ______________

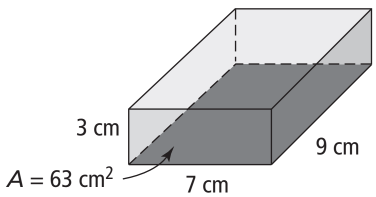
V = ______________

Sentence: ____

Name: ______________________________ Date: ______________

Communicate the Ideas

1. **a)** Charlotte found the volume of a rectangular prism.



Volume = area of base × height

$V = 63 \times 7$

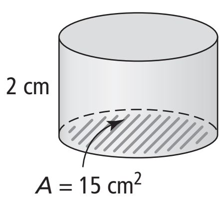
$V = 441$

The volume of the rectangular prism is 441 cm^3.

What is the height?

Is she correct? Circle YES or NO.
If no, show the correct answer.

b) Evan found the volume of a right cylinder.



Volume = area of base × height

$V = 15 \times 2$

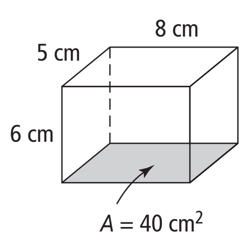
$V = 30$

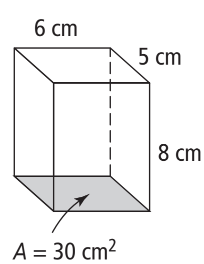
The volume of the cylinder is 30 cm^3.

Is he correct? Circle YES or NO.
If no, correct his error.

2. Does the orientation of an object change the volume?
Use the prisms to explain your answer.

These objects have the same measurements.
They have different orientations.
Do they have the same volume?





____

____

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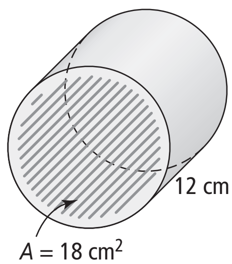
Name: ______________________________ Date: ____________

Check Your Understanding

Practise

3. Find the volume of the right cylinder and right prism.

a)

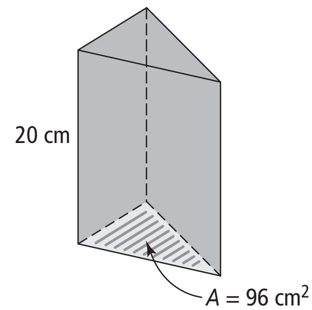


Volume = area of base × ____________

V = ____________ × ____________

V = ______________

b)



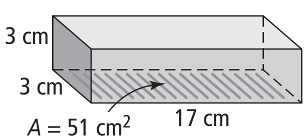
Volume = __________ × __________

V = __________ × __________

V = ______________

Volume is measured in cubic units.

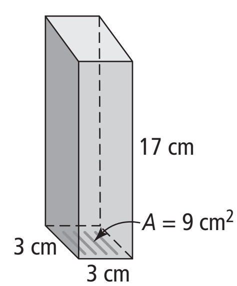
4. Find the volume of each right rectangular prism.



Volume = ______________ × height

V = ____________ × ____________

V = ________________________



Volume = ________________________

V = ________________________

V = ________________________

How does the orientation of the prism affect the volume of the prism?

____

Name: ____________________ Date: __________

Apply

5. Find the height of the right rectangular prism.

area of base = 5 cm^2, volume = 35 cm^3

Formula → Volume = area of base × ______________

Substitute → 35 = 5 × ______________

5 × ☐ = 35
Use guess and check.

The height of the right rectangular prism is ______________.

6. Jose opens a can of soup and sees the soup only reaches 9 cm up the can. If the area of the base is 10.4 cm^2, how much soup is in the can?

Formula →

Use the volume formula.

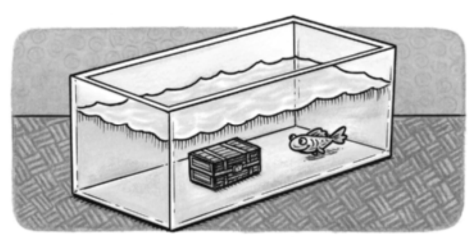
Substitute →

Solve →

Sentence: ____

7. Ocean City Aquarium is building a new rectangular tank for its coral reef fish. The area of the base is 18 750 cm^2 and the height is 90 cm.

a) What is the volume of the tank?



Sentence: The volume of the tank is ______________.

b) Millilitres and litres are measures of capacity. What is the capacity of the tank in litres?
1 L = 1000 cm^3

Volume of fish tank ÷ 1000

= ______________ ÷ 1000

= ______________ L

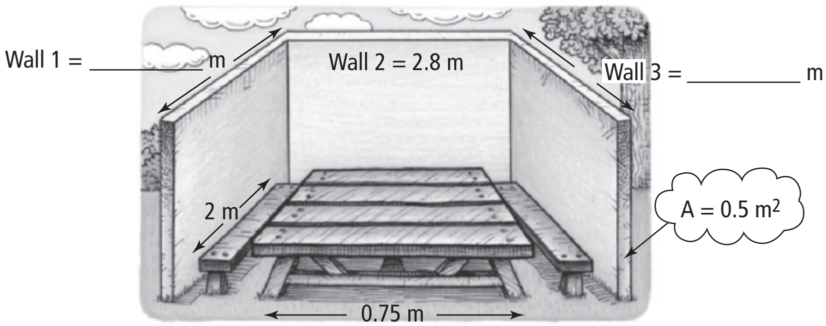
Sentence: ____

Name: ______________________________ Date: ______________

MATH LINK

Picnic shelters are built using 3 concrete walls.
The picnic table inside the shelter is 2 m long and 0.75 m wide.

Each wall is a rectangular prism.



Wall 2 is done for you.

a) How long does each wall need to be to fit the picnic table?
Estimate the length of each side wall. Label the diagram with your estimates.

b) The area of the base of each wall is 0.5 m^2.
Use your estimated lengths from part a) as the height of each wall.
Calculate the volume of each wall.

Wall	Area of Base	Estimated Height (Length)	Volume
1	0.5 m^2		V = area of base × height = ________ × ________ = ________
2	0.5 m^2	2.8 m	V = area of base × height = ________ × ________ = ________
3	0.5 m^2		V = area of base × height = ________ × ________ = ________

c) Calculate the volume of concrete you need to build the 3 walls.

Add the volumes of the 3 walls.

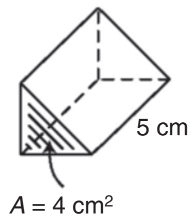
Sentence: ____

Name: ______________________________ Date: ______________

7.2 Warm Up

1. Find the volume of each prism.

a)

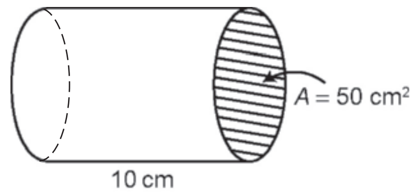


Volume = area of base × ______________

V = ____________ × ____________

V = ______________

b)



Volume = ______________ × height

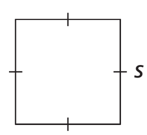
V = ____________ × ____________

V = ______________

2. What is the area formula for each shape?

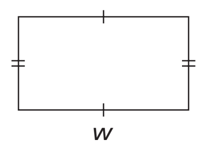
a) Square

A = __________^{2}



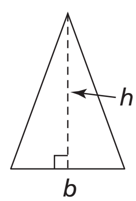
b) Rectangle

A = ________ × ________



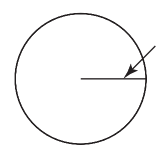
c) Triangle

A = ________ × ________ ÷ 2



d) Circle

A = ________ × ________^{2}



3. Solve.

a) $\frac{1}{4}$ of 40

$\frac{1}{4} \times 40$

$= \frac{1}{4} \times \frac{40}{1}$

$= \frac{1 \times 40}{4 \times 1}$

$= \frac{\square}{\square}$

= ______________

b) $1 - \frac{4}{5}$

$1 = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5}$, etc.

$= \frac{5}{5} - \frac{4}{5}$

$= \frac{\square - \square}{5}$

$= \frac{\square}{\square}$

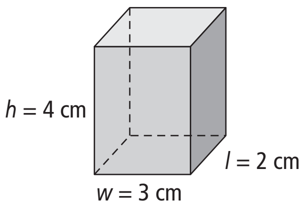
Name: ______________________________ Date: ______________

7.2 Volume of a Prism

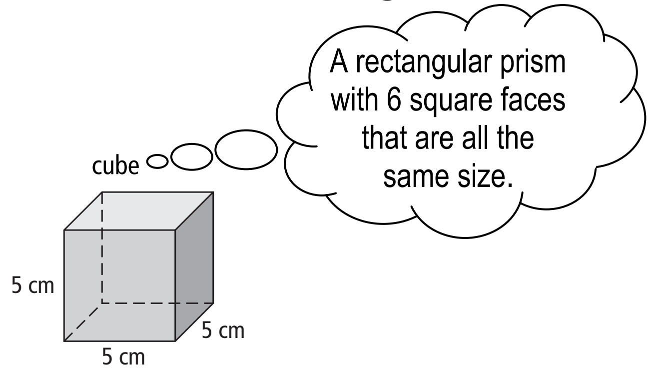
Working Example 1: Use a Formula to Determine the Volume of a Right Rectangular Prism

Find the volume.

a) right rectangular prism



b) cube



Solution (a)

V = area of base × height of prism

V = (length × width) × height

$V = l \times w \times h$

$V = 2 \times$ __________ × __________

$V =$ ____________ cm^3

The volume is ____________.

Solution (b)

Volume = area of base × height of prism

V = (length × width) × height

$V = s \times s \times s$

$s^3 = s \times s \times s$

$V = 5 \times$ __________ × __________

$V =$ ____________ cm^3

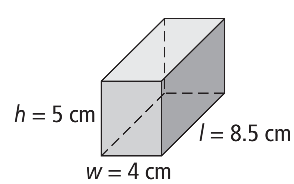
The volume is ____________.

Show You Know

Find the volume.

a) Formula → $V = l \times w \times h$

right rectangular prism

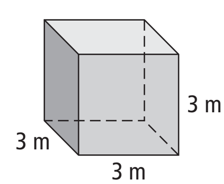


Substitute → $V =$ __________ × __________ × __________

Solve → $V =$ ____________ cm^3

b) Formula → $V = s^3$

cube



Substitute → $V =$ ____________^{3}

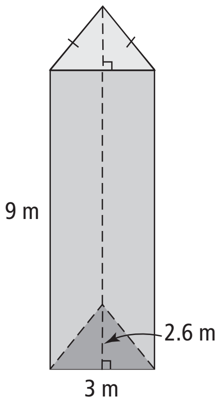
$V =$ __________ × __________ × __________

Solve → $V =$ ____________ m^3

Name: ____ Date: ____________

Working Example 2: Use a Formula to Determine the Volume of a Right Triangular Prism

What is the volume of the right triangular prism?



Solution

Volume of triangular prism = area of triangular base × height of prism

$V = (b \times h \div 2) \times h$

$V = (3 \times 2.6 \div 2) \times 9$

The first *h* is for the height of the triangle.
The second *h* is for the height of the prism.

$V =$ (____________ $\div 2) \times 9$

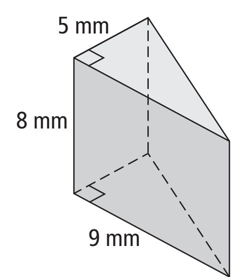
$V =$ ____________ $\times 9$

$V =$ ____________ m^3

The volume of the right triangular prism is ____________.

Show You Know

Find the volume of the right triangular prism.



Volume of triangular prism = area of triangular base × height of prism

Formula → $V =$ (____________ $\times h \div 2) \times$ ____________

Substitute → $V =$ (____________ $\times 9 \div 2) \times$ ____________

Solve → $V =$ (____________ $\div 2) \times$ ____________

$V =$ ____________ $\times$ ____________

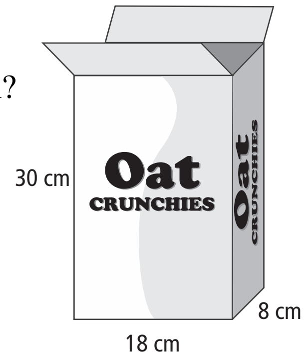
$V =$ ____________ mm^3

Name: ____ Date: ____________

Working Example 3: Use Volume to Solve a Problem

Katie poured a bowl of cereal for breakfast.

If the box is only $\frac{5}{6}$ full, how much cereal is in the box?



Solution

Find the volume of the cereal box. 

Volume of cereal box = area of rectangular base × height of box

$V = l \times w \times h$

$V =$ ____________ × ____________ × ____________

$V =$ ____________ × ____________

$V =$ ____________ cm^3

The volume of the cereal box is ____________.

Now, find $\frac{5}{6}$ of that amount. (*Of* means multiply.)

Amount of cereal $= \frac{5}{6} \times$ volume of cereal box

$= \frac{5}{6} \times 4320$

$= \frac{5}{6} \times \frac{\square}{1}$

$= \frac{5 \times \square}{6 \times 1}$

$= \frac{\square}{6}$

$=$ ____________ cm^3

There are ____________ cm^3 of cereal in the box.

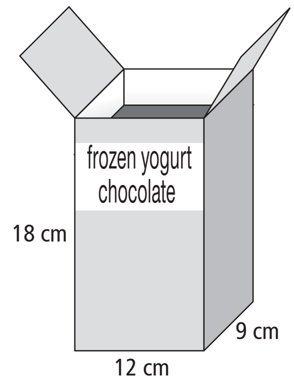
Name: ____________________ Date: ____________

Show You Know

Jack and his friends ate part of a carton of frozen yogurt.

There is $\frac{3}{4}$ of the yogurt left in the carton.

What volume of yogurt is left?



Volume of the Box:

Formula →

Substitute →

Solve →

Volume of Yogurt:

$V = \frac{3}{4} \times$ volume of box

$= \frac{3}{4} \times$ ______________

$= \frac{3}{4} \times \frac{\square}{1}$

$= \frac{3 \times \square}{4 \times 1}$

$= \frac{\square}{4}$

$=$ ______________

Sentence: ____

Name: ____ Date: ____________

Communicate the Ideas

1. Grace writes the formula for finding the volume of a rectangular prism as $V = l \times w \times h$. Write what each letter means.

   V: ____

   l: ____

   w: ____

   h: ____

2. A box has a volume of 1200 cm^3. Explain how to find $\frac{2}{3}$ of the volume of the box.

   ____

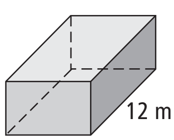
   ____

   ____

Check Your Understanding

Practise

3. What is the volume of each right rectangular prism?

   a) 

   $V =$ ________ × ________ × ________ ← Formula →

   $V =$ ________ × ________ × ________ ← Substitute →

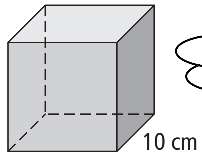
   $V =$ __________ m^3 ← Solve →

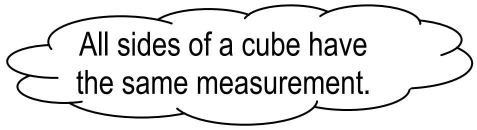
   b) $l = 8$ cm, $w = 7$ cm, $h = 9$ cm

Name: ______________________________ Date: ______________

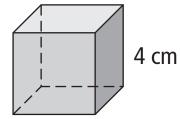
4. Find the volume of each cube.

a)





b)



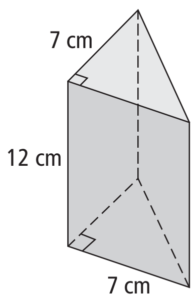
$V = s^3$ ← Formula →

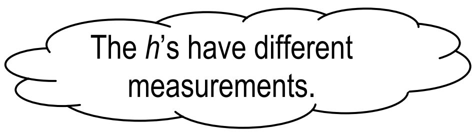
$V =$ ________ × ________ × ________ ← Substitute →

$V =$ __________ cm^3 ← Solve →

5. What is the volume of each right triangular prism?

a)





b) base of triangle = 15 mm,
height of triangle = 8 mm,
height of prism = 20 mm

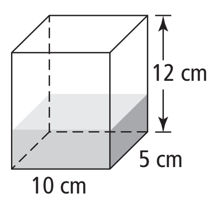
$V =$ area of base × _______________

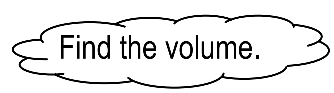
$V = (b \times h \div 2) \times h$

$V =$ (________ × ________ ÷ 2) × ________

$V =$ _______________ cm^3

6. The container is $\frac{1}{3}$ full. How much liquid is in it?





Volume of the container:	*Volume of liquid:*
Formula →	$V = \frac{1}{3} \times$ volume of container
Substitute →	$= \frac{1}{3} \times$ _______________
Solve →	= _______________ cm^3

Name: ______________________________ Date: ______________

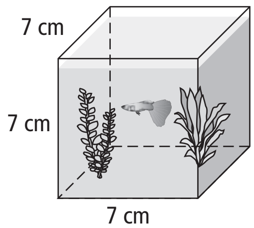
Apply

7. Complete the table for each right rectangular prism ($V = l \times w \times h$).

	Volume (cm^3)	Length (cm)	Width (cm)	Height (cm)
a)	70	5	2	$V = l \times w \times h$ $70 = 5 \times 2 \times h$ $70 = 10 \times h$ $\frac{70}{10} = \frac{\cancel{10} \times h}{\cancel{10}}$ 70 ÷ 10 = ? ________ $= h$
b)	100	4	5	$V = l \times w \times h$ $100 =$ ______ $\times$ ______ $\times h$ $100 =$ ______ $\times h$ $\frac{100}{\square} = \frac{\square \times h}{\square}$ ________ $= h$
c)	150	$V = l \times w \times h$ _____ $= l \times$ _____ $\times$ _____	3	5
d)	1080		12	10

Name: ____ Date: ____________

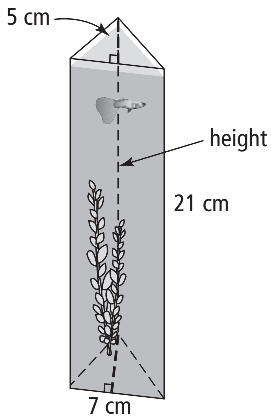
8. Melissa wants to buy 1 of these fish tanks for her guppy fish.
Which tank holds the most water?



Formula → $V = s^3$

Substitute →

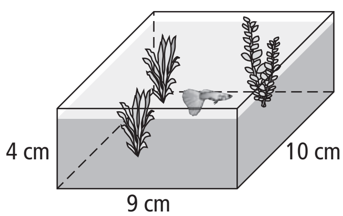
Solve →



Formula → $V = (b \times h \div 2) \times h$

Substitute →

Solve →



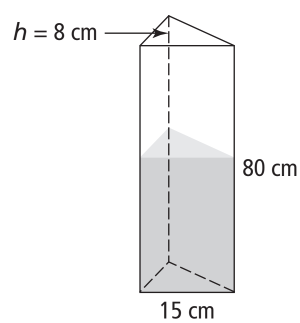
Formula → $V = l \times w \times h$

Substitute →

Solve →

Sentence: ____

9. Chet's dog knocked over a vase filled with sand. Half of the sand spilled out.
How much sand does Chet need to fill up the vase?

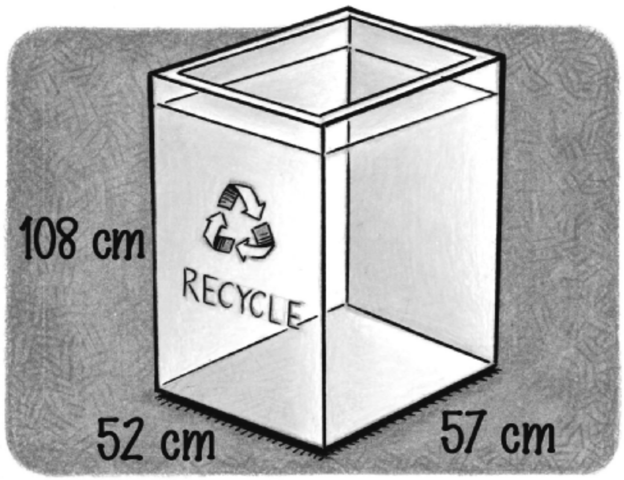


Sentence: ____

Name: ____ Date: ____________

MATH LINK

The Parks Committee is putting 12 of these recycling bins in the park.
The 12 bins are filled and picked up each week.
What volume of recycling is picked up in 1 week?



Formula → Volume = ____________ × ____________ × ____________

Substitute → V = ____________ × ____________ × ____________

Solve → V = ____________ × ____________

V = ____________ cm^3

How many bins are there? ____________

The volume of each bin is ____________.

Total volume of recycling = number of bins × volume of each bin

= ____________ × ____________

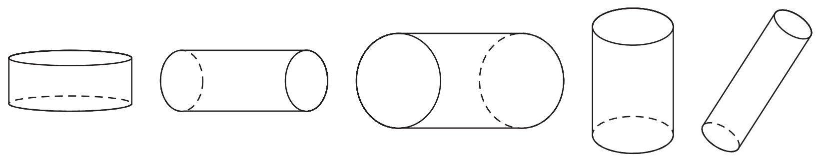
= ____________________ cm^3

The total volume of recycling picked up each week is ____________________.

Name: ______________________________ Date: ______________

7.3 Warm Up

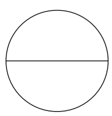
1. **a)** Colour the base of each cylinder.



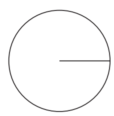
b) What shape is the base of each cylinder? ____________________

2. Circle the correct name for the part of the circle that is shown in the diagram.

radius *or* diameter

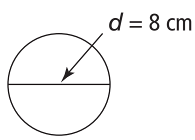


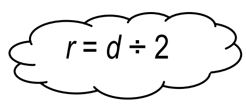
radius *or* diameter



3. Find the radius of each circle.

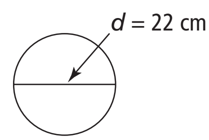
a)





The radius of the circle is ____________.

b)



The radius of the circle is ____________.

4. Calculate.

a) 4^2

= ____________ × ____________

= ____________

b) 5^2

5. Round to the nearest whole number.

a) 32.334 ≈ ____________

b) 678.8799 ≈ ____________

c) 920.089 ≈ ____________

d) 8.51 ≈ ____________

6. Calculate.

a) 50 ÷ 2 = ____________

b) 46 ÷ 2 = ____________

c) 30 ÷ 2 = ____________

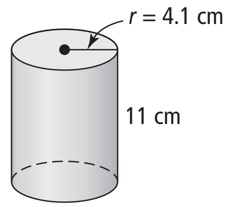
d) 28 ÷ 2 = ____________

Name: ____ Date: ____________

7.3 Volume of a Cylinder

Working Example 1: Determine the Volume of a Cylinder Given the Radius

a) *Estimate* the volume of the cylinder.



Solution

11 cm is close to 10 cm.
4.1 cm is close to 4 cm.

Volume of cylinder = area of circular base × height of cylinder

$V = (\pi \times r^2) \times h$

$V = \pi \times r \times r \times h$

$r^2 = r \times r$
π is close to 3

$V = 3 \times$ ____________ $\times$ ____________ $\times 10$

$V =$ ____________ $\times$ ____________ $\times 10$

$V =$ ____________ $\times 10$

$V =$ ____________ cm^3

An *estimate* for the volume of the cylinder is ____________ cm^3.

b) *Calculate* the actual volume of the cylinder.

Solution

Volume of cylinder = area of circular base × height of cylinder

$V = (\pi \times r^2) \times h$

$V = \pi \times r \times r \times h$

$V = 3.14 \times$ ____________ $\times$ ____________ $\times 11$

$V =$ ____________ $\times$ ____________ $\times 11$

$V =$ ____________ $\times 11$

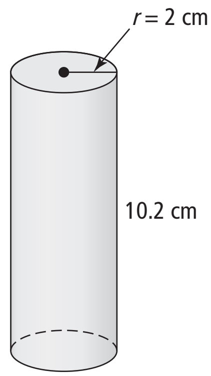
$V =$ ____________ cm^3

The volume of the cylinder is ____________ cm^3.

Name: ____ Date: ____________

Show You Know

a) Estimate the volume of the cylinder.



10.2 is close to ____________

Formula → $V =$ ____________________

$V =$ ____________ × ____________ × ____________ × ____________

Substitute →

Solve →

b) Calculate the volume of the cylinder.
Round your answer to the nearest tenth (1 decimal place).

Formula → $V =$ ____________________

$V =$ ____________ × ____________ × ____________

Substitute →

Solve →

Name: ____ Date: _____________

Working Example 2: Determine the Volume of a Cylinder Given the Diameter

How much rubber is needed to make a hockey puck?
Round your answer to the nearest cubic centimetre.

Solution

The hockey puck is in the shape of a ______________________.
Find the volume of the puck.
The diameter is 7.6 cm.
$r = d \div 2$

$= \_\_\_\_\_\_\_\_\_\_ \div 2$

$= \_\_\_\_\_\_\_\_\_\_$

The radius is 3.8 cm.

Volume of cylinder = area of circular base × height of cylinder

$V = (\pi \times r^2) \times h$

$V = \pi \times r \times r \times h$

$V =$ ____________ × ____________ × ____________ × ____________

$V =$ ____________ × ____________ × ____________

$V =$ ____________ × ____________

$V =$ ____________ cm^3

Round to the nearest whole number.

The amount of rubber needed to make a hockey puck is ____________ cm^3.

Show You Know

What volume of recycling waste can you fit into this green bin?
Round your answer to the nearest cubic centimetre.

$d =$ ____________ $r =$ ____________

Formula → $V =$ ____________ × ____________ × ____________

Substitute →

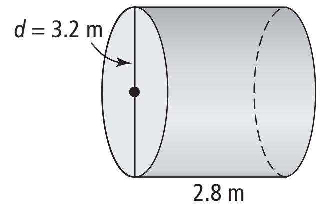
Solve →

Sentence: ____

Name: ____________________ Date: __________

Communicate the Ideas

1. Hanna missed the lesson on volume of a cylinder.



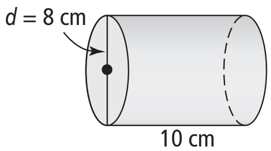
a) What is the height? __________

b) Explain how you know this is the height.

____

____

2. Jethro calculated the volume of the cylinder.



$V = (\pi \times r^2) \times h$

$V \approx (3.14 \times 8^2) \times 10$

$V \approx 3.14 \times 64 \times 10$

$V \approx 2009.6$

The volume of the cylinder is 2009.6 cm^3.

Jethro made an error in his calculations.
Explain the error.

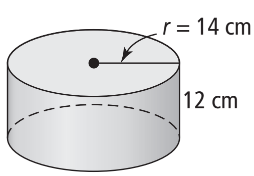
____

Check Your Understanding

Practise

3. Find the volume of each cylinder. Round your answer to the nearest tenth (1 decimal place).

a)



$V = (\pi \times r^2) \times h$

$V = \pi \times r \times r \times h$

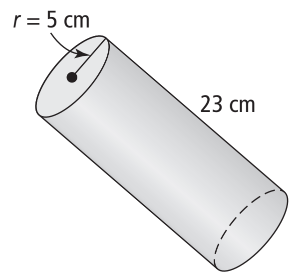
$V =$ ______ × ______ × ______ × ______

$V =$ ______ × ______ × ______

$V =$ ______ × ______

$V =$ __________ cm^3

b)



Name: ____ Date: ____________

4. What is the volume of each cylinder?

a) radius = 5 cm, height = 8 cm

$V = (\pi \times r^2) \times h$ ← Formula →
$V = \pi \times r \times r \times h$

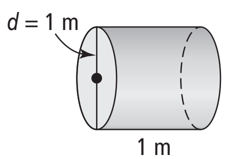
$V =$ _____ × _____ × _____ × _____ ← Substitute →

← Solve →

b) radius = 11 cm, height = 11 cm

5. Find the volume of each cylinder.

a)



diameter = 1 m
radius = 1 ÷ 2
= ______ m

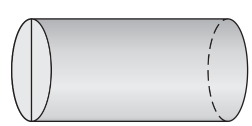
Volume of cylinder = area of circular base × height of cylinder

Formula →

Substitute → $V =$ ____________ × ____________ × ____________ × ____________

Solve →

b) diameter = 12 cm, height = 37.5 cm



Label the cylinder.

diameter = 12 cm

radius = ______________

Volume of cylinder = area of circular base × height of cylinder

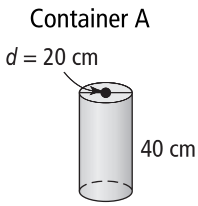
Formula →

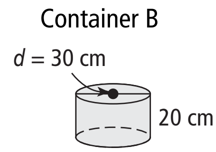
Substitute → $V =$ ____________ × ____________ × ____________ × ____________

Solve →

Apply

6. Martha is choosing between 2 containers of popcorn at the movie theatre.
Which container holds more popcorn?





$d =$ ________

$r =$ ________ ÷ ________

$=$ ________

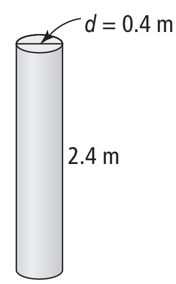
$V =$ ________ × ________ × ________ ← Formula →

← Substitute →

← Solve →

Container ______________ holds the most popcorn.

7. Companies use tubes to make concrete posts.
If a building needs 35 posts, how much concrete is needed?



$r =$ ______________ ÷ ______________

$=$ ______________

Formula → $V =$ ______________ × ______________ × ______________

$V = \pi \times r \times r \times h$

Substitute → $V =$ ______________ × ______________ × ______________ × ______________

Solve →

1 post needs ________________________ m^3 of concrete.

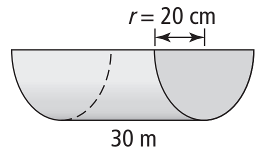
Round to the next highest whole number to make sure there is enough concrete.

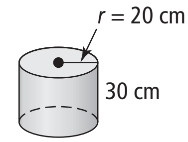
35 posts need 35 × ______________ = ______________

The amount of concrete needed to make 35 posts is ________________________ m^3.

Name: ______________________________ Date: ______________

8. Tom has a planter shaped like half a cylinder.
How much soil can he fit in the planter?





Volume of the whole cylinder:

Formula → V = __________ × __________ × __________

$V = \pi \times r \times r \times h$

Substitute → V = __________ × __________ × __________ × __________

Solve →

Volume of half the cylinder:

Half of the cylinder = volume of whole cylinder ÷ 2

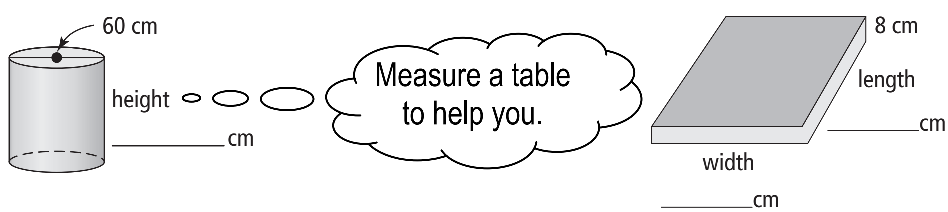
= __________ ÷ 2

= __________

Sentence: ____

MATH LINK

A concrete picnic table has a column in the shape of a cylinder.
The column has a diameter of 60 cm.
How much concrete do you need to build the picnic table?



Volume of column:

$V = \pi \times r^2 \times h$

Volume of tabletop:

$V = l \times w \times h$

Volume of column and tabletop:

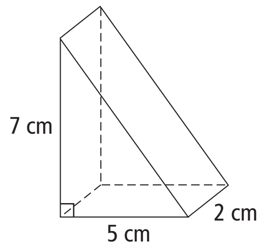
The amount of concrete needed to make the table is __________.

Name: ______________________________ Date: ______________

7.4 Warm Up

1. Calculate the volume.

a)



$V = (b \times h \div 2) \times h$

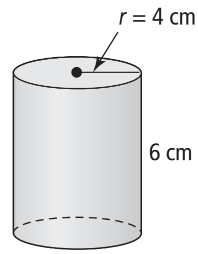
$V =$ (________ × ________ ÷ 2) × ________

$V =$ (______________ ÷ 2) × ______________

$V =$ ______________ × ______________

$V =$ ______________ cm^3

b)



$V = \pi \times r \times r \times h$

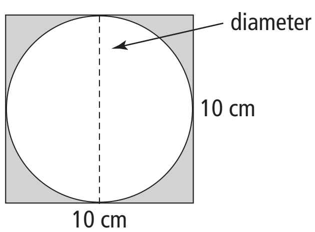
$V =$ ______ × ______ × ______ × ______

$V =$ ________ × ________ × ________

$V =$ ______________ × ______________

$V =$ ______________ cm^3

2. Find the area of the shaded part.



Area of square:
A = side × side

$A =$ ______________ × ______________

$A =$ ______________ cm^2

Area of circle:
$A = \pi \times r^2$

$r = d \div 2$

$A =$ _________ × _________ × _________

$A =$ ______________ × ______________

$A =$ ______________ cm^2

Area of shaded part = area of square – area of circle

= ______________ – ______________

= ______________

The area of the shaded part is ______________ cm^2.

3. Multiply.

a) $120 \times 10 =$ ______________

b) $24 \times 100 =$ ______________

c) $525 \times 100 =$ ______________

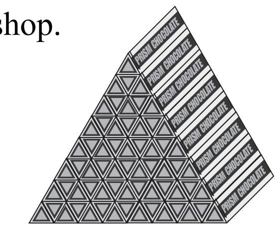
d) $42 \times 1000 =$ ______________

Name: ______________________________ Date: ______________

7.4 Solving Problems Involving Prisms and Cylinders

Working Example 1: Solve a Problem Involving Right Triangular Prisms

Marcus made this display of packages of Prism Chocolates for his candy shop.
He stacked 64 packages to form a triangular prism.
There are 8 packages in the bottom layer.
What is the volume of the display?



Solution

Find the volume of 1 triangular prism.
Volume = area of base × height of prism

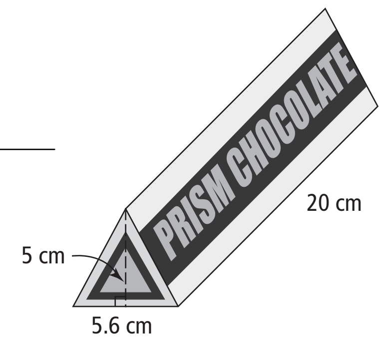
$V = (b \times h \div 2) \times h$

$V =$ (______________ × ______________ ÷ 2) × ______________

$V =$ (______________ ÷ 2) × ______________

$V =$ ______________ × ______________

$V =$ ______________ cm^3



There are 64 packages in the display.
Volume of display = volume of 1 package × 64

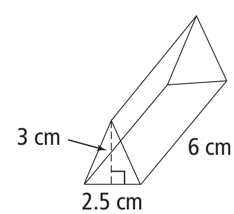
= ______________ × 64

= ______________

The volume of the chocolate display is ______________ cm^3.

Show You Know

Keisha stores beads in 12 containers.
She wants to put the 12 containers in a box.
What is the volume of the box?



Volume of triangular prism = area of base × height

Formula → $V =$ (______________ × ______________ ÷ 2) × ______________

Substitute → $V =$ (______________ × ______________ ÷ 2) × ______________

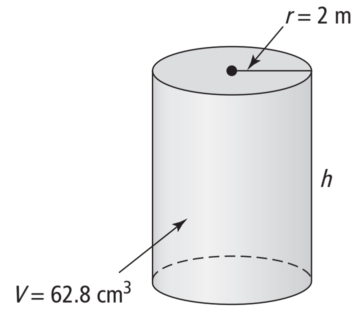
Solve →

Volume of 12 containers:

Sentence: ____

Name: ____ Date: ____________

Working Example 2: Solve a Problem Involving Cylinders



A cylindrical pipe is broken and needs to be replaced.
The new pipe must allow the same volume of water to travel through it.
The broken cylinder had a volume of 62.8 m^3.
The new pipe has a radius of 2 m.
What is the height of the new pipe?

Solution

To find the new height, replace all the variables in the formula with values except for *h*.

$V = (\pi \times r^2) \times h$

$V = (\pi \times r \times r) \times h$

$62.8 = 3.14 \times 2 \times 2 \times h$

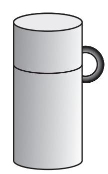
$62.8 = 12.56 \times h$ Divide both sides by 12.56 to get *h* alone.

$\frac{62.8}{12.56} \approx \frac{\cancel{12.56} \times h}{\cancel{12.56}}$ **C 62.8 ÷ 12.56 =** 5

____________ $= h$

The height of the new cylinder must be ____________ m to hold the same volume of water.

Show You Know



Tiki wants to get a new thermos for school.
Her old thermos had a volume of 1570 cm^3.
The new thermos has a radius of 5 cm.
How tall should it be to hold the same amount?

Formula → $V = (\pi \times r^2) \times h$

Substitute → ________ ≈ (3.14 × ________ × ________) × *h*

Solve → ________ ≈ ________ × *h*

$\frac{\square}{\square} \approx \frac{\square}{\square} h$ Divide both sides by the number in front of *h*.

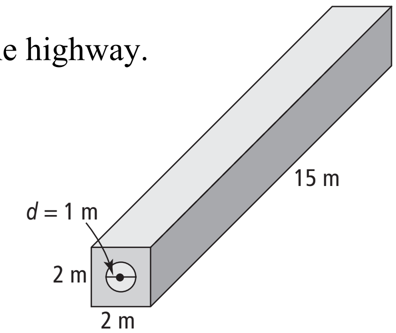
________ ≈ *h*

Sentence: ____

Name: ____ Date: ____________

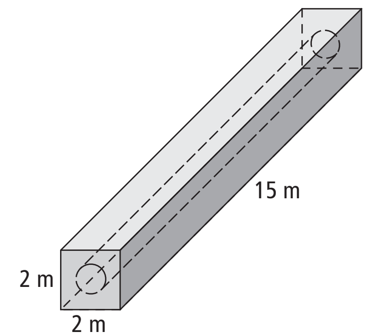
Working Example 3: Solve a Problem Involving Right Prisms and Cylinders

Rob and Kyla have designed rectangular drains to carry water under the highway.
How much concrete is needed to make 3 drains?
Round your answer to the nearest tenth of a cubic metre.



Solution

This diagram shows the drain under the highway.



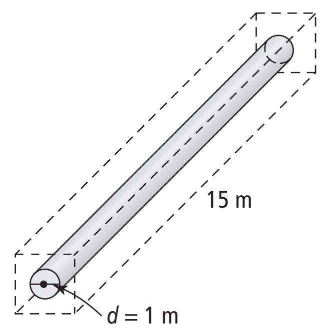
Volume of rectangular prism:

$V = l \times w \times h$

$V =$ ______________ $\times$ ______________ $\times 15$

$V =$ ________________________ m^3

This diagram shows 1 pipe inside the drain.



Volume of the pipe (cylinder):

$r = 1 \div 2$ d = 1 m

$=$ ______________ m

$V = (\pi \times r^2) \times h$

$V =$ _________ $\times$ _________ $\times$ _________ $\times 15$

$V =$ ______________ $\times$ ______________ $\times 15$

$V =$ ______________ $\times 15$

$V =$ ______________ m^3

Volume of concrete for 1 drain = volume of rectangular prism – volume of cylinder

= ______________ – ______________

= ______________ m^3

Volume of 3 drains = volume of 1 drain × 3

= ______________ × 3

= ______________

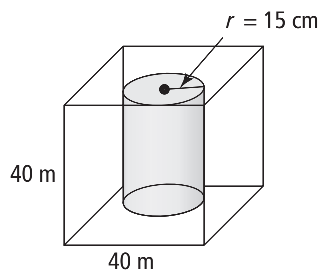
Round your answer to 1 decimal place.

The amount of concrete needed to make 3 drains is ______________ m^3.

Name: ______________________________ Date: ______________

Show You Know

A cylindrical tube is removed from a cube.
How much volume of the cube is left?



Volume of cube: *Volume of cylinder:*

← Formula →

← Substitute →

← Solve →

Remaining volume = volume of cube – volume of cylinder

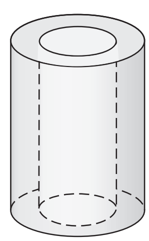
= ______________ – ______________

= ______________

Sentence: ____

Communicate the Ideas

1. Jessa is confused about how to find the volume of a hollow tube.
Explain the steps she should use.



Step 1: ____

Step 2: ____

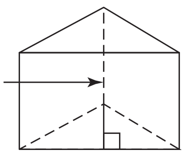
Step 3: ____

Name: ____________________ Date: __________

Check Your Understanding

Practise

2. **a)** Stacey eats 1 triangle of cheese every day for lunch.
How much cheese does she eat in 1 week?
Round your answer to the nearest tenth (1 decimal place).



$V = (b \times h \div 2) \times h$

$V = ($________ $\times$ ________ $\div 2) \times$ ________

$V = ($________ $\div 2) \times$ ________

$V =$ ________ $\times$ ________

$V =$ ________ cm^3

1 week = 7 days

Amount of cheese in 1 week = volume of 1 piece of cheese × 7 days

= ________ × 7

= ________ cm^3

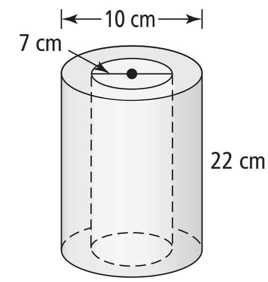
The amount of cheese Stacey eats in 1 week is ________ cm^3.

b) If Stacey eats 1 cheese stick every day, how much does she eat in 1 week?

Sentence: ____________________

Name: ____ Date: ____________

3. Kenu puts hot chocolate in a thermos that is 22 cm tall and has a diameter of 10 cm.
The inside of the thermos has a diameter of 7 cm.
How much material was used to make the thermos?



Volume of thermos (whole cylinder):

r = ____________ ÷ 2

r = ____________

$V = (\pi \times r^2) \times h$
$V = \pi \times r \times r \times h$

V = ________ × ________ × ________ × ________

V = ________ × ________ × ________

V = ____________ × ____________

V = ____________ m^3

Volume of inside cylinder:

r = ____________ ÷ 2

r = ____________

$V = (\pi \times r^2) \times h$

Volume of material = volume of whole cylinder – volume of inside cylinder

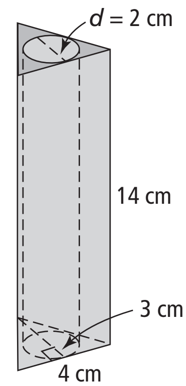
= ____________ – ____________

= ____________ cm^3

Sentence: ____

Name: ____ Date: ____________

4. This clay planter is a right triangular prism.
Inside the planter is a cylindrical hole.
Calculate the volume of clay needed to make this planter.



Volume of triangular prism:

$V = (b \times h \div 2) \times h$

$V =$ ____________ × ____________ ÷ 2 × ____________

$V =$ ____________ ÷ 2 × ____________

$V =$ ____________ × ____________

$V =$ ____________ cm^3

Volume of cylinder:

$r =$ ____________ ÷ 2

$r =$ ____________

$V = (\pi \times r^2) \times h$

$V =$ ____________ × ____________ × ____________ × ____________

$V =$ ____________ × ____________ × ____________ × ____________

$V =$ ____________ × ____________ × ____________

$V =$ ____________ × ____________

$V =$ ____________ cm^3

Volume of clay = volume of triangular prism – volume of cylinder

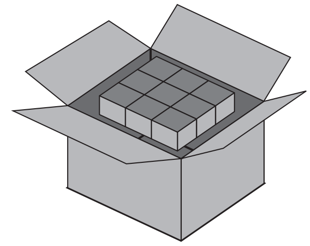
= ____________ – ____________

= ____________ cm^3

Sentence: ____

Name: ______________________________ Date: ______________

Apply



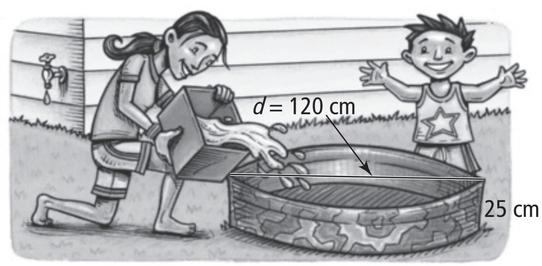
5. Laura has to pack 60 small boxes into 1 large carton.
Each small box is 30 cm × 26 cm × 10 cm.
The large carton is 100 cm × 80 cm × 50 cm.
Will 60 small boxes fit into the large carton?

Volume of small box:		*Volume of large carton:*
$V = l \times w \times h$	← Formula →	$V = l \times w \times h$
	← Substitute →
	← Solve →

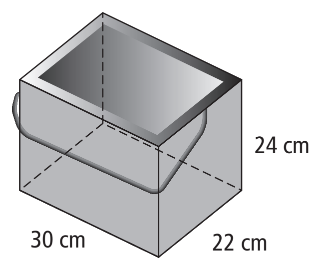
Volume of 60 small boxes:

Sentence: ______________________________

6. Fatima is filling a circular wading pool with water.
She is using a rectangular pail.
How many containers will she need to completely fill the pool?



Volume of pool:		*Volume of pail:*
$V = \pi \times r^2 \times h$	← Formula →	$V = l \times w \times h$



Number of pails to fill the pool = volume of pool ÷ volume of pail

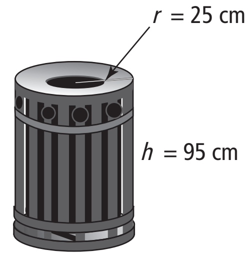
= ______________ ÷ ______________

= ______________

Sentence: ______________________________

Name: ____________________ Date: ____________

7. The school cafeteria has 1 large garbage can.



a) What volume of garbage does this can hold?

Formula →

Substitute →

Solve →

Sentence: ____________________

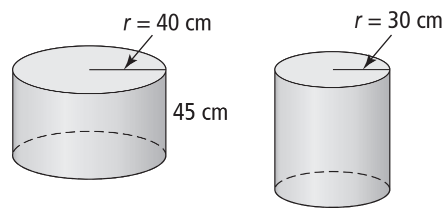
b) Garbage cans are emptied twice every lunch hour. How much garbage is collected in 1 lunch hour?

____

c) How much garbage is collected after 5 days?

____

8. A cylinder has a radius of 40 cm and a height of 45 cm. Another cylinder has the same volume with a radius of 30 cm. What is the height of the second cylinder?



Volume of first cylinder:

Formula →

Substitute →

Solve →

Height of second cylinder:

V = volume of the first cylinder

$V = \pi \times r^2 \times h$

_______ $= 3.14 \times 30^2 \times h$

_______ $= 3.14 \times 30 \times 30 \times h$

_______ = _______ $\times h$

$\frac{\square}{\square} = \frac{\square \times h}{\square}$

_______ $= h$

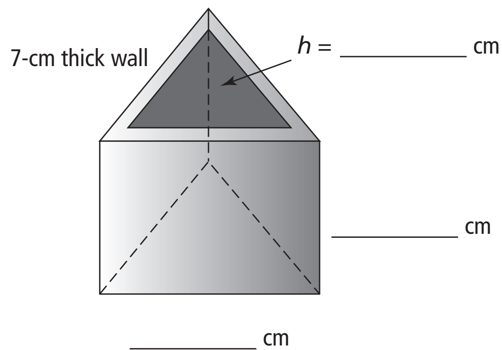
Sentence: ____________________

Name: ____ Date: ____________

MATH LINK

Design 2 concrete flower planters for your park.
The walls of the planters must be 7 cm thick.
One must be a right triangular prism.

a) Label the dimensions of your triangular prism.



b) Find the volume of concrete you need to build your triangular planter.

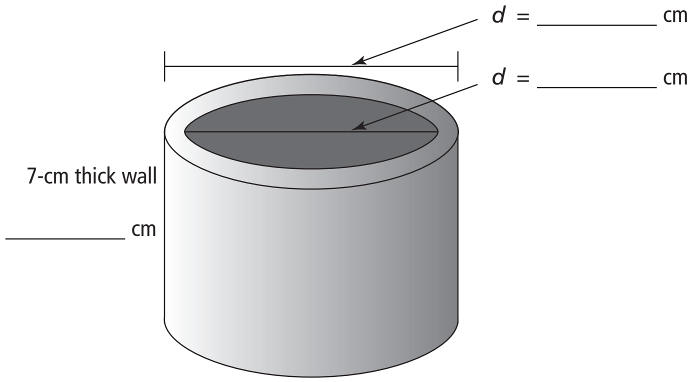
Volume of whole prism:		*Volume of inside:*
V = area of the base × height	← Formula →	
$V = (b \times h \div 2) \times h$	← Substitute →	
	← Solve →	

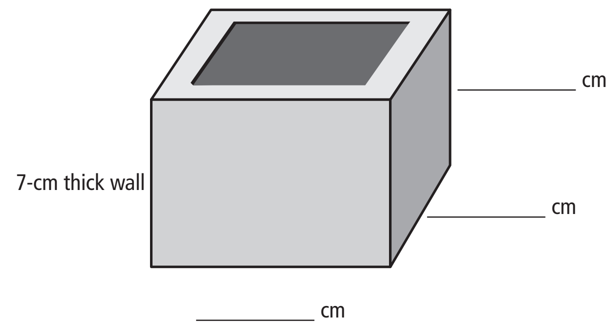
Volume of concrete = volume of outside – volume of inside

The amount of concrete needed to build my triangular planter is ____________ cm^3.

Name: ____ Date: ____________

c) Choose 1 of the planter shapes below: Circle CYLINDER or RECTANGULAR PRISM. Label the dimensions.





d) Calculate the volume of the planter from part c).

Volume of whole prism from part c):		*Volume of inside:*
V = area of the base × height	← Formula →	*V* =

V = ______________ cm^3

Volume of concrete = volume of outside – volume of inside

= ______________ – ______________

= ______________ cm^3

The amount of concrete needed to build my _______________________ planter is
(cylinder or rectangular prism)

______________ cm^3.

Name: ____ Date: ____________

7 Chapter Review

Key Words
For #1 to #4, write the number that matches the description.

1. height ________ the amount of space an object occupies

2. volume ________ the position or view of an object

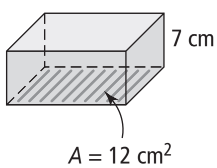
3. base of a prism ________ the distance between the 2 faces that name the object

4. orientation ________ the face that helps name the object; could be the face the shape rests on

7.1 Understanding Volume, pages 360–366

5. What is the volume of each right prism or cylinder?

a)

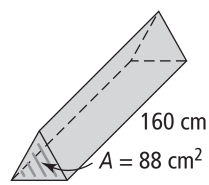


Volume = area of base × ____________

$V =$ __________ × __________

$V =$ ____________

b)

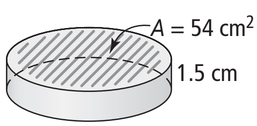


Volume = __________ × __________

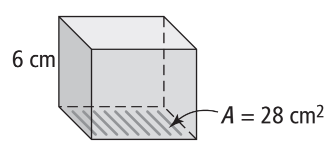
$V =$ __________ × __________

$V =$ ____________

c)



d)

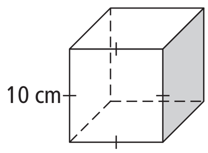


Name: ____ Date: ____________

7.2 Volume of a Prism, pages 368–376

6. What is the volume of each object?

Volume of rectangular prism: $V = l \times w \times h$
Volume of triangular prism: $V = (b \times h \div 2) \times h$
Volume of a cube: $V = s^3$ or $V = s \times s \times s$

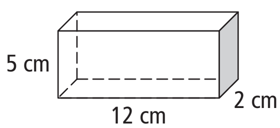
a) 

Formula → ______________________________

Substitute → V = ________ × ________ × ________

Solve → V = __________ × __________

V = __________ cm³

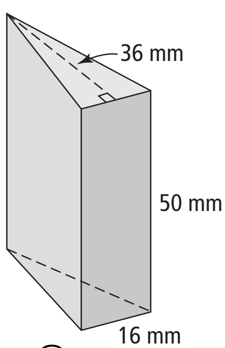
b) 

Formula → ______________________________

Substitute → V = ________ × ________ × ________

Solve → V = __________ × __________

V = __________

c) 

The base of a triangular prism is the triangular face.

Formula → ______________________________

Substitute → V = (________ × ________ ÷ 2) × ________

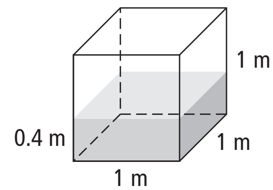
Solve → V = (__________ ÷ 2) × __________

V = __________ × __________

V = __________

Name: ______________________________ Date: ______________

7. **a)** A tank measures 1 m by 1 m by 1 m.
The water level in the tank is 0.4 m high.
How much water is in the tank?



height of water = ______________

length = ______________

width = ______________

Formula →

Substitute → V = ______________ × ______________ × ______________

Solve →

Sentence: ____

b) How much empty space is in the tank?

height of tank = ______________

length of tank = ______________

width of tank = ______________

Volume of tank = ______________ × ______________ × ______________

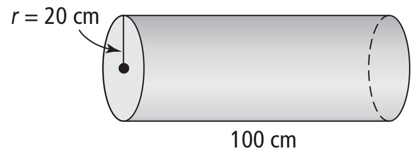
Volume of empty space = volume of tank – volume of water

Sentence: ____

Name: ______________________________ Date: ____________

7.3 Volume of a Cylinder, pages 378–384

8. What is the volume of each cylinder?



a) Formula → $V = \pi \times r^2 \times h$
$V = \pi \times r \times r \times h$

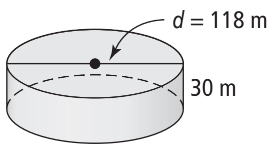
Substitute → $V =$ __________ × __________ × __________ × __________

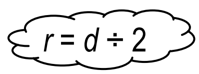
Solve → $V =$ __________ × __________ × __________

$V =$ __________ × __________

$V =$ __________ cm^3

b)





$d =$ __________

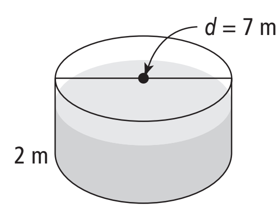
$r =$ __________

Formula →

Substitute →

Solve →

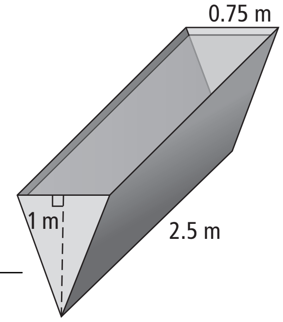
9. Jane wants to fill her pool so the water reaches 2 m.
Find the volume of water she will need.



Sentence: ____

Name: ______________________________ Date: ______________

7.4 Solving Problems Involving Prisms and Cylinders, pages 386–396



10. At Wacky Water Park, this large bucket tips over when it fills with water.

a) What is the volume of water when the bucket is full?

Volume = area of base × ______________

V = (______________ × ______________ ÷ 2) × ______________

V = (______________ ÷ 2) × ______________

V = ______________ × ______________

V = ______________

b) If the bucket fills every minute, how much water is dumped after 15 min?

Amount of water dumped in 15 min = number of times bucket is filled in 15 min × volume

= ______________ × ______________

= ______________

Sentence: ____

11. An old cylinder has a volume of 87.92 m^3.
A new cylinder has the same volume and a radius of 4 m.
What height is the new cylinder?

$V = \pi \times r^2 \times h$
$V = \pi \times r \times r \times h$

87.92 = 3.14 × ______________ × ______________ × h

87.92 = ______________ × ______________ × h

87.92 = ______________ × h

$\frac{87.92}{\square} = \frac{\square \times h}{\square}$ Divide both sides by the number in front of h.

h = ______________ cm

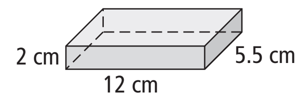
Name: ____________________ Date: ____________

7 Practice Test

V = area of base × height of prism
Volume of rectangular prism: $V = l \times w \times h$
Volume of triangular prism: $V = (b \times h \div 2) \times h$
Volume of a cube: $V = s^3$ or $V = s \times s \times s$

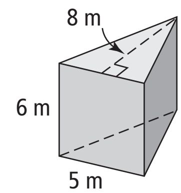
For #1 to #3, choose the correct answer.

1. What is the volume of the right rectangular prism?



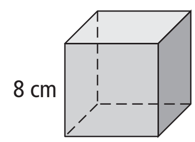
A 101 cm^3 **B** 126 cm^3
C 132 cm^3 **D** 144 cm^3

2. What is the volume of the right triangular prism?



A 120 m^3 **B** 180 m^3
C 240 m^3 **D** 480 m^3

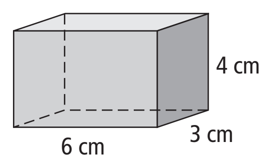
3. What is the volume of the cube?



A 64 cm^3 **B** 72 cm^3
C 384 cm^3 **D** 512 cm^3

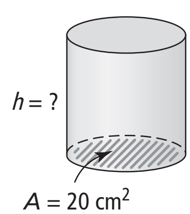
Complete the statements in #4 and #5.

4. A right rectangular prism is 3 cm by 4 cm by 6 cm.



The volume of the prism is ____________________.

5. The area of the base of a right cylinder is 20 cm^2.
The volume of the cylinder is 60 cm^3.
What is the height?

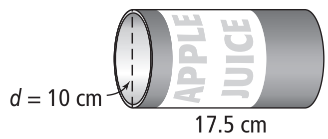


The height of the cylinder is ____________________.

Name: ____ Date: ____________

Short Answer

6. Ian knocked over a full can of apple juice. What volume of juice did he spill?

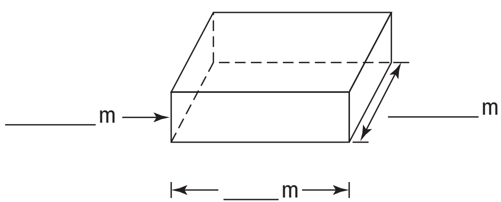


$V = \pi \times r^2 \times h$

Sentence: ____

7. Yuri is building a square concrete patio that is 6 m wide, 6 m long, and 0.15 m high.

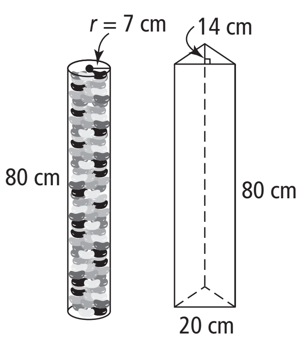
a) What volume of concrete will he need?

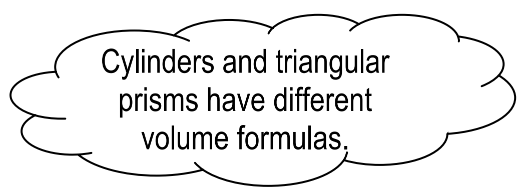


b) Concrete costs $100.00/m^3.
How much will it cost to make the patio?
Do not include taxes.

Volume of concrete × cost of 1 m^3

8. Which container holds more jelly beans?





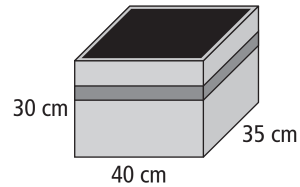
← Formula →

← Substitute →

← Solve →

Sentence: ____

9. Every classroom in a school has a recycling bin for paper.



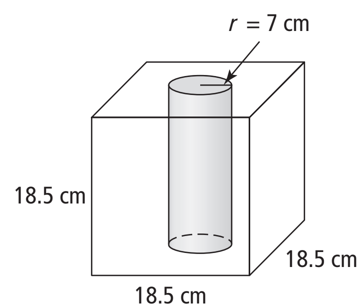
a) What volume of paper can each bin hold?

Each bin holds ____________ of paper.

b) If there are 14 classrooms in the school, how much paper can be collected in total?

Altogether, the 14 bins can hold ____________ of paper.

10. Tiki is making a cube-shaped candleholder.
The candle fits in a hollow cylinder inside the cube.
How much material will she need to make the candleholder?



Volume of cube:

Volume of cylinder:

Volume of candleholder:

The amount of material needed to make the candleholder is ____________.

Name: ______________________________ Date: ______________

WRAP IT UP!

You are designing a concrete eating area in a park.

Draw a plan of your eating area.
You must have *at least*
- 1 cylinder
- 1 rectangular prism
- 1 triangular prism

Find the total volume of concrete you need to create the eating area.

a) Look at Math Link 7.1 on page 366.
What is the volume of the concrete used to make the shelter? ______________

b) Look at Math Link 7.2 on page 376.
What is the volume of the recycling bin? ______________

c) Look at Math Link 7.3 on page 384.
What is the volume of the concrete used to make the table? ______________

d) Look at Math Link 7.4 on page 395.
What is the volume of concrete used to make the *triangular prism* flower planter?
____

e) Find the total amount of concrete needed to create your eating area.

Volume of shelter + volume of table + volume of recycling bin + volume of flower planter

= ______________ + ______________ + ______________ + ______________

= ______________ cm^3

The total amount of concrete needed to create this eating area is ______________ cm^3.

f) Use the Internet or newspapers to find the cost for 1 m^3 of concrete. ______________

g) Calculate the cost of the concrete for your eating area.

Total cost = cost of 1 m^3 of concrete × total amount of concrete

= ______________ × ______________

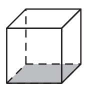
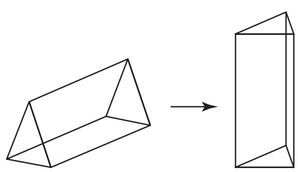
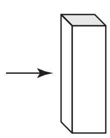
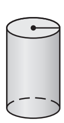
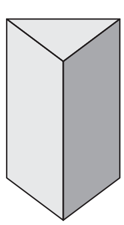
= ______________

Sentence: ____

Name: ______________________________ Date: ______________

Key Word Builder

Use the clues to help you unscramble the letters for each word.

Clues	Scrambled Word	Word
The face that helps name the object. 	seba	__ __ __ __
An object that has *all* rectangular faces. 	tagurlrecna mprsi	__ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __
Changing the position of an object. 	tioroneatin	__ __ __ __ __ __ __ __ __ __ __
The amount of material that can fit into an object.	lmoevu	__ __ __ __ __ __
The distance between the 2 faces that name the object. 	hhitge	__ __ __ __ __ __
The name of this object. 	rcynelid	__ __ __ __ __ __ __ __
An object that has 2 triangular faces. 	agurltrina mprsi	__ __ __ __ __ __ __ __ __ __ __ __ __ __ __

Name: ______________________________ Date: ______________

Math Games

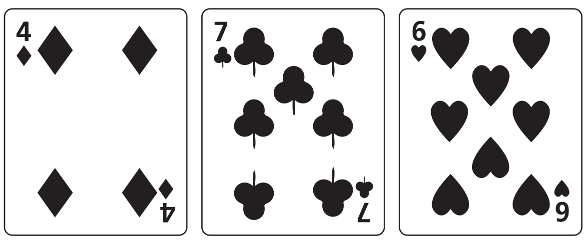
Turn Up the Volume!

Play Turn Up the Volume! with a partner or in a small group.

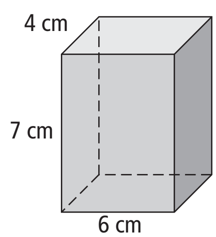
Materials
- deck of playing cards for each pair or small group
- sheet of paper for each student
- calculator for each student

Rules
- Remove all jacks, queens, kings, aces, and jokers from the deck.
- Take turns being the dealer.
- Shuffle the cards and deal 3 cards, face up, to each player.
- The 3 cards are the measurements of a rectangular prism.
- Using paper and pencil, find the volume using the 3 numbers on the cards.

Example:
My cards are



Volume = $l \times w \times h$
$V = 4 \times 7 \times 6$
$V = 168$



Scoring
- Use the tally chart to keep score.
- If you calculate your volume correctly, you get 1 point. Exchange papers and check each other's work.
- The player who has the greatest volume wins 1 extra point. If there is a tie, both players get 1 extra point.
- The first player to reach 10 points wins the game. If there is a tie, continue to play until there is a winner.

Tally Chart

Player 1	Player 2

Name: ____ Date: ____________

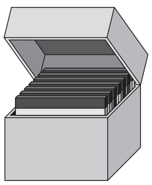
Challenge in Real Life

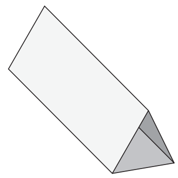
Create a Storage Container

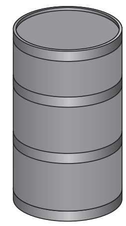
Design a storage container.

What kinds of things can you store in your container?

1. Circle the shape of your container.







2. Write 2 items your container could be used for.

1. ______________________________

2. ______________________________

If you are not sure what size to make your container, measure something in your classroom to help you.

3. Label the lengths of the sides of your container.

4. Find the volume of your container.

5. You want to sell your container in a store. Make a sign to advertise your container. Include:
- a sketch of your container
- what it is used for
- the cost of your container

Answers

Get Ready, pages 356–357

1. a) YES. **b)** NO. **c)** NO. **d)** YES.

2. a) 800 **b)** 210 **c)** 160 **d)** 200

3. 416 cm^2

4. a) 49 **b)** 25

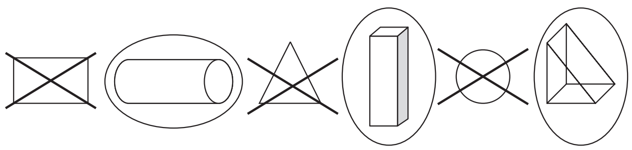
Math Link

a) Answers may vary. Examples: benches, swings, garbage bins

b) $l \approx 2$ m, $w \approx 1$ m **c)** 2 m^2 **d)** 25 cm **e)** 1962.5 cm^2

7.1 Warm Up, page 359

1.



2. square

3. a) 77 cm^2 **b)** 22.5 cm^2 **c)** 153.86 cm^2 **d)** 9 m^2

4. Estimates may vary. **a)** 200 **b)** 160 **c)** 200 **d)** 280

7.1 Understanding Volume, pages 360–366

Working Example 1: Show You Know

880 cm^3

Working Example 2: Show You Know

Both boxes have the same volume.

Communicate the Ideas

1. a) NO. 189 cm^3 **b)** YES

2. No, orientation does not change volume. Orientation changes which dimension is considered the height, and whether the shape is resting on its base.

Practise

3. a) 216 cm^3 **b)** 1920 cm^3

4. 153 cm^3; 153 cm^3; Orientation does not change the volume.

Apply

5. a) 7 cm

6. 93.6 cm^3

7. a) 1 687 500 cm^3 **b)** 1687.5 L

Math Link

a) Answers may vary. Example: Wall #1 = 2.5 m, Wall #3 = 2.5 m

b) Answers may vary. Example:

Wall	Area of Base	Estimated Height (Length)	Volume
#1	0.5 m^2	*2.5 m*	$V = 1.25\ m^3$
#2	0.5 m^2	*2.8 m*	$V = 1.4\ m^3$
#3	0.5 m^2	*2.5 m*	$V = 1.25\ m^3$

c) Answers may vary. Example: You would need 3.9 m^3 of concrete to build the walls.

7.2 Warm Up, page 367

1. a) 20 cm^3 **b)** 500 cm^3

2. a) s^2 **b)** $l \times w$ **c)** $b \times h \div 2$ **d)** $\pi \times r^2$

3. a) 10 **b)** $\frac{1}{5}$

7.2 Volume of a Prism, pages 368–376

Working Example 1: Show You Know

a) 170 cm^3 **b)** 27 m^3

Working Example 2: Show You Know

180 mm^3

Working Example 3: Show You Know

1458 cm^3

Communicate the Ideas

1. V: volume, l: length, w: width, h: height

2. Multiply the volume by $\frac{2}{3}$ to get 800 cm^3.

Practise

3. a) 792 m^3 **b)** 504 cm^3

4. a) 1000 cm^3 **b)** 27 cm^3

5. a) 294 cm^3 **b)** 1200 mm^3

6. 200 cm^3

Apply

7. a) $h = 7$ cm **b)** $h = 5$ cm **c)** $l = 10$ cm **d)** $l = 9$ cm

8. triangular prism; it holds 367.5 cm^3

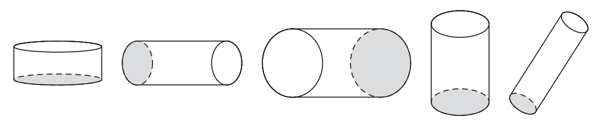
9. 2400 cm^3

Math Link

3 841 344 cm^3

7.3 Warm Up, page 377

1. a)



b) circle

2. diameter; radius

3. a) 4 cm **b)** 11 cm

4. a) 16 **b)** 25

5. a) 32 **b)** 679 **c)** 920 **d)** 9

6. a) 25 **b)** 23 **c)** 15 **d)** 14

7.3 Volume of a Cylinder, pages 378–384

Working Example 1: Show You Know

a) 120 m^3 **b)** 128.1 cm^3

Working Example 2: Show You Know

143 066 cm^3

Communicate the Ideas

1. a) 2.8 m **b)** The height is the distance between the 2 faces that help name the object.

2. Jethro used the diameter, not the radius.

Practise

3. a) 7385.3 cm^3 **b)** 1805.5 cm^3

4. a) 628 cm^3 **b)** 4179.34 cm^3

5. a) 0.785 m^3 **b)** 4239 cm^3

Apply

6. Container B

7. 11 m^3

8. 18 840 cm^3

Math Link

Answers will vary. Example: $h = 70$ cm; $V_{cylinder} = 197\ 820$ cm^3

$l = 100$ cm; $w = 100$ cm; $V_{prism} = 80\ 000$ cm^3

277 820 cm^3

7.4 Warm Up, page 385

1. a) 35 cm^3 **b)** 301.44 cm^3

2. 21.5 cm^2

3. a) 1200 **b)** 2400 **c)** 52 500 **d)** 42 000

7.4 Solving Problems Involving Prisms and Cylinders, pages 386–396

Working Example 1: Show You Know

270 cm^3

Working Example 2: Show You Know

20 cm

Working Example 3: Show You Know

35 740 cm^3

Communicate the Ideas

1. *Step 1*: Calculate the volume of the cylinder before the centre portion is removed. *Step 2*: Calculate the volume of the portion that was cut out. *Step 3*: Subtract the volume of the cutout from the total volume of the cylinder.

Practise

2. a) 78.8 cm^3 **b)** 65.94 cm^3

3. 880.77 cm^3

4. 40.04 cm^3

Apply

5. No, the small boxes will not fit in the large box.

6. 18

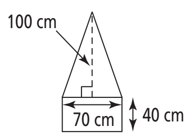
7. a) 186 437.5 cm^3 **b)** 372 875 cm^3 **c)** 1 864 375 cm^3

8. 80 cm

Math Link

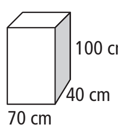
Answers will vary. Examples:

a)



b) 75 040 cm^3

c)



d) 134 400 cm^3

Chapter Review, pages 397–401

1. the distance between the 2 faces that name the object

2. the amount of space an object occupies

3. the face that helps name the object; could be the face the shape rests on

4. when you change the position of the object

5. a) 84 cm^3 **b)** 14 080 cm^3 **c)** 81 cm^3 **d)** 168 cm^3

6. a) 1000 cm^3 **b)** 120 cm^3 **c)** 14 400 mm^3

7. a) 0.4 m^3 **b)** 0.6 m^3

8. a) 125 600 cm^3 **b)** 327 910.2 m^3

9. 76.93 m^3

10. a) 0.9375 m^3. **b)** 14.0625 m^3

11. 1.75 m

Practice Test, pages 402–404

1. C **2.** A **3.** D

4. 72 cm^3

5. 3 cm

6. 1373.75 cm^3

7. a) 5.4 m^3 **b)** $540.00

8. The cylindrical container holds more jelly beans.

9. a) 42 000 cm^3 **b)** 588 000 cm^3

10. 3485.2 cm^3

Wrap It Up!, page 405

Answers will vary. Examples:

a) 3.9 m^3 **b)** 320 112 cm^3 **c)** 277 820 cm^3 **d)** 43 680 cm^3 **e)** 4 541 612 cm^3
f) and **g)** At a price of $0.0001 per cubic centimetre, the price is $454.16

Key Word Builder, page 406

base; rectangular prism; orientation; volume; height; cylinder; triangular prism

Challenge in Real Life, page 408

Answers will vary. Examples:

1. rectangular prism

2. jewellery or paperclips

3. l = 5 cm, w = 4 cm, h = 5 cm

4. 100 cm^3

5. Answers will vary.