Date: _____

CHAPTER 9

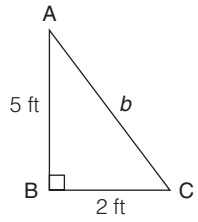
Volume and Surface Area

Get Set

Answer these questions to check your understanding of the Get Ready concepts on pages 362–363 of the *Foundations of Mathematics 10* textbook.

Pythagorean Theorem

1. Find the length of the indicated side of this right triangle to one decimal place.



Solution:
The length of the legs are ___ ft and ___ ft.
The length of the hypotenuse is x ft.

$(\_\_\_)^2 + (\_\_\_)^2 = x^2$

$\_\_\_ + \_\_\_ = x^2$

$\_\_\_ = x^2$

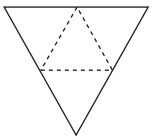
$\sqrt{\_\_\_} = x$

$\_\_\_ \doteq x$

The hypotenuse is approximately ___ ft long.

Nets

2. Identify the solid for this net.



The net has a _____ base and _____ congruent triangular faces. It is a net of a _____.

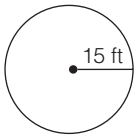
Convert Measurements

3. Convert each measure to the unit indicated.

852 in. _____ ft 0.084 m _____ mm 0.6 m^2 _____ cm^2 3.4 ft^3 _____ $in.^3$

Area

4. Find the area of the circle. Round your answer to one decimal place.



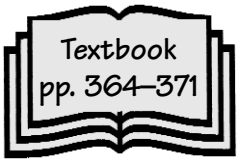
$A = \pi r^2$

$= \pi \times \_\_\_\_$

$\doteq \_\_\_\_$

Date: _____

9.1 Volume of Prisms and Pyramids



Warm-Up

1. Pythagorean Theorem	2. Rearrange Formulas
The hypotenuse of a right triangle is 10 in. long. One leg of the triangle is 8 in. long. How long is the other leg?	Rearrange the formula to isolate P. $I = Prt$
3. Rearrange Formulas	**4. Math Literacy**
Rearrange the formula to isolate t. $d = at^2$	Give an everyday example of when it would be important to determine the volume of an object.
5. Algebraic Equations	**6. Alegebraic Equations**
Find the value of y when $x = 2$. $y = 3x^2 + 2x - 5$	Find the value of A when $x = 4$ and $y = -2$. $A = 3xy - 4x + 3y$

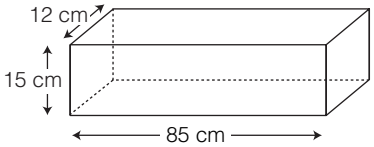
Date: _____

Practise

Section 9.1

Where necessary, round your answers to one decimal place.

1. Find the volume of each prism.



Area of base = length × width

A = _____cm × _____cm

= _____

The area of the base is _____.

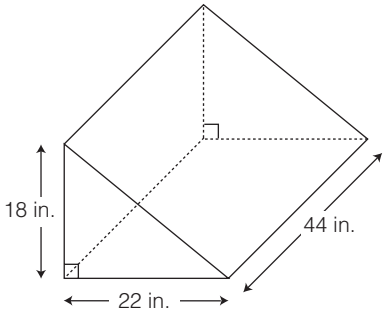
Volume = area of base × height

V = _____cm^2 × _____cm

= _____

The volume of the prism is _____.

2. Find the volume of the prism.



Area of triangular face (or base) = $\frac{1}{2}bh$

A = $\frac{1}{2}$(_____in.)(_____in.)

= _____

The area of the triangular face is _____.

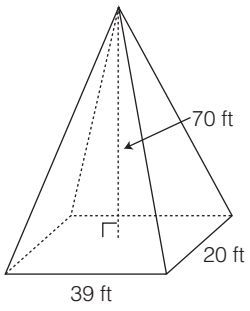
Volume = area of base × height

V = _____in.^{2} × _____in.

= _____

The volume of the prism is _____.

3. Find the volume of the pyramid.



Area of base = length × width

A = _____ft × _____ft

= _____

The area of the base is _____.

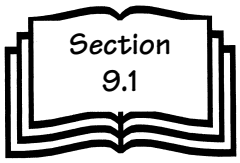
Volume of pyramid = $\frac{1}{3}$ area of base × height

V = $\frac{1}{3}$ (_____ft^2)(_____ft)

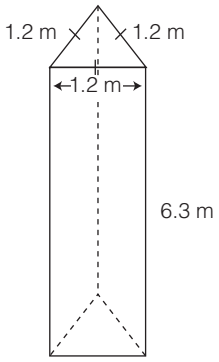
= _____

The volume of the pyramid is _____.

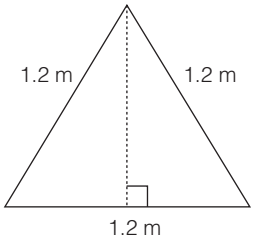
Date: _____

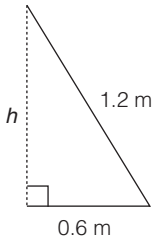


4. Find the volume of the prism.



STEP 1: Determine the area of the triangular face, using the Pythagorean theorem to calculate the height. Round your answer to two decimal places.





$\_\_\_^2 + h^2 = \_\_\_^2$

$h^2 = \_\_\_^2 - \_\_\_^2$

$h^2 = \_\_\_ - \_\_\_$

$h^2 = \_\_\_$

$h \doteq \_\_\_$

Area of triangular face (or base) $= \frac{1}{2}bh$

$A = \frac{1}{2}(\_\_\_)(\_\_\_)$

$=$

$=$

The Area of the triangle face is _____.

STEP 2: Determine the volume of the prism. Round your answer to three decimal places.

Volume = area of base × height

$V = \_\_\_ \times \_\_\_$

$= \_\_\_$

The volume of the prism is _____.

5. A box in the shape of a rectangular prism has a length of 10 cm, a width of 8 cm, and a height of 5 cm. Find the volume of the box.

Date: _____

9.2 Surface Area of Prisms and Pyramids

Textbook pp. 372–380

Warm-Up

1. Pythagorean Theorem

In triangle ABC, angle B measures 90°, the length of side AB is 15 cm, and the length of side BC is 11 cm. Draw the triangle. Use the Pythagorean theorem to find the length of side AC to one decimal place.

2. Math Literacy

Give two examples from real life where you would need to know the surface area of an object.

3. Rearrange Formulas

Rearrange each formula to isolate the indicated variable.

a) $A = bh$, for h

b) $C = 2\pi r$, for r

4. Algebra

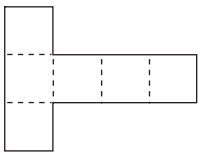
Solve each equation for the given values.

a) $x = 22y + 11$ for x if $y = 2$

b) $y = x^2 + 11$ for y if $x = 5$

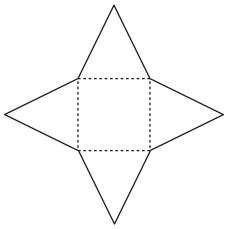
5. Nets

What object would this net make?



6. Nets

What object would this net make?



7. Congruence

Circle the correct answer.

If two triangles are congruent, it means they are

a) similar

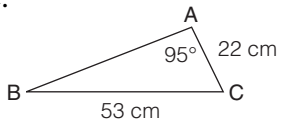
b) exactly the same size and shape

c) completely different from each other

8. Math Literacy

Jeremy suggests the Pythagorean theorem can be used to calculate the length of side AB in triangle ABC.

Is Jeremy correct? Explain your answer.



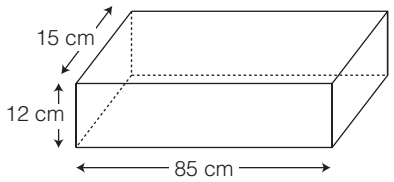
Date: _____

Section 9.2

Practise

Where necessary, round your answers to one decimal place.

1. Draw and label a net for the rectangular prism.



2. Find the surface area of the prism in question 1.

Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

= _____

Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

= _____

Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

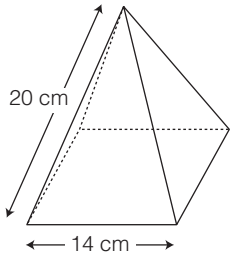
= _____

Surface Area = 2(_____) + 2(_____) + 2(_____)

= _____

The surface area of the prism is _____ cm^2.

3. Draw and label a net for this square-based pyramid.



Date: _____

4. Find the surface area of the pyramid in question 3.

STEP 1: Find the height of each triangular face of the pyramid using Pythagorean theorem. Round your answer to two decimal places.

$h^2 +$ ____ $=$ ____

$h^2 =$ ____ $-$ ____

$h^2 = \sqrt{\quad}$

$h^2 \doteq$ _____

STEP 2: Find the surface area of each triangular face, which are congruent because it is a square-based pyramid. Round your answer to one decimal place.

Surface area of *each* triangular face $= \frac{1}{2}bh$

$= \frac{1}{2}$(____)(____)

$=$ _____

STEP 3: Find the *total* surface area of the pyramid.

Since there are 4 congruent triangular faces:

SA of triangular faces $= 4$(_____)

$=$ _____

SA of base $=$ ____ $\times$ ____

$=$ _____

The *total* surface area of the pyramid is _____ + _____ $=$ _____.

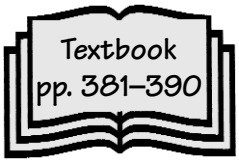
5. The foundation of a new garage has walls that are 2.5 m high. The garage is 8 m long and 10 m wide. The walls of the foundation are to be sprayed with a waterproofing tar.

a) Find the surface area of the exterior walls of the garage.

b) The waterproofing spray costs $13.95 per square metre. How much will the spray cost?

Date: _____

9.3 Surface Area and Volume of Cylinders



Warm-Up

1. Math Literacy

Give two or three different real-life examples of cylinders.

2. Area of a Circle

Write the formula for the area of a circle.

A = _____

3. Radius

Where is the radius on a circle? Circle the correct answer.

a) straight across the centre

b) around the outside edge

c) from the centre to the edge

4. Number Sense

What is the three-digit decimal value of π?

5. Convert Measurements

Write each measure using the indicated units.

a) 315 ft to yards

b) 0.185 m to millimetres

c) 22 300 mm^2 to square centimetres

d) 5184 $in.^3$ to cubic feet

6. Rearrange Formulas

Rearrange each formula to isolate the indicated variable.

a) $PV = nRT$, for n

b) $P = 2(l + w)$, for w

7. Algebraic Expressions

Find the value of V when $l = 22$ m, $w = 18$ m, and $h = 20$ m.

$V = lwh$

8. Algebraic Equations

Find the value of SA when $l = 5$ in., $w = 2$ in., and $h = 1.5$ in.

$SA = 2lw + 2lh + 2wh$

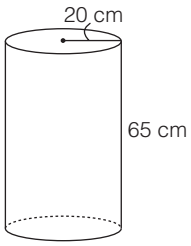
Date: _____

Practise

Section 9.3

Where necessary, round your answers to one decimal place. Use $\pi = 3.14$.

1. Find the surface area of the cylinder.



$SA = 2\pi r^2 + 2\pi rh$

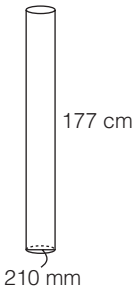
$= 2\pi(\_\_\_\_)^2 + 2\pi(\_\_\_\_)(\_\_\_\_)$

$\doteq$ _____ + _____

$\doteq$ _____

The surface area of the cylinder is approximately _____ cm^2.

2. Find the surface area of the cylinder.



Convert units to centimetres. Since there are 10 mm in 1 cm,

210 mm is ____ cm.

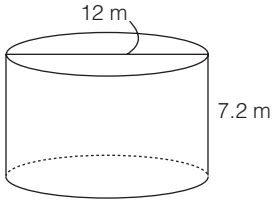
$SA = 2\pi r^2 + 2\pi rh$

$=$

$\doteq$

The surface area of the cylinder is approximately _____ cm^2.

3. Find the volume of the cylinder.



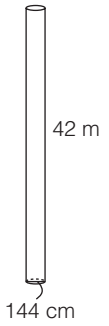
$V = \pi r^2 h$

$= \pi(\_\_\_\_)^2(\_\_\_\_)$

$\doteq$ ____

The volume of the cylinder is approximately _____ m^3.

4. Find the volume of the cylinder.



Convert units to metres. Since there are 100 cm in 1 m,

144 cm is ____ m.

$V = \pi r^2 h$

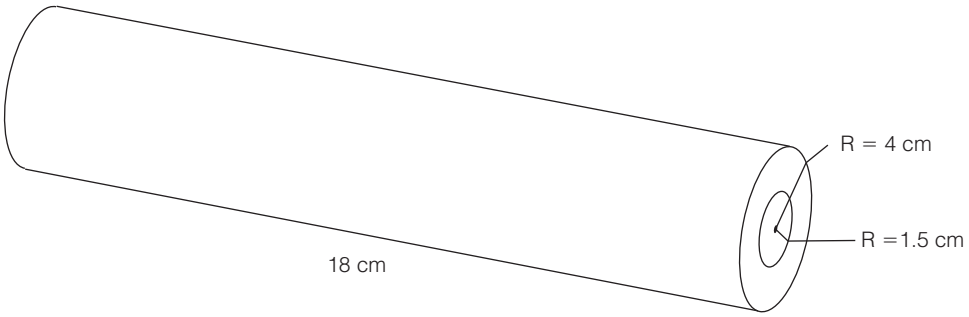
$=$

$\doteq$

The volume of the cylinder is approximately _____ m^3.

Date: _____

5. A piece of wood to be used as part of a child's toy has the shape of a cylinder. The cylinder has a height of 18 cm and a radius of 4 cm. The cylinder is hollowed out by drilling a hole with radius 1.5 cm through it lengthwise.



a) Find the volume of the cylinder before it is hollowed out.

$V = \pi r^2 h$

$= \pi(\_\_\_\_)^2(\_\_\_\_)$

$\doteq$ _____

The volume of the cylinder is approximately _____ cm^3.

b) Find the volume of wood that is removed when the hole is drilled.

$V = \pi r^2 h$

$= \pi(\_\_\_\_)^2(\_\_\_\_)$

$\doteq$ _____

The volume of the cylinder of wood removed is approximately _____ cm^3.

c) Find the volume of wood remaining in the hollowed-out cylinder.

6. Would more paint be needed to cover all the surfaces of the cylinder before or after it was hollowed out? Explain your answer based on surface area.

_____

_____

Date: _____

9.4 Volume of Cones and Spheres

Textbook pp. 391–397

Warm-Up

1. Math Literacy

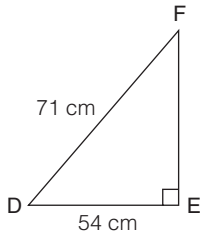
Sydney says that if all of the side lengths of a cube are doubled, the volume of the cube will also double. Is she correct? Explain.

2. Cones

Give two real-life examples of cone-shaped objects.

3. Pythagorean Theorem

Find the length of side EF to the nearest centimetre.



4. Spheres

Give two real-life examples of sphere-shaped objects, other than a ball.

5. Convert Measurements

Write each measure using the indicated units.

a) 42 km to metres

b) 352 cm to millimetres

c) 573 cm^3 to cubic millimetres

d) 1250 m^2 to square feet

6. Rearrange Formulas

Rearrange each formula for the indicated variable.

a) $P = I^2R$, for I

b) $D = \frac{m}{V}$, for V

7. Algebra

Solve for the unknown values.
Use $\pi = 3.14$.

a) $V = \pi r^2 h$ for $h = 22$ in. and $r = 5$ in.

b) $SA = 2\pi r^2 + 2\pi rh$ for $r = 16$ cm and $h = 54$ cm

8. Evaluate Expressions

If π equals 3.14, evaluate $\frac{1}{3}\pi(2)(5)$.

Round your answer to one decimal place.

Date: _____

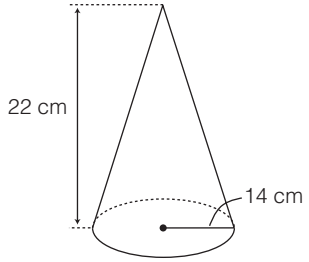
Practise

Section 9.4

Where necessary, round your answers to one decimal place. Use $\pi = 3.14$.

1. Find the volume of each cone. Convert measures to the same units where necessary.

a)



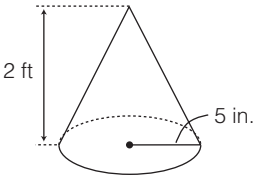
$$V = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi(\_\_\_\_)^2(\_\_\_\_)$$

$$\doteq \_\_\_\_\_$$

The volume of the cone is approximately _____ cm^3.

b)



Convert units to inches. Since there are 12 in. in 1 ft, 2 ft is ____ in.

$V =$

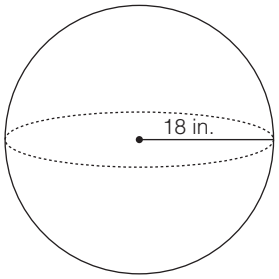
$$= \_\_\_\_(\_\_\_\_)^2(\_\_\_\_)$$

$$\doteq \_\_\_\_\_$$

The volume of the cone is approximately _____ in^3.

2. Find the volume of each sphere.

a)



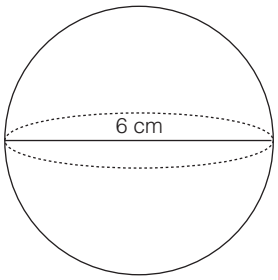
$$V = \frac{4}{3}\pi r^3$$

$$= \frac{4}{3}\pi(\_\_\_\_)^3$$

$$\doteq \_\_\_\_\_$$

The volume of the sphere is approximately _____ $in.^3$

b)



$V =$

$$= \_\_\_\_(\_\_\_\_)^3$$

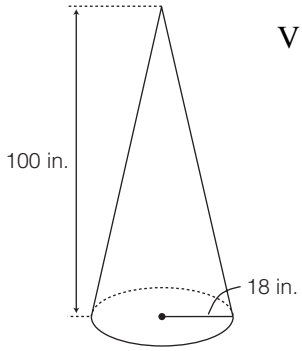
$$\doteq \_\_\_\_\_$$

The volume of the sphere is approximately _____ cm^3.

Date: _____

3. A cone has radius 18 in. and height 100 in.

a) Find the volume of the cone.



$$V = \frac{1}{3}\pi r^2 h$$

$$= \frac{1}{3}\pi(\_\_\_\_)^2(\_\_\_\_)$$

$$\doteq \_\_\_\_\_$$

The volume of the cone is approximately _____ in^3.

b) The volume of a particular sphere is half the volume of the cone shown above. Find the radius of the sphere.

$V = \frac{4}{3}\pi r^3$

Now rearrange the equation to solve for r, knowing the volume of the sphere equals $\frac{1}{2}$ the volume of the cone.

c) What is the diameter of the sphere?

4. A woodworker carves a sphere from a solid cube of wood that has a side length of 18 cm.

a) What is the radius of the largest sphere the woodworker can carve from the cube?

b) What is the volume of this sphere?

Date: _____

9.5 Solve Problems Involving Surface Area and Volume

Textbook pp. 398–405

Warm-Up

1. Convert Measurements

Write each measure using the units indicated.

a) 31 yd to feet

b) 0.0042 m to millimetres

c) 2276 cm^2 to square metres

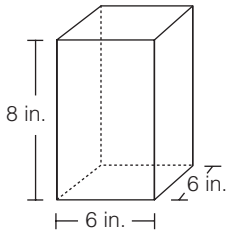
d) 62 yd^3 to cubic feet

2. Math Literacy

Regina tells Seema that if the height of the triangle in a triangular prism is doubled, the volume will double. Seema says that if the height is doubled, the surface area of the prism will double, too. Is either student correct? Explain your answer.

3. Number Sense

A square prism has a height of 8 in. and a base with 6-in. sides. Calculate the area of the base.



4. Volume

Calculate the volume of the prism in question 3.

5. Rearrange Formulas

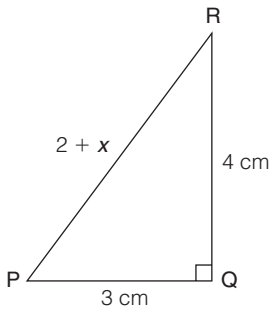
Rearrange each formula to isolate the indicated variable.

a) $SA = 2\pi r^2 + 2\pi rh$, for h

b) $E = mc^2$, for c

6. Pythagorean Theorem

Find the value of x.



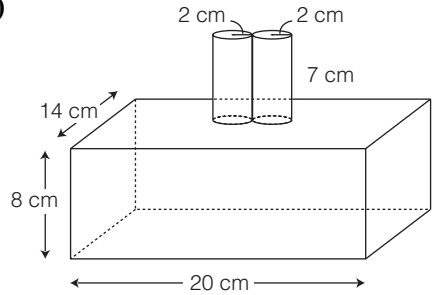
Date: _____

Practise

Where necessary, round your answers to one decimal place.

1. Find the volume of each shape.

a)



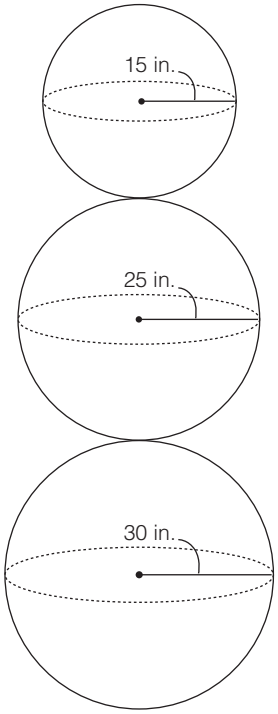
Cylinders:

V =

Rectangular Prism:

V =

b)



Sphere A

V =

Sphere B

V =

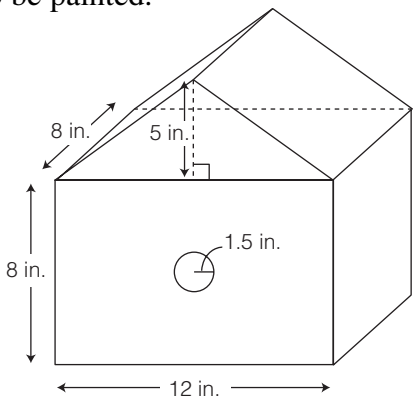
Sphere C

V =

Date: _____

Section 9.5

2. All sides, including the bottom, of the birdhouse shown below are to be painted.



What is the total surface area that will be painted?

Area of back = _____ × _____

= _____

Area of front = _____ × _____ − _____

= _____

Area of 2 sides = _____ × _____ × _____

= _____

Area of base = _____ × _____

= _____

Area of front and back triangles = _____ × _____ × _____

= _____

Area of roof = _____ × _____

= _____

Total surface area to be painted = _____

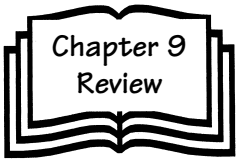
3. A warehouse has the shape of a rectangular prism with a cube attached to one of the long sides. The part of the warehouse that is a rectangular prism has length 200 ft, width 65 ft and height 25 ft. The part that is a cube has side length 20 ft.

a) Make a sketch of the warehouse with the measurements indicated.

b) What is the total volume of the warehouse?

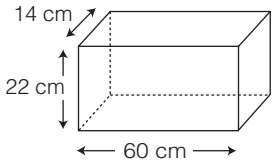
Date: _____

Chapter 9 Review



9.1 Volume of Prisms and Pyramids, textbook pages 364–371

1. Find the volume of the prism. If necessary, round your answers to one decimal place. Use $\pi = 3.14$.

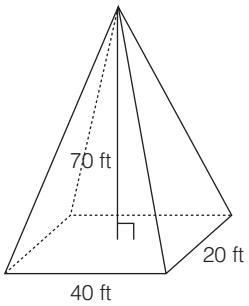


V = _____ × _____ × _____

=

=

2. Find the volume of the pyramid.



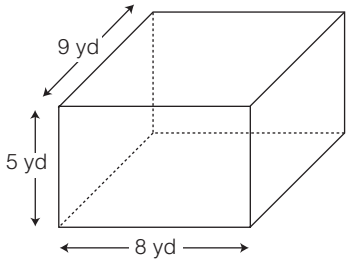
V = _____ area of _____ × _____

=

=

9.2 Surface Area of Prisms and Pyramids, textbook pages 372–380

3. Find the surface area of the prism.



Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

= _____

Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

= _____

Two faces have dimensions _____ cm by _____ cm.

Area = _____ × _____

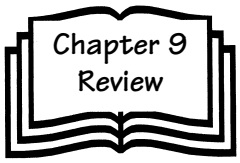
= _____

Surface Area = 2(_____) + 2(_____) + 2(_____)

= _____

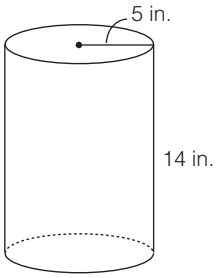
The surface area of the prism is _____ yd^2.

Date: _____



9.3 Surface Area and Volume of Cylinders, textbook pages 381–390

4. Find the surface area and volume of the cylinder.



Circular Top

SA = _____

Side

SA = _____ × _____

Cylinder

SA =

Volume

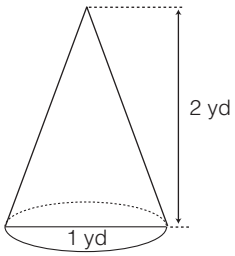
V = _____ r^2 _____

=

=

5. Find the volume of each object.

a)

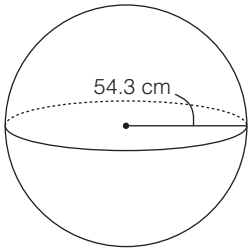


V = _____r^2___

=

=

b)



V = _____r^3

=

=

9.5 Solve Problems Involving Surface Area and Volume, textbook pages 398–405

6. The composite shape shown below is a rectangular prism with a cube removed from one corner.

a) Find the surface area of the composite shape.

b) Find the volume of the composite shape.