

# CHAPTER

# 8

# Surface Area and Volume

## GETTING STARTED

### Warm Up

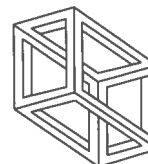
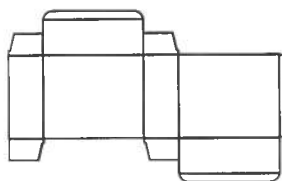
- 8.1 Three-Dimensional Solids**
- 8.2 Surface Areas of Polyhedra**
- 8.3 Volumes of Prisms**
- 8.4 Surface Area and Volume of a Cylinder**
- 8.5 Surface Area and Volume of Composite Solids**

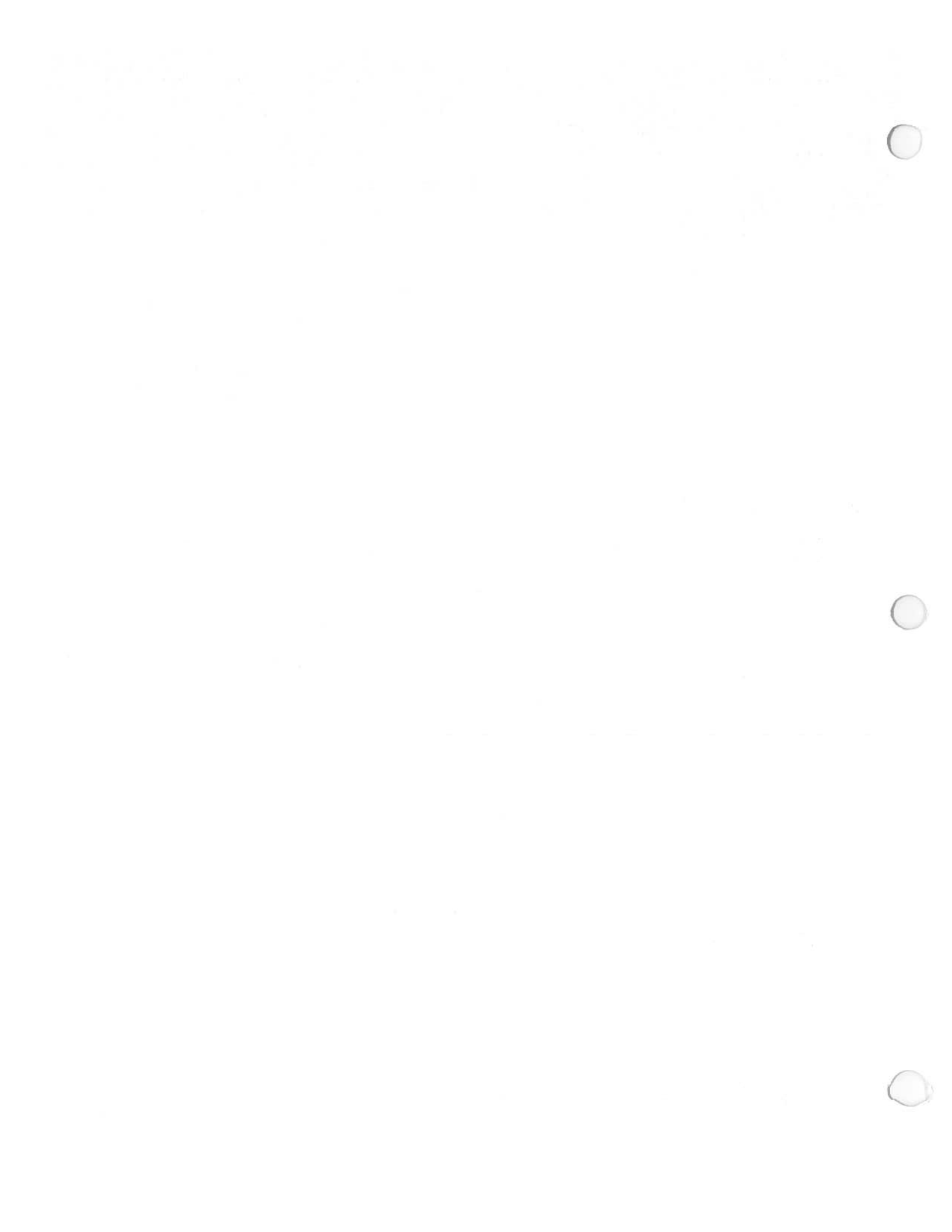
### *Review*

### *Chapter Check*

### *Problem Solving: Using the Strategies*

### Answers CHAPTER 8 Surface Area and Volume





## Skill Builder

1. Calculate.

a) 50% of 12  
=  $0.5 \times 12$

= \_\_\_\_\_

b) 25% of 122

c) 10% of 150

d) 10% of 450

e) 20% of 100

f) 20% of 10

2. Evaluate.

a)  $3^3 = 3 \times 3 \times 3 =$  \_\_\_\_\_

b)  $2^3 =$  \_\_\_\_\_ = \_\_\_\_\_

c)  $4^2 =$  \_\_\_\_\_ = \_\_\_\_\_

d)  $1^4 =$  \_\_\_\_\_ = \_\_\_\_\_

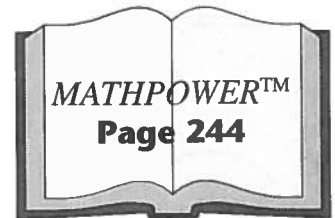
e)  $5^2 =$  \_\_\_\_\_ = \_\_\_\_\_

f)  $8^0 =$  \_\_\_\_\_

## GETTING STARTED

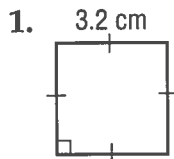


Work together with your classmates, using your *MATHPOWER*<sup>TM</sup> student text, page 244.



## Warm Up

Estimate, then calculate the area of each figure.



Est.  
 $A = l \times w$   
 $= 3 \times 3$   
 $=$  \_\_\_\_\_  $\text{cm}^2$

Round calculated answers to 2 decimal places.  
 Calculate



$A = l \times w$

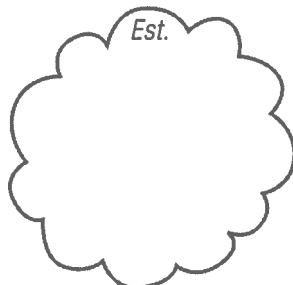
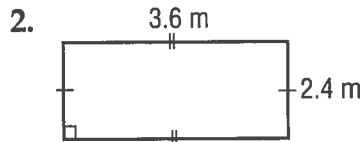
← Formula

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

← Substitute

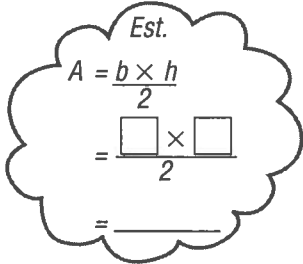
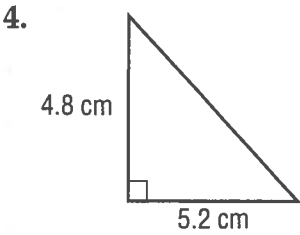
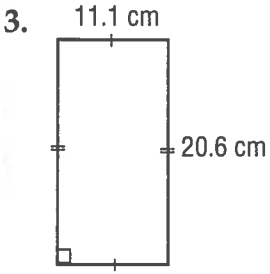
$=$  \_\_\_\_\_  $\text{cm}^2$

← Calculate





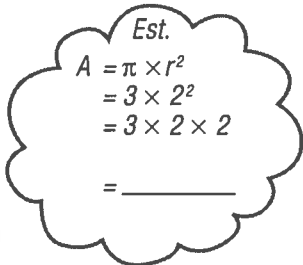
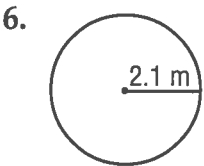
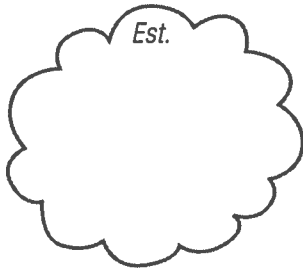
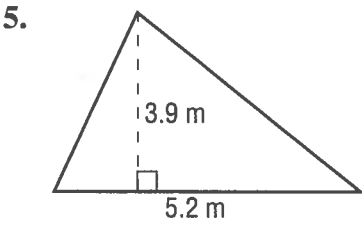
Calculate area.



$$A = \frac{b \times h}{2} \quad \text{or} \quad A = \frac{1}{2} \times b \times h$$

$$= \frac{4.8 \times 5.2}{2} \quad \text{or} \quad = \frac{1}{2} \times 4.8 \times 5.2$$

$$= \underline{\hspace{2cm}} \text{ cm}^2 \quad = \underline{\hspace{2cm}} \text{ cm}^2$$

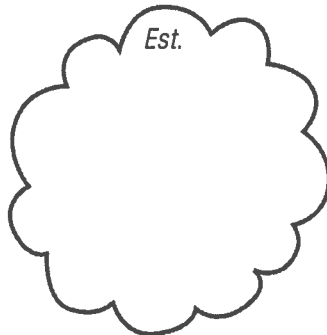
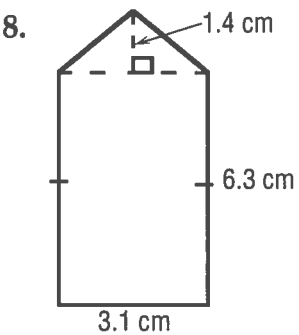
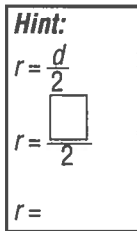
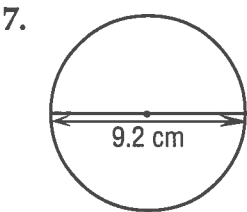


$$A = \pi \times r^2$$

$$= 3.14 \times 2.1 \times 2.1$$

$$= \underline{\hspace{2cm}} \text{ m}^2$$

Round answers to 2 decimal places.



Triangle      Rectangle

Total area: \_\_\_\_\_

# Mental Math



NO CALCULATOR

## 1. Add.

$$\begin{array}{r} \text{a) } 17 \\ + 14 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{b) } 27 \\ + 14 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{c) } 36 \\ + 15 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{d) } 46 \\ + 15 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{e) } 55 \\ + 16 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{f) } 65 \\ + 16 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{g) } 74 \\ + 17 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{h) } 84 \\ + 17 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{i) } 93 \\ + 18 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{j) } 23 \\ + 18 \\ \hline \\ \hline \end{array}$$

## 2. Subtract.

$$\begin{array}{r} \text{a) } 60 \\ - 11 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{b) } 70 \\ - 11 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{c) } 55 \\ - 12 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{d) } 35 \\ - 12 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{e) } 46 \\ - 13 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{f) } 76 \\ - 13 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{g) } 78 \\ - 14 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{h) } 98 \\ - 14 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{i) } 49 \\ - 15 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{j) } 79 \\ - 15 \\ \hline \\ \hline \end{array}$$

## 3. Calculate.

$$\text{a) } 4 + 6 - 10 = \underline{\hspace{2cm}}$$

$$\text{b) } 3 - 3 + 7 = \underline{\hspace{2cm}}$$

$$\text{c) } 5 - 5 + 8 = \underline{\hspace{2cm}}$$

$$\text{d) } 7 - 7 + 15 = \underline{\hspace{2cm}}$$

$$\text{e) } 1 + 9 - 2 = \underline{\hspace{2cm}}$$

$$\text{f) } 6 + 4 - 9 = \underline{\hspace{2cm}}$$

$$\text{g) } 3 - 3 + 1 = \underline{\hspace{2cm}}$$

$$\text{h) } 1 + 9 - 4 = \underline{\hspace{2cm}}$$

$$\text{i) } 7 + 3 + 5 = \underline{\hspace{2cm}}$$

## 4. Multiply.

$$\begin{array}{r} \text{a) } 101 \\ \times 3 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{b) } 101 \\ \times 5 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{c) } 202 \\ \times 4 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{d) } 1001 \\ \times 7 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{e) } 202 \\ \times 6 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{f) } 303 \\ \times 8 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{g) } 707 \\ \times 2 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{h) } 2002 \\ \times 3 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{i) } 404 \\ \times 9 \\ \hline \\ \hline \end{array}$$

$$\begin{array}{r} \text{j) } 505 \\ \times 8 \\ \hline \\ \hline \end{array}$$

## 5. Divide.

$$\text{a) } 4 \overline{)436}$$

$$\text{b) } 5 \overline{)535}$$

$$\text{c) } 3 \overline{)123}$$

$$\text{d) } 6 \overline{)186}$$

$$\text{e) } 7 \overline{)749}$$

$$\text{f) } 8 \overline{)856}$$

$$\text{g) } 3 \overline{)219}$$

$$\text{h) } 7 \overline{)287}$$

$$\text{i) } 6 \overline{)426}$$

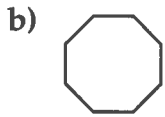
$$\text{j) } 9 \overline{)945}$$

# Skill Builder

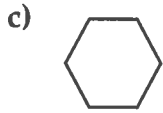
1. Match each polygon with its name.



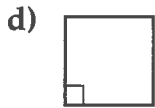
pentagon



triangle



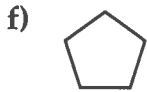
square



octagon



hexagon



rectangle

2. Estimate.

a)  $\$5.34 + \$99.25$

Est.  $5 + 100 =$  \_\_\_\_\_

b)  $\$61.26 - \$8.90$

Est. \_\_\_\_\_

c)  $\$0.91 + \$1.84$

Est. \_\_\_\_\_

d)  $\$39.20 - \$31.20$

Est. \_\_\_\_\_

e)  $\$1.23 - \$0.43$

Est. \_\_\_\_\_

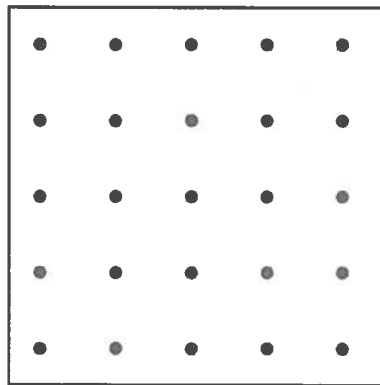
f)  $\$8.19 - \$1.99$

Est. \_\_\_\_\_

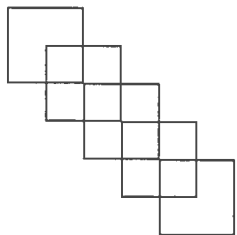
## Pattern



How many squares can you draw on the geoboard below?



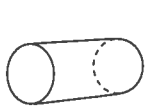
Squares may vary in size.



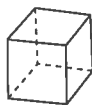
# 8.1 Three-Dimensional Solids

## Practice

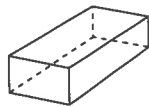
1. Use the solids shown below to answer a – g.



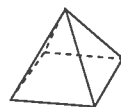
cylinder



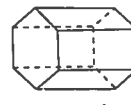
cube



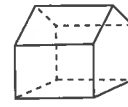
rectangular prism



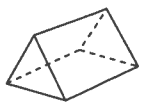
square pyramid



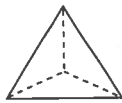
hexagonal prism



pentagonal prism



triangular prism



triangular pyramid



pentagonal pyramid



sphere



cone

a) List all the solids with **more than 4** flat faces.

\_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ ,  
 \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_ ,  
 \_\_\_\_\_ , \_\_\_\_\_ , \_\_\_\_\_

b) List all the solids with **at least 1** square face.

\_\_\_\_\_ and \_\_\_\_\_

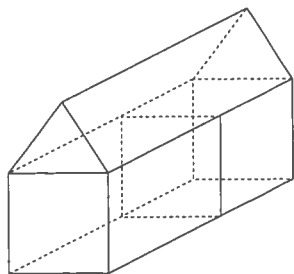
c) List all the solids with **no** flat faces. \_\_\_\_\_

d) List all the solids with **only** triangular faces. \_\_\_\_\_

e) List all the solids with **at least one** triangular face.

\_\_\_\_\_ , \_\_\_\_\_ ,  
 \_\_\_\_\_ and \_\_\_\_\_

f) The model was built using 3 solids. Name the solids.



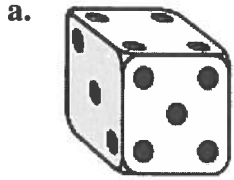
Two \_\_\_\_\_  
 and one \_\_\_\_\_

g) Draw a model of a structure built from at least 2 geometric solids.  
 Name the solids you used.

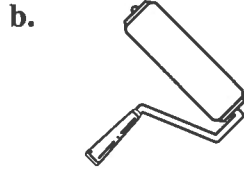
\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

## Problems and Applications

2. Name the geometric shape suggested by each object.



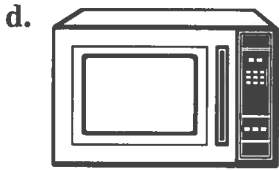
\_\_\_\_\_



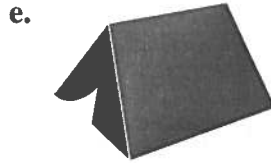
\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_

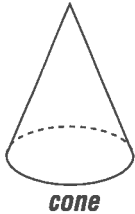
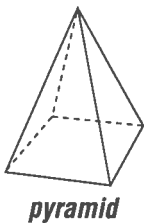
3. Describe how a **prism** is named. *See diagrams on p. 351, #1.*

\_\_\_\_\_  
\_\_\_\_\_

4. Describe how a **pyramid** is named. *See diagrams on p. 351, #1.*

\_\_\_\_\_  
\_\_\_\_\_

5. a) How are a pyramid and a cone alike?

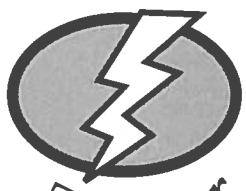


\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b) How are a pyramid and a cone different?

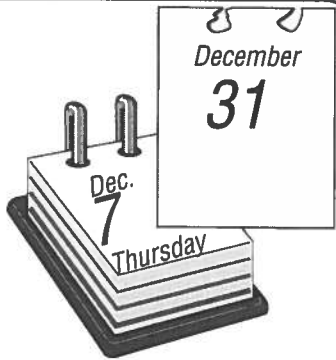
\_\_\_\_\_  
\_\_\_\_\_

**Logic**



**Zapper**

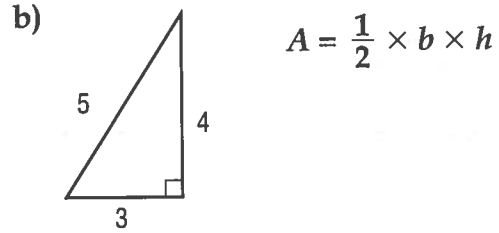
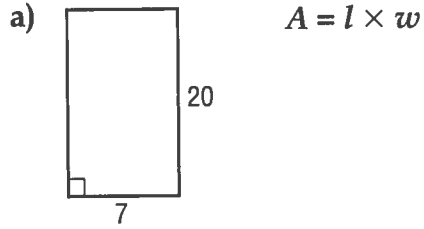
If December 7 falls on a Thursday,  
on which day of the week will  
December 31 fall?





## Skill Builder

1. Calculate the area.



2. Write each fraction as a decimal.

a)  $\frac{4}{5} = \frac{\boxed{\phantom{00}}}{10}$   
 $= 0.\boxed{\phantom{00}}$

b)  $\frac{7}{10} = \underline{\hspace{2cm}}$

c)  $\frac{3}{4} = \frac{\boxed{\phantom{00}}}{100}$   
 $= \underline{\hspace{2cm}}$

d)  $\frac{1}{5}$

e)  $\frac{9}{10}$

f)  $\frac{1}{2}$

g)  $\frac{1}{100}$

h)  $\frac{3}{50}$

i)  $\frac{12}{100}$

## 8.2 Surface Areas of Polyhedra

### Practice

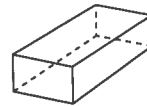
1. Match each net with its polyhedron.



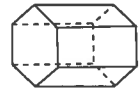
triangular prism



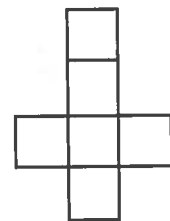
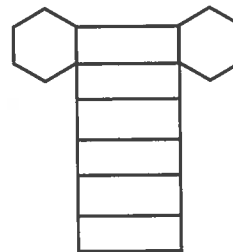
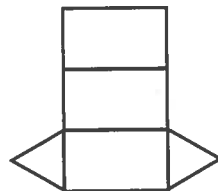
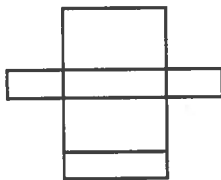
cube



rectangular prism

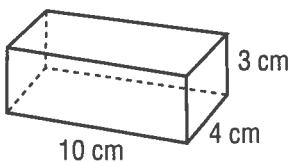


hexagonal prism

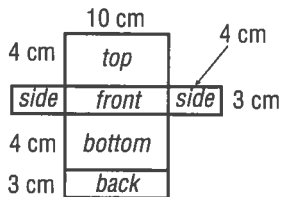


2. Draw the net. Then, calculate the surface area of each polyhedron.

a)

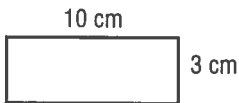


Drawing:

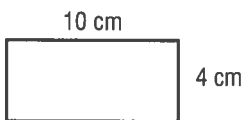


Calculate:

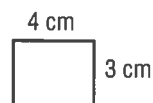
*Use  $A = l \times w$*



**Front and back**



**Top and bottom**



**Sides**

**Front:**  $A = \underline{\quad} \times \underline{\quad}$     **Top:**  $A = \underline{\quad} \times \underline{\quad}$     **Side:**  $A = \underline{\quad} \times \underline{\quad}$   
 $= \underline{\quad} \text{ cm}^2$                        $= \underline{\quad} \text{ cm}^2$                        $= \underline{\quad} \text{ cm}^2$

**Front and back:**  $2 \times \underline{\quad} \text{ cm}^2 = \underline{\quad}$

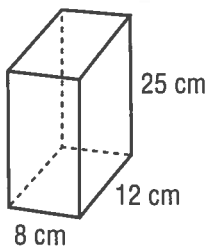
**Top and bottom:**  $2 \times \underline{\quad} \text{ cm}^2 = \underline{\quad}$

**Two sides:**  $2 \times \underline{\quad} \text{ cm}^2 = \underline{\quad}$

---

**Total Surface Area** =  $\underline{\quad}$

b)



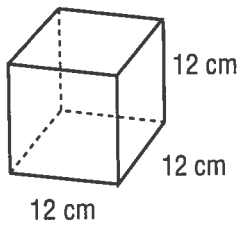
Drawing:



Calculate:

Draw the net. Then, calculate the **surface area** of each polyhedron.

c)

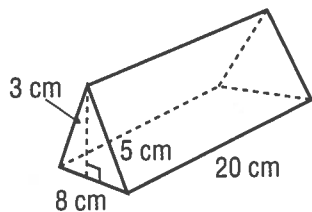


**Drawing:**

**Calculate:**

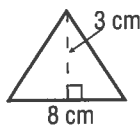


d)

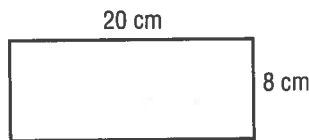


**Drawing:**

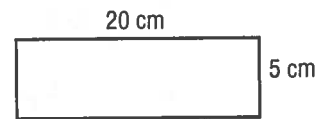
**Calculate:**



*Two ends*



*Bottom*



*Two sides*

**End:**  $A = \frac{1}{2} \times b \times h$

$$= \frac{1}{2} \times 3 \times 8$$

$$= \frac{\boxed{\phantom{000}}}{2}$$

$$= \underline{\hspace{2cm}} \text{ cm}^2$$

**Bottom:**  $A = \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$

$$= \underline{\hspace{2cm}} \text{ cm}^2$$

**Side:**  $A = \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$

$$= \underline{\hspace{2cm}} \text{ cm}^2$$

**Two ends:**  $2 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{2cm}}$

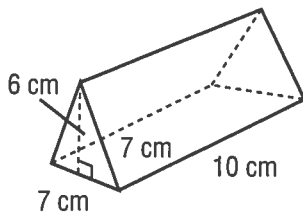
**Bottom:**  $1 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{2cm}}$

**Two sides:**  $2 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{2cm}}$

**Total Surface Area** =  $\underline{\hspace{2cm}}$

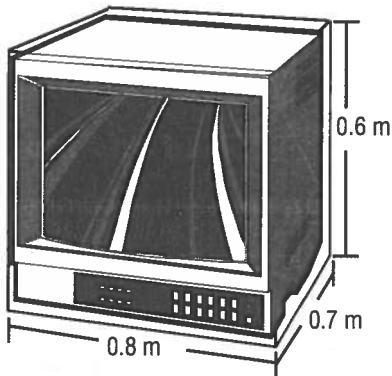
Draw the net. Then, calculate the *surface area* of each polyhedron.

e)



### Problems and Applications

3. a) The Chan's television is delivered in a cardboard box. Calculate the least amount of cardboard needed to make the box.



**Top and Bottom:**

**Front and back:**

**Two sides:**

**Front and back:**

**Top and Bottom:**

**Two sides:**

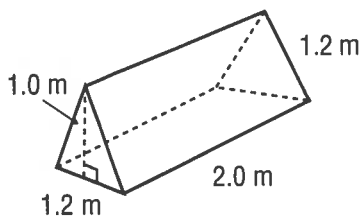
---

**Total Surface Area = \_\_\_\_\_**

Sentence: \_\_\_\_\_

b) What assumptions have you made? \_\_\_\_\_

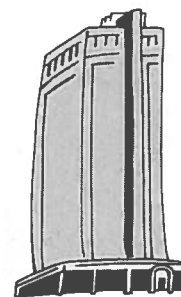
4. This small tent has an attached ground sheet. What is the least amount of material that would be needed to make this tent?



Sentence: \_\_\_\_\_

5. A highrise office tower is 165 m tall, 85 m long, and 22 m wide. What is the **total surface area** of the **sides and roof** of the tower?

*Do not include the floor.*



Sentence: \_\_\_\_\_



Make each of the following sentences true. Use the numbers 2, 3, and 6 only once in each problem.

1.  $\bigcirc - \bigcirc + \bigcirc = 7$

2.  $\bigcirc \times \bigcirc - \bigcirc = 0$

3.  $\bigcirc \times \bigcirc + \bigcirc = 20$

4.  $\bigcirc \div \bigcirc + \bigcirc = 4$

## Skill Builder

1. Find the area of each rectangle.

a)  $l = 11 \text{ cm}, w = 10 \text{ cm}$

$$A = l \times w$$

b)  $l = 3 \text{ m}, w = 1.9 \text{ m}$

Show  
your  
work!

Show your  
work.



2. Calculate.

a) 50% of 50

b) 10% of 70

c) 20% of 70

"of"  
means  
multiply

$$= 0.5 \times 50$$

$$= \underline{\hspace{2cm}}$$

d) 60% of 300

e) 100% of 76

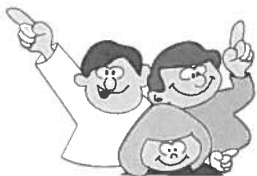
f) 30% of 60

3. There is *one* mistake in the box below. Shade it.

x	3	5	7	9
4	12	20	28	36
6	18	30	49	54
8	24	40	56	72
2	6	10	14	18

What should  
the number be? \_\_\_\_\_

## LEARNING TOGETHER Estimating and Measuring Volume



Work together with your classmates, using your *MATHPOWER*<sup>TM</sup> student text, pages 250 and 251.

*MATHPOWER*<sup>TM</sup>  
Pages  
250 to 251

## Skill Builder

1. Calculate the area.

a) a square with side 5 cm

b) a rectangle with length 8 m  
and width 4 m

Formulas:

$$A = l \times w$$

$$A = \frac{1}{2} \times b \times h$$

Continues on next page. ➔

Calculate the *area*.

- c) a triangle with base 6 cm and height 3 cm

- d) a rectangle with length 9 m and width 1 m

**Formulas:**  
 $A = l \times w$   
 $A = \frac{1}{2} \times b \times h$

2. Complete each table.

Decimal	Percent
a) 0.3	
b) 0.45	45%
c) 0.04	
d) 0.5	
e) 0.01	

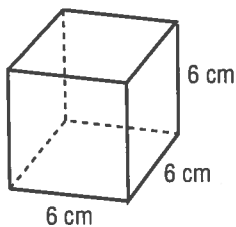
Decimal	Percent
f) 3.61	361%
g) 1.25	
h) 1	
i) 1.01	
j) 2	

## 8.3 Volumes of Prisms

### Practice

1. Calculate the *volume* of each prism.

a)



$$V = \text{area of base} \times \text{height}$$

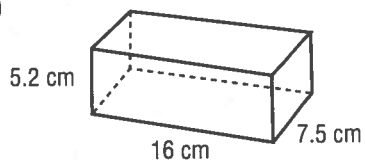
$$= l \times w \times h$$

$$= \underline{\quad} \times \underline{\quad} \times \underline{\quad}$$

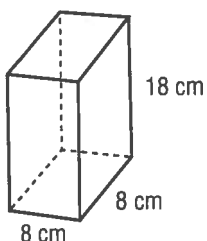
$$= \boxed{\quad} \text{ cm}^3$$



b)

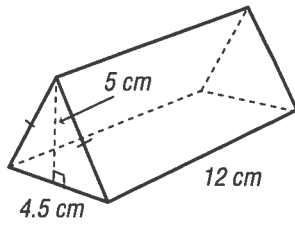


c)



Calculate the *volume* of each prism.

d)



$$V = \text{area of base} \times \text{height}$$

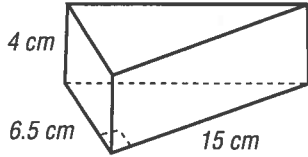
$$V = \frac{b \times h}{2} \times \text{height}$$

$$= \frac{1}{2} \times 5 \times 4.5 \times 12$$

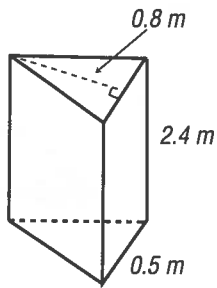
Press  $\boxed{C} \ 5 \ \boxed{\times} \ 4.5 \ \boxed{\times} \ 12 \ \boxed{\div} \ 2 \ \boxed{=}$

$$V = \boxed{\phantom{000}} \text{ cm}^3$$

e)

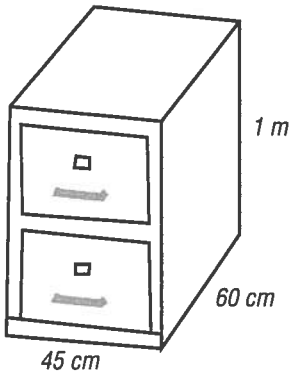


f)



## Problems and Applications

2. Calculate the volume of the filing cabinet, in **cubic metres**.



$$60 \text{ cm} = 0.6 \text{ m}$$

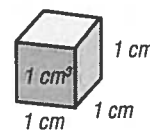
$$45 \text{ cm} = \underline{\hspace{2cm}} \text{ m}$$



3. a) How many rectangular prisms can you make with 12 unit cubes in each one?

Draw each prism.

Use unit cubes or cube-a-links to build each one.

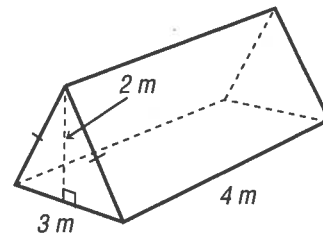


b) What is the volume of each prism? \_\_\_\_\_

4. A tent is 4 m long, 3 m wide, and 2 m high.

a) What is the volume of the tent?

**Volume = Area of base × height**



b) How many campers could sleep in this tent? \_\_\_\_\_

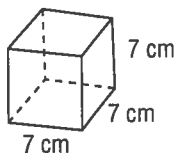
Explain how you would arrange them to sleep.

Remember, they must be comfortable.



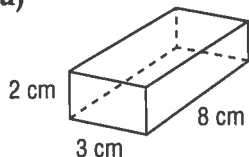
### Skill Builder

1. Draw the net and calculate the surface area of the cube.

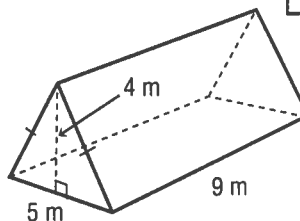


2. Calculate the volume of each prism.

a)



b)



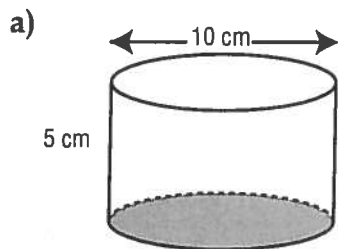
**Volume = Area of base × height**

# 8.4 Surface Area and Volume of a Cylinder Practice



Round all answers to 1 decimal place.

1. Calculate the surface area of each cylinder.



**Hint:**  
 $r = \frac{d}{2}$   
 $r = \frac{\square}{2}$   
 $r = \underline{\hspace{1cm}}$

**One end:**  
 $A = \pi \times r^2$   
 $= 3.14 \times 5 \times 5$   
 $= \underline{\hspace{1cm}}$

The length of the rectangle equals the circumference of the circle.

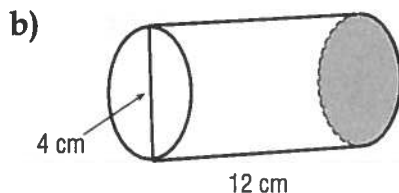
$C = \pi \times d$   
 $= 3.14 \times 10$   
 $= \underline{\hspace{1cm}}$

**One side:**  
 $A = l \times w$   
 $= \underline{\hspace{1cm}} \times 5$   
 $= \underline{\hspace{1cm}}$

**Two ends:**  $2 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{1cm}}$

**One side:**  $1 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{1cm}}$

**Total Surface Area** =  $\underline{\hspace{1cm}}$



**Hint:**  
 $r = \frac{d}{2}$   
 $r = \frac{\square}{2}$   
 $r = \underline{\hspace{1cm}}$

**One end:**  
 $A = \pi \times r^2$   
 $= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$   
 $= \underline{\hspace{1cm}} \text{ cm}^2$

$C = \pi \times d$   
 $= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$   
 $= \underline{\hspace{1cm}}$

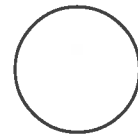
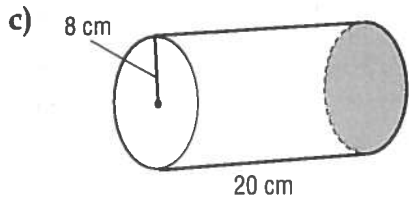
**One side:**  
 $A = l \times w$   
 $= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$   
 $= \underline{\hspace{1cm}} \text{ cm}^2$

**Two ends:**  $2 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{1cm}}$

**One side:**  $1 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{1cm}}$

**Total Surface Area** =  $\underline{\hspace{1cm}}$

Calculate the **surface area** of each cylinder.



**Ends:**

$$d = 2 \times r$$

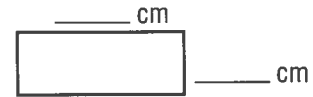
$$= 2 \times \underline{\hspace{1cm}}$$

$$= \underline{\hspace{1cm}}$$

$$C = \pi \times d$$

$$= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$$

$$= \underline{\hspace{1cm}}$$



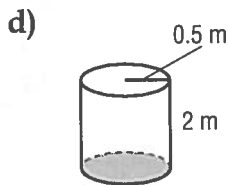
**Side:**

**Two ends:**  $2 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{2cm}}$

**One side:**  $1 \times \underline{\hspace{1cm}} \text{ cm}^2 = \underline{\hspace{2cm}}$

---

**Total Surface Area** =  $\underline{\hspace{2cm}}$

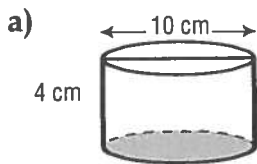


$$d = 2 \times r$$

$$= 2 \times \underline{\hspace{1cm}}$$

$$= \underline{\hspace{1cm}}$$

2. Find the **volume** of each cylinder.



$$r = \frac{d}{2}$$

$$= \underline{\hspace{1cm}}$$

$$= \underline{\hspace{1cm}}$$

$$V = \text{Area of base} \times \text{height}$$

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

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

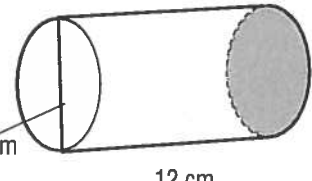
$$= \underline{\hspace{1cm}} \times 5^2 \times 4$$

*Substitute*

$$= \underline{\hspace{1cm}} \times 5 \times 5 \times 4$$

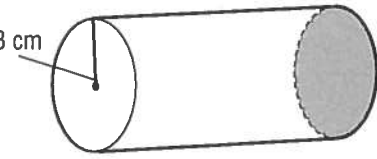
**Volume** =  $\underline{\hspace{2cm}} \text{ cm}^3$

Find the **volume** of each cylinder.

b)   $r =$

$V = \text{Area of base} \times \text{height}$   
 $V = \pi \times r^2 \times h$

$V = \pi \times r^2 \times h$   
 $= \underline{\quad} \times \underline{\quad} \times \underline{\quad}$  ← Substitute  
 $= \underline{\hspace{2cm}}$

c)  20 cm

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



**Problems and Applications**

3. a) The glue stick container has a radius of 1.5 cm and a height of 10.5 cm. What is the **volume** of the container?

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

Sentence: \_\_\_\_\_

b) The glue inside the glue stick container has a radius of 1.3 cm and a height of 9 cm. What is the **volume** of the glue?

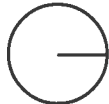


- ← Formula
- ← Substitute
- ← Calculate

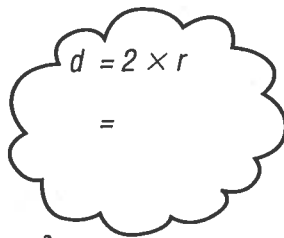
c) What is the **difference** between the volume of the container and the volume of the glue?

4. The Durams have a water heater with a radius of 30 cm and a height of 120 cm.

a) What is the **surface area** of the water heater?



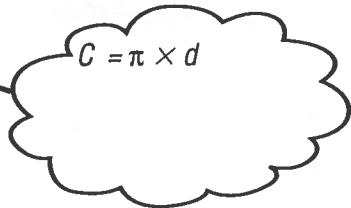
Two ends



**One end:**  $A = \pi \times r^2$



One side



**Side:**  $A = l \times w$



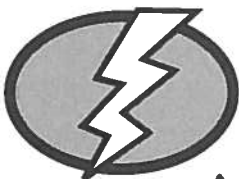
Sentence: \_\_\_\_\_

b) What is the **volume** of the water heater?

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

← Substitute

Pattern



Zapper

1. Describe the following pattern in words.

$$99 \times 2 = 198$$

$$99 \times 3 = 297$$

$$99 \times 4 = 396$$

$$99 \times 5 = 495$$

$$99 \times 6 = \underline{\hspace{2cm}}$$

$$99 \times 7 = \underline{\hspace{2cm}}$$

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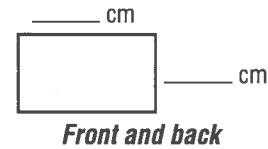
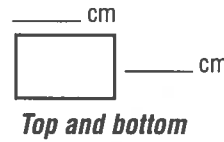
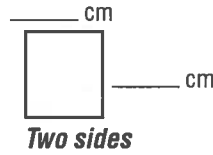
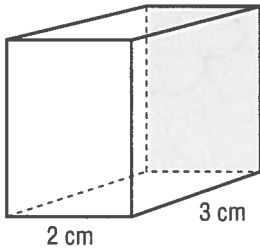
---

2. Complete the last 2 lines without using a calculator.

# Skill Builder

1. Find the surface area of the rectangular prism.

Use  $A = l \times w$ .



**One side:**

$$A = l \times w$$

$$= \square \times \square$$

$$= \underline{\hspace{2cm}} \text{ cm}^2$$

**Top:**

$$A = l \times w$$

$$= \square \times \square$$

$$= \underline{\hspace{2cm}}$$

**Front:**

$$A = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$



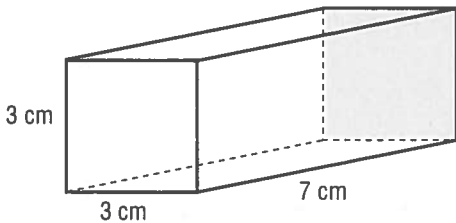
**Two sides:**  $2 \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

**Top and bottom:**  $2 \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

**Front and back:**  $2 \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

**Total Surface Area** =  $\underline{\hspace{2cm}}$

2. Find the volume of the rectangular prism.

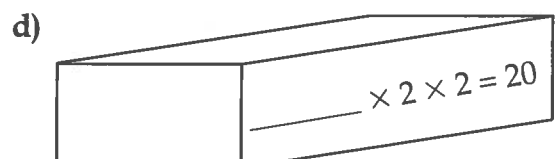
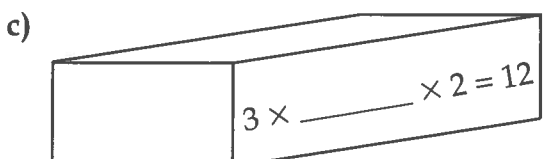
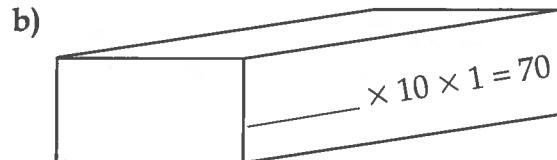
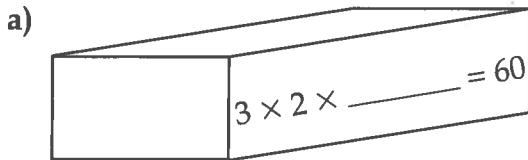


Volume = Area of base  $\times$  height

$$V = l \times w \times h$$

← Substitute

3. Find the missing factor.



# 8.5 Surface Area and Volume of Composite Figures

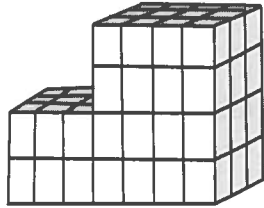
## Practice

**Surface area** is the total area of all the faces.

**Volume** is the number of cubic units in each figure or area of base times height.

1. Each solid is built from 1-cm cubes. Find the surface area and volume.

a)



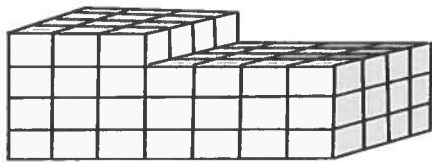
**Surface Area:**

To find the volume, divide the solid into two rectangular prisms.

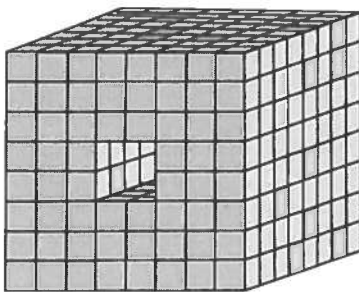
**Volume:**

Use cube-a-links or unit cubes to build each shape.

b)



2. The solid is built from 1-cm cubes. The hole passes all the way through the solid. Find the volume of the solid.



**First:** Find the volume of the solid with no hole.

$$V = l \times w \times h$$

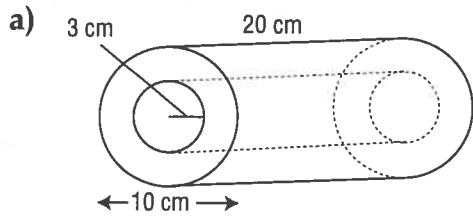
**Second:** Find the volume of the hole.

**Third:** Subtract the two volumes.



# Problems and Applications

3. Calculate the *volume* of each solid.



$$r = \frac{d}{2}$$

$$r = \frac{10}{2}$$

$$r = \boxed{\quad}$$

Volume of large cylinder,  $V_1$ :

$$V_1 = \pi \times r^2 \times h$$

$$= \underline{\hspace{2cm}} \leftarrow \text{Substitute}$$

$$= \underline{\hspace{2cm}}$$

Volume of small cylinder,  $V_2$ :

$$V_2 = \pi \times r^2 \times h$$

$$= \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

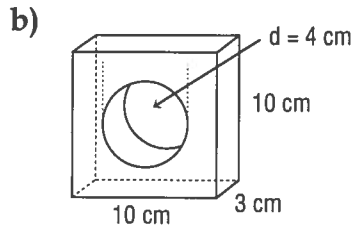
Volume of solid,  $V$ :

$$V = V_1 - V_2$$

$$= \underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$$

$$= \underline{\hspace{2cm}}$$

Sentence: \_\_\_\_\_



Volume of Prism,  $V_1$ :

$$V_1 = l \times w \times h$$

$$r = \frac{d}{2}$$

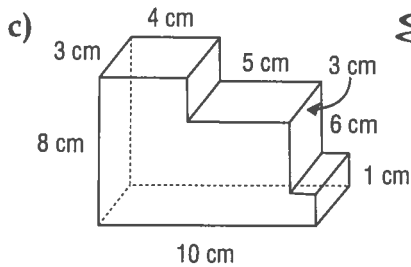
Volume of cylinder,  $V_2$ :

$$V_2 = \pi \times r^2 \times h$$

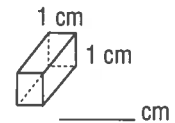
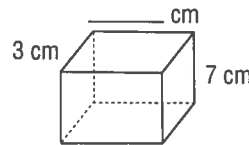
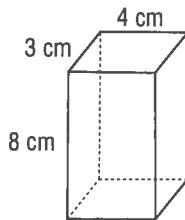
Volume of solid,  $V$ :

$$V = V_1 - V_2$$

Sentence: \_\_\_\_\_



*Hint: Break into 3 rectangular prisms.*



Sentence: \_\_\_\_\_



4. A metal storage building with no floor has the dimensions shown.

a) What is the **surface area** of the outside of the building?

*Do not find the area of the floor.*

**Surface Area of Roof:**

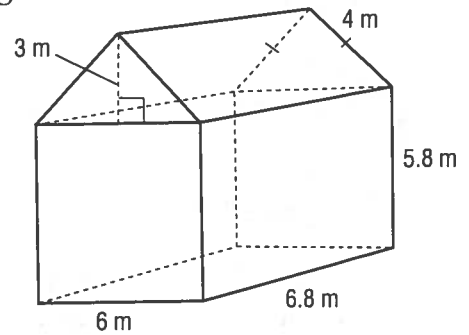
*Two triangular ends:*

$$A = \frac{b \times h}{2}$$



*Two roof sides:*

$$A = l \times w$$



**Surface Area of Walls:**



*Two ends:*



*Front and back:*

**Two triangular ends:** = \_\_\_\_\_

**Two roof sides:** = \_\_\_\_\_

**Two sides:** = \_\_\_\_\_

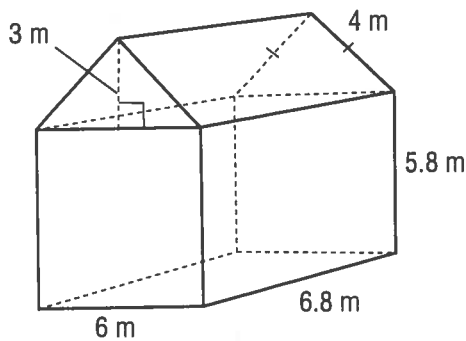
**Front and back:** = \_\_\_\_\_

*Add*

**Total Surface Area:** = \_\_\_\_\_

**Sentence:** \_\_\_\_\_

b) What is the **volume** of the building?



**First:** Find **volume** of the triangular prism.

$$V_1 = \frac{b \times h}{2} \times \text{length of roof}$$

**Second:** Find **volume** of rectangular prism.

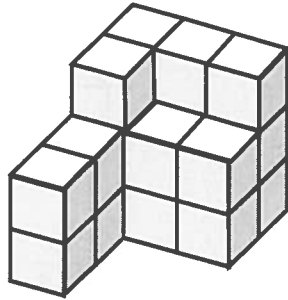
$$V_2 = l \times w \times h$$

**Third:** Add  $V_1 + V_2$

**Sentence:** \_\_\_\_\_



Assume there are no cubes missing from the back of the stack.  
Each cube represents  $1 \text{ cm}^3$ .



1. What is the **volume** of the stack?  
\_\_\_\_\_
2. What is the **surface area** of the stack?  
\_\_\_\_\_



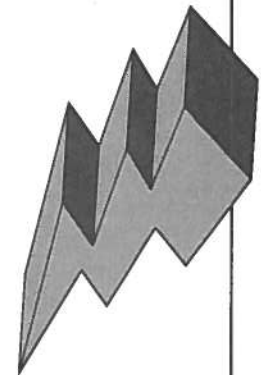
1. Draw each of the following.

a) cylinder

b) square pyramid

c) triangular prism

d) rectangular prism



See pages 394 to 400  
of your MATHPOWER™  
student text.

2. Match each word with its definition.

\_\_\_\_\_ polyhedron

a) The **sum** of the areas of the faces of a 3-dimensional figure

\_\_\_\_\_ cube

b) A pattern (  ) used to construct a polyhedron

\_\_\_\_\_ net

c) The number of **cubic units** contained in a space

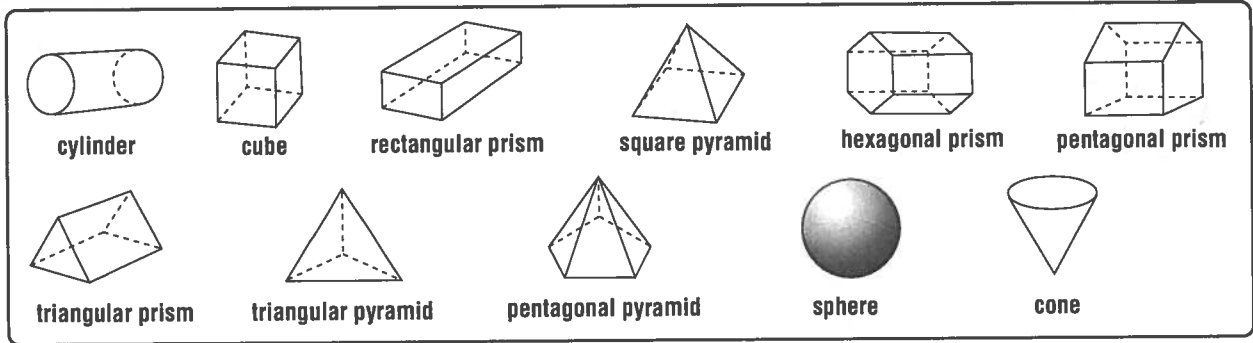
\_\_\_\_\_ surface area

d) A 3-dimensional figure with polygons as faces

\_\_\_\_\_ volume

e) A polyhedron with 6 congruent faces

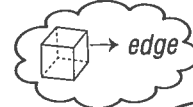
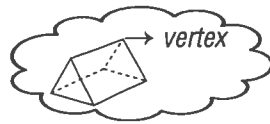
# Review



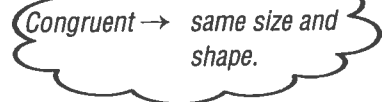
1. Using the diagrams above, name a **three-dimensional solid** with

a) 2 triangular ( $\triangle$ ) faces and 3 rectangular ( $\square$ ) faces \_\_\_\_\_

b) 8 vertices \_\_\_\_\_ c) 8 edges \_\_\_\_\_



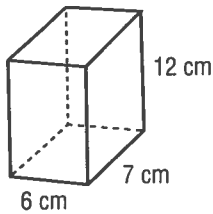
d) 4 congruent faces. \_\_\_\_\_



2. Calculate each **surface area**.

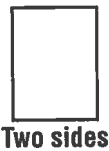
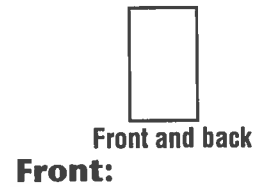
*Use  $A = l \times w$*

a)



$$\text{Top: } A = l \times w \\ = 6 \times 7$$

= \_\_\_\_\_



**Side:**

**Top and bottom:**  $2 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

**Front and back:**  $2 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

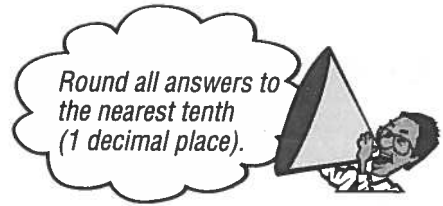
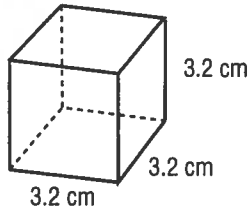
**Two sides:**  $2 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

**Total Surface Area** = \_\_\_\_\_

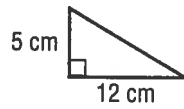
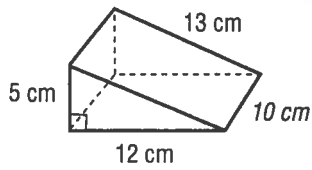


Calculate each *surface area*.

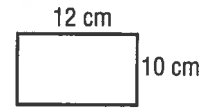
b)



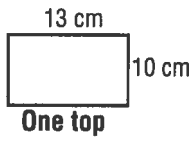
c)



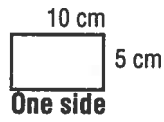
Front and back



One bottom



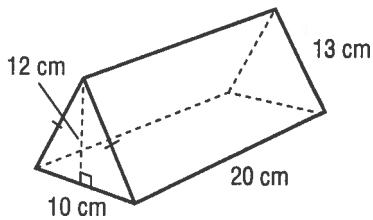
One top



One side

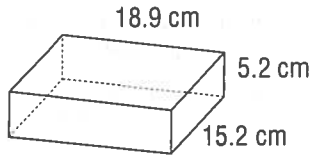
<b>Front and back:</b>	$2 \times$ _____ = _____
<b>One bottom:</b>	= _____
<b>One top:</b>	= _____
<b>One side:</b>	= _____
<hr/>	
<b>Total Surface Area</b>	= _____

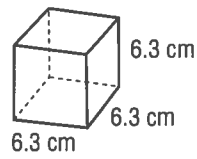
d)

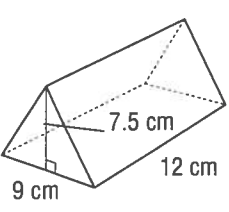


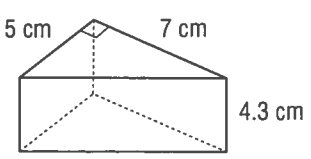
3. Calculate each volume.

Volume = Area of base  $\times$  height

a)   $V = l \times w \times h$   
\_\_\_\_\_

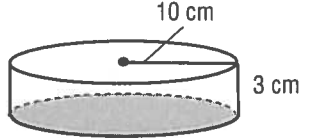
b) 

c)   $V = \left(\frac{b \times h}{2}\right) \times \text{height}$   
 $= \frac{9 \times 7.5}{2} \times \square$   
 $= \underline{\hspace{2cm}}$

d) 

Base is the triangle.

4. Calculate the surface area of each cylinder.

a)   $\pi \approx 3.14$

$d = 2 \times r$   
 $d = \underline{\hspace{1cm}}$

**Top and bottom**  
**Top:**  $A = \pi \times r^2$   
 $= 3.14 \times 10^2$   
 $= 3.14 \times 10 \times 10$   
 $= \underline{\hspace{2cm}}$

$C = \pi \times d$   
 $= 3.14 \times 20$   
 $= \underline{\hspace{1cm}} \text{ cm}$

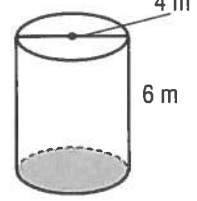
**Side**  
**Side:**  $A = l \times w$   
 $= \square \times 3$   
 $= \underline{\hspace{2cm}}$

**Top and bottom:**  $2 \times \underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

**Side:**  $\underline{\hspace{1cm}} = \underline{\hspace{1cm}}$

---

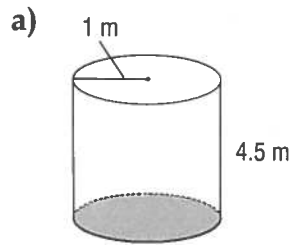
**Total Surface Area:**  $= \underline{\hspace{2cm}}$

b)  **Top:** **Side:**

**Hint:**  
 $r = \frac{d}{2}$   
 $r = \underline{\hspace{1cm}}$

5. Calculate the *volume* of each cylinder.

*Volume = Area of base × height*



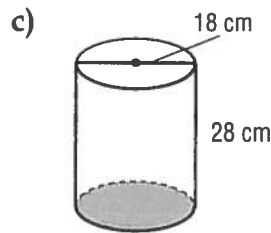
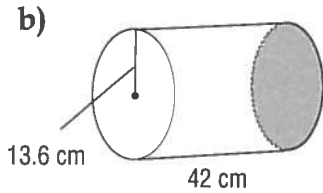
$$V = \pi \times r^2 \times h$$

$$= 3.14 \times 1^2 \times \square$$

$$= 3.14 \times 1 \times 1 \times \square$$

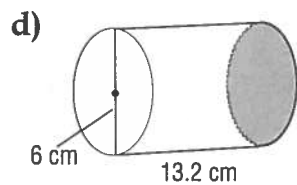
$$= \underline{\hspace{2cm}} \text{ m}^3$$

Base is a circle.



$r = \frac{d}{2}$   
 $r = \underline{\hspace{1cm}}$

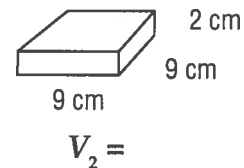
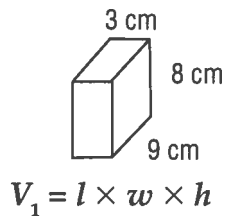
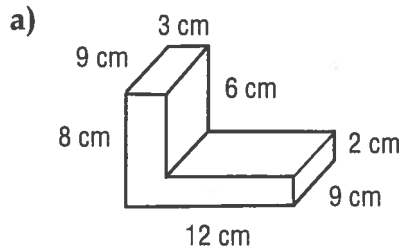
*Formula*  
*Substitute*  
*Calculate*



$r = \frac{d}{2}$   
 $r = \underline{\hspace{1cm}}$

*Formula*  
*Substitute*  
*Calculate*

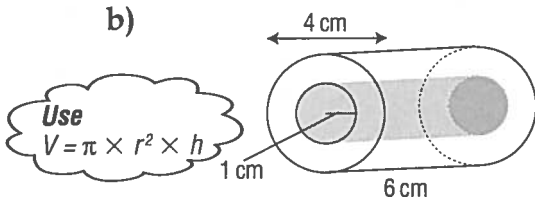
6. Calculate the *volume* of each solid.



**Total Volume** =  $V_1 + V_2$   
 =  $\underline{\hspace{1cm}} + \underline{\hspace{1cm}}$   
 =  $\underline{\hspace{2cm}}$

Calculate the volume.

b)



Volume of large cylinder ( $V_1$ )

$$V_1 =$$

Volume of small cylinder ( $V_2$ )

$$V_2 =$$

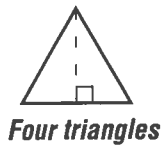
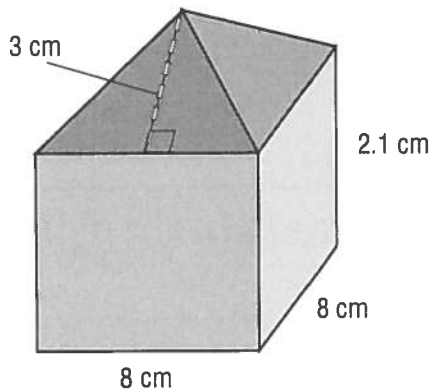
Volume of solid,  $V$ :

$$V = V_1 - V_2$$

$$= \underline{\hspace{2cm}} - \underline{\hspace{2cm}}$$

$$= \underline{\hspace{4cm}}$$

7. Calculate the surface area.



$$A_1 = \frac{b \times h}{2}$$

$$= \frac{8 \times 3}{2}$$

$$= \underline{\hspace{2cm}}$$



$$A_2 = l \times w$$



$$A_3 = l \times w$$

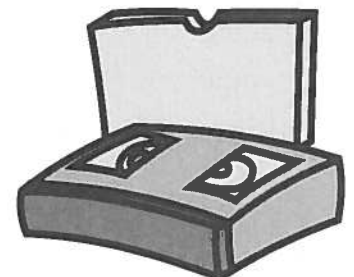
$$4 \times \text{Area of Triangle:} = 4 \times \underline{\hspace{2cm}} = \underline{\hspace{4cm}}$$

$$4 \times \text{Area of Side:} = 4 \times \underline{\hspace{2cm}} = \underline{\hspace{4cm}}$$

$$\text{Area of Bottom:} = \underline{\hspace{4cm}}$$

$$\text{Total Surface Area:} = \underline{\hspace{4cm}}$$

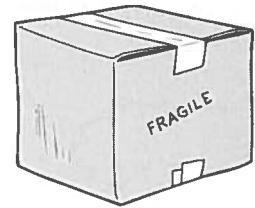
8. A video tape box has dimensions 10 cm by 20 cm by 3.2 cm. What is the **total volume** of 12 video boxes?



Sentence: \_\_\_\_\_

9. A rectangular box has dimensions 25 cm by 17.5 cm by 20 cm.

a) Calculate the **surface area** of the box.



Draw and label shapes.

b) Calculate the **volume** of the box.

Formula

Substitute

Calculate

Word

What is the name of a 5-pointed star? (★)



Find all the words listed below hidden in the squares on the right. Use a pencil and lightly shade all the letters of each word.

The words may be hidden horizontally, vertically, diagonally, and backward.

The letters not shaded will spell the name of a 5-pointed star.

- |          |            |              |
|----------|------------|--------------|
| acute    | height     | shell        |
| angle    | line       | solid        |
| base     | nets       | sphere       |
| cone     | polygon    | square       |
| cylinder | polyhedron | surface area |
| edges    | prism      | volume       |

S	P	R	I	S	M	S	E	P
U	O	H	E	I	G	H	T	O
R	L	L	I	N	E	E	U	L
F	Y	P	I	E	E	L	C	Y
A	G	N	L	D	T	L	A	H
C	O	G	S	Q	U	A	R	E
E	N	O	C	A	G	R	N	D
A	C	Y	L	I	N	D	E	R
R	S	P	H	E	R	E	T	O
E	D	G	E	S	A	B	S	N
A	V	O	L	U	M	E	A	M

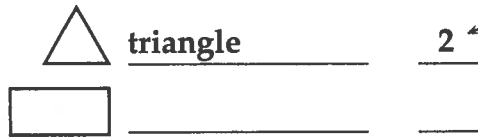


# Chapter Check



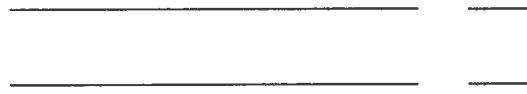
1. Name the shapes that form the faces of each polyhedron. State the number of each shape.

a)



Number of each shape

b)

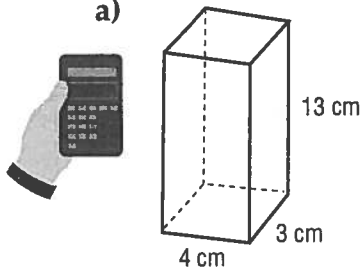


c)

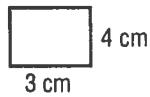


2. Calculate each surface area.

a)



Top and bottom

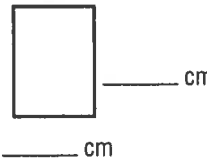


Top:  $A = l \times w$

$= \underline{\quad} \times \underline{\quad}$

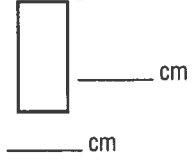
$= \underline{\quad}$

Front and back



Front:

Two sides



Side:

**Top and bottom:**  $2 \times \underline{\quad} = \underline{\quad}$

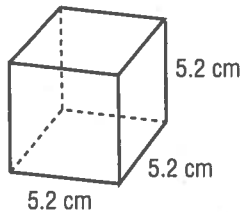
**Front and back:**  $2 \times \underline{\quad} = \underline{\quad}$

**Two sides:**  $\underline{\quad} \times \underline{\quad} = \underline{\quad}$

**Total Surface Area**  $= \underline{\quad}$

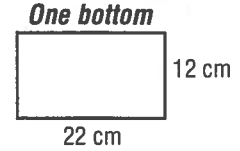
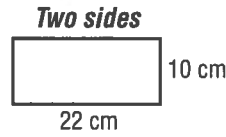
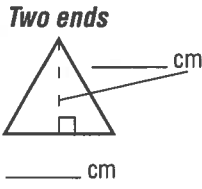
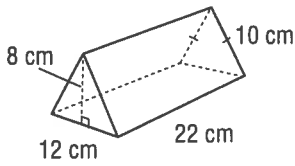


b)



Calculate each surface area.

c)



$A = \text{---} \times \text{---}$       $A = \text{---} \times \text{---}$

$$A = \frac{b \times h}{2}$$

$$= \frac{\text{---} \times \text{---}}{2}$$

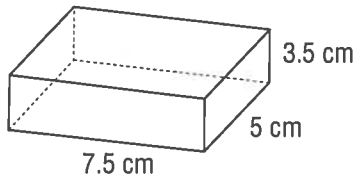
$$= \text{---}$$

Find total surface area

<b>Two Ends:</b>	$2 \times \text{---} = \text{---}$
<b>Two sides:</b>	$2 \times \text{---} = \text{---}$
<b>One Bottom:</b>	$\text{---} = \text{---}$
<b>Total Surface Area</b>	$= \text{---}$

3. Calculate each volume.

a)



$$V = l \times w \times h$$

$$= \text{---} \times \text{---} \times \text{---}$$

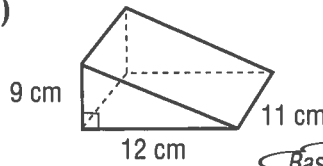
Volume =  $\text{---} \text{ cm}^3$

Formula

Substitute

Calculate

b)



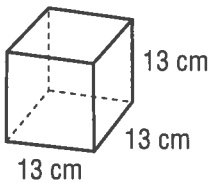
Volume = Area of base  $\times$  height

Base is a triangle.

$$V = \frac{(b \times h)}{2} \times \text{height}$$



c)

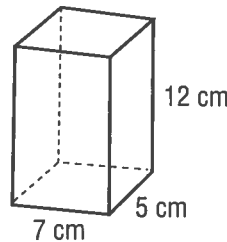


Formula

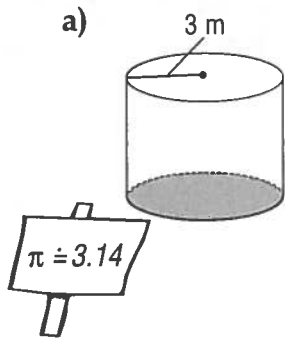
Substitute

Calculate

d)



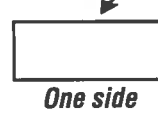
4. Calculate each surface area.



$$d = 2 \times r$$

$$= 2 \times \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$



$$C = \pi \times d$$

$$= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

**One end:**  $A = \pi \times r^2$

**One side:**  $A = l \times w$

$$= \underline{\hspace{2cm}} \times 3^2$$

$$= \underline{\hspace{2cm}} \times 8.2$$

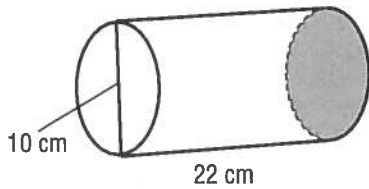
$$= \underline{\hspace{2cm}} \times 3 \times 3$$

$$= \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}}$$

<b>Two ends:</b> $2 \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
<b>One side:</b> $\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$
<b>Total Surface Area:</b> $= \underline{\hspace{2cm}}$

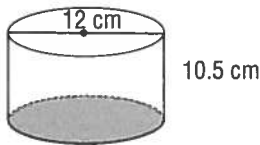
b)



$r = \frac{d}{2}$
$= \underline{\hspace{2cm}}$
$= \underline{\hspace{2cm}}$

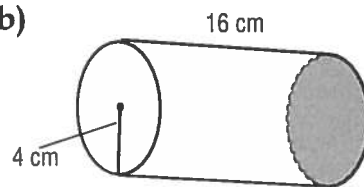
5. Calculate each volume.

a)



$r = \frac{d}{2}$
$= \underline{\hspace{2cm}}$

b)



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

Formula

$$= \underline{\hspace{2cm}} \times \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

Substitute

$$= \underline{\hspace{2cm}}$$

Calculate

6. A rectangular box has a length of 15 cm, a width of 8 cm, and a height of 22 cm. What is the volume of the box?



Formula

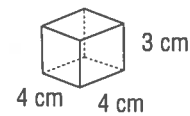
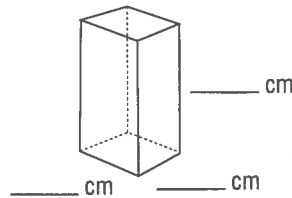
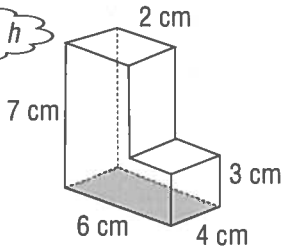
Substitute

Calculate

7. Calculate the volume.

Divide solid into two rectangular prisms.

$V = l \times w \times h$



$V_1 = l \times w \times h$

Formula

$V_2 =$  \_\_\_\_\_

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

Substitute

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

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

Calculate

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

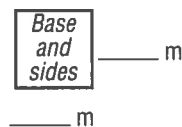
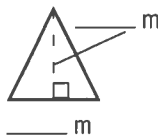
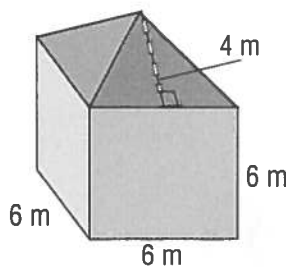
**Total Volume**  $= V_1 + V_2$

Add

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

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

8. Calculate the surface area.



$A = \frac{b \times h}{2}$

Formula

$A = l \times w$

Substitute

Calculate

4 triangles:  $4 \times$  \_\_\_\_\_  $=$  \_\_\_\_\_

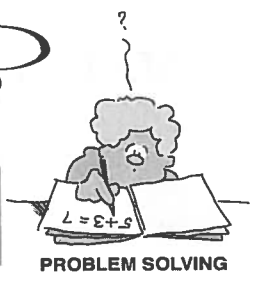
1 base: \_\_\_\_\_  $=$  \_\_\_\_\_

4 sides:  $4 \times$  \_\_\_\_\_  $=$  \_\_\_\_\_

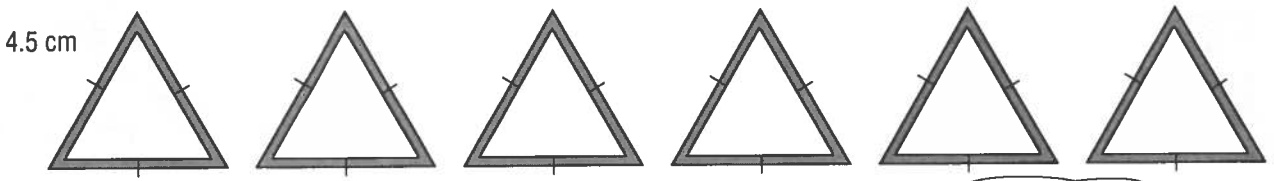
**Total Surface Area:**  $=$  \_\_\_\_\_

# Problem Solving: Using the Strategies

Show all your work on looseleaf!



1. Each of the sides of the triangles below is 4.5 cm.



a) What is the **perimeter** of each triangle?

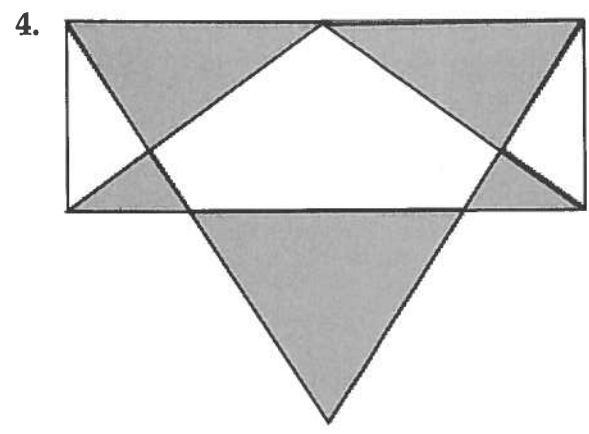
Perimeter = sum of all sides

"Sum" means to add.

- b) Trace the six triangles, then cut them out.
- c) Use the six triangles to form a **hexagon** (⬡). What is the **perimeter** of the hexagon?
- d) The six triangles are laid **side by side** to form a **parallelogram** (▭). Draw the parallelogram and find its **perimeter**.
- e) Make 1 other figure using the six triangles. Draw the figure and find its perimeter.

2. What is the smallest number divided by 4 that gives a remainder of 3? *Guess and check*

- 3. The average person uses about 95 L of drinking water each week. How much drinking water is used each week by
  - a) your family?
  - b) your class?



- How many of each polygon can be found in this diagram?
- a) triangles
  - b) rectangles
  - c) trapezoids (▭)

Work with a classmate.

# DATA BANK

See page 365 of your MATHPOWER™ student text.

1. a) What is the size of the world's largest island? \_\_\_\_\_  
b) What is the size of Canada's largest island? \_\_\_\_\_ *Baffin*

c) How many times larger is the world's largest island than Canada's largest island?

Round your answer to 1 decimal place.



Divide

See p. 365

\_\_\_\_\_

2. a) What is the flying distance from Edmonton to Vancouver?  
\_\_\_\_\_

See page 362 of your MATHPOWER™ student text.

b) How many hours would it take to fly from Edmonton to Vancouver at 550 km/h?  
\_\_\_\_\_

Round your answer to one decimal place.

See p. 362

\_\_\_\_\_

3. State the page number on which you would find each of the following.

Use the DATA BANK on pages 360 to 369 of your MATHPOWER™ student text.

- a) the flying distance from Winnipeg to Toronto \_\_\_\_\_  
b) Canada's tallest waterfall \_\_\_\_\_  
c) Halifax's average monthly precipitation \_\_\_\_\_  
d) the distance Mars is from the Sun \_\_\_\_\_  
e) Canada's longest river \_\_\_\_\_  
f) the driving distance from Saskatoon to Edmonton \_\_\_\_\_