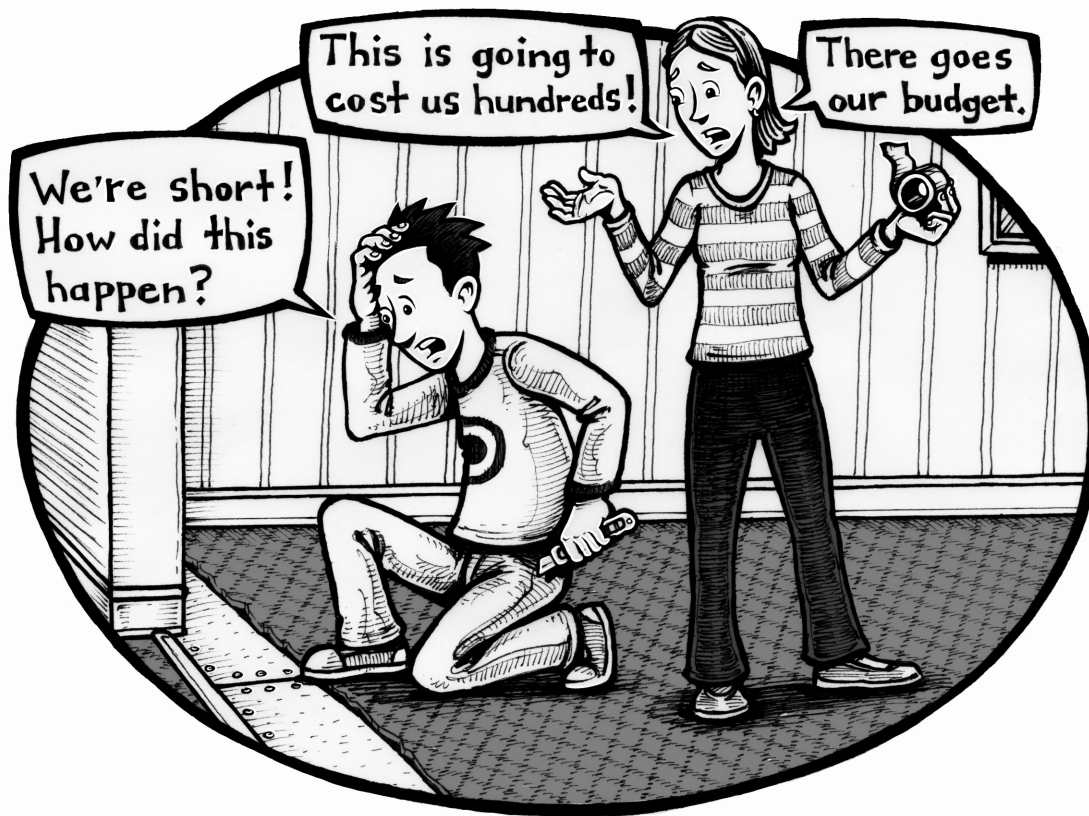# 7 Measurement and Design

1. An old saying goes, "Measure twice, cut once." Explain what you think the saying means.

_____

_____

2. What do you think the woman means by, "There goes our budget"?

_____

_____

3. If you had a budget of $2000, what home renovation project would you like to do?

_____

_____

7.1 2-D Scale Drawings

Focus: measuring, scale, proportional reasoning, problem solving

Chapter 7

Warm Up	
1. What fraction of a metre is **a)** 50 cm? _____ **b)** 25 cm? _____ **c)** 75 cm? _____	**2.** What fraction of a foot is **a)** 6 inches? _____ **b)** 3 inches? _____ **c)** 9 inches? _____
3. How many 50-cm sections are in **a)** 2 m? _____ **b)** 3 m? _____ **c)** 4.5 m? _____	**4.** How many 6-in. sections are in **a)** 18 in.? _____ **b)** 9 ft? _____ **c)** $11\frac{1}{2}$ ft? _____
5. A road map uses a scale of 1 cm : 7 km. What is the actual distance between 2 towns that are 6 cm apart on the map? _____ _____	**6.** A particular yarn for a knit sweater yields 4 rows per inch. How many rows do you need to make an arm that is 15 in. long? _____ _____

Using Scale Drawings

- A dressmaker works from a pattern.
- A landscaper works from a drawing.
- An electrician works from a blueprint.
- A truck driver works from a map.

Go to pages 187–188 to write the definition for **scale drawing** in your own words.	All of these people need to know how to read a scale drawing. A **scale drawing** is a reduced or enlarged picture of an object.

1. A bathroom floor is 8 ft long by 5 ft wide.

a) In the top-left corner of the grid above, create a scale diagram of the bathroom floor using a scale of 1 square to 1 ft. Label it Drawing A.

b) In the top-right corner of the grid above, create a scale diagram of the bathroom floor using a scale of 1 square to 2 ft. Label it Drawing B.

c) In the bottom-left corner of the grid above, create a scale diagram of the bathroom floor using a scale of 1 square to 6 in. Label it Drawing C.

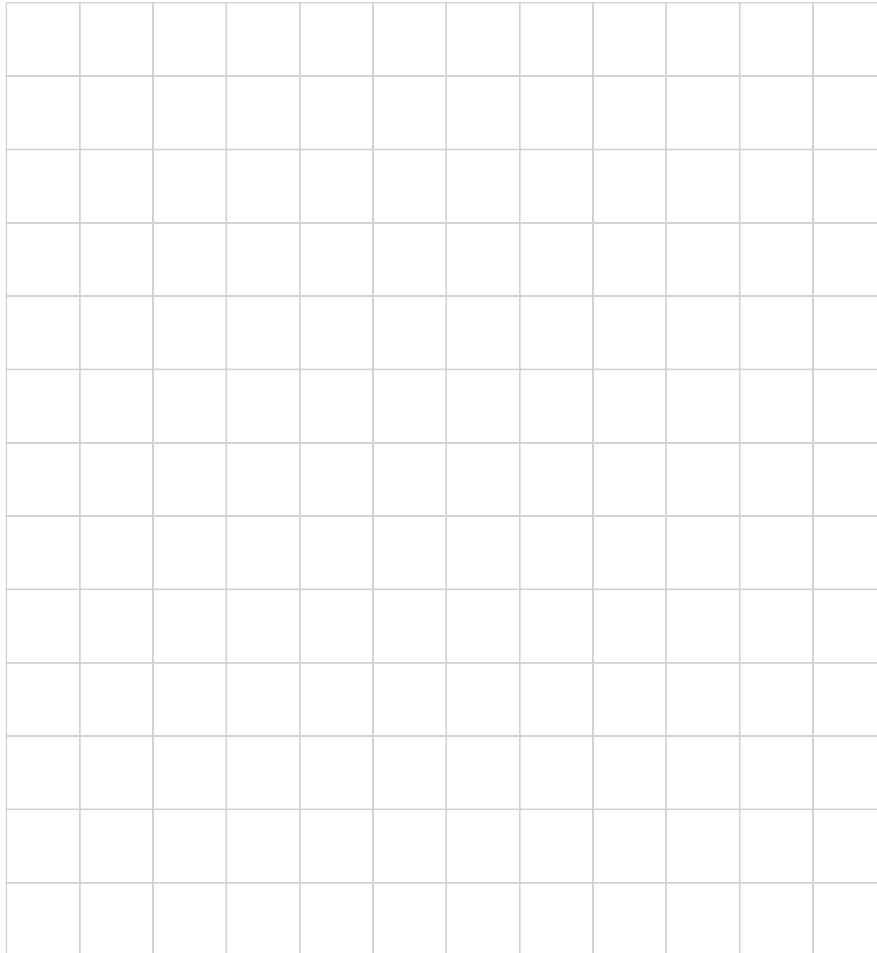**d)** A bathtub is 5' × 3'. Draw a bathtub to scale in each bathroom. Use this symbol to show the tub:
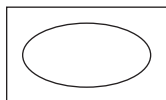
e) Which scale drawing do you prefer working with? _____ Explain why.

_____

_____

2. a) Measure the length and the width of this book in centimetres. Round to the nearest centimetre.

length = _____ cm   width = _____ cm

b) Draw a scale diagram of this book using a scale of 1 square to 3 cm.

c) Measure the diameter of 1 of the holes in the book.

Round to the nearest centimetre. _____

d) Rounding to the nearest centimetre, measure the distance

- of 1 hole from the left edge of the book _____

- of the top hole from the top of the book _____

- between the top hole and the middle hole _____

- from the bottom of the book to the bottom hole

_____

e) Draw all 3 holes to scale on your diagram above.

3. a) One wall in a family room measures 12 ft long and 8 ft high. Make a scale diagram using the scale 1 square to 6 in.

You have artwork to hang.
- Two prints are each 36" high × 24" wide.
- Two plaques are each 12" high × 18" wide.
- One photo is 21" high × 15" wide.

b) Calculate the number of squares needed to draw each piece of art to scale.

Print: _____ squares × _____ squares = _____

Plaque: _____ squares × _____ squares = _____

Photo: _____ squares × _____ squares = _____

c) Draw each piece of art on the diagram. You can cut out paper templates to help you decide where to hang the pieces.

d) How can your knowledge of proportional reasoning help you plan where to put the pictures?

_____

_____

4. When you move, you get new closets and storage areas. Designing a closet to organise your belongings is an inexpensive solution to storage challenges.

a) A closet is 3 m long and 2.4 m high. Choose an appropriate scale and draw a scale diagram of the closet as if you were looking into it.

Scale: 1 square to _____ .
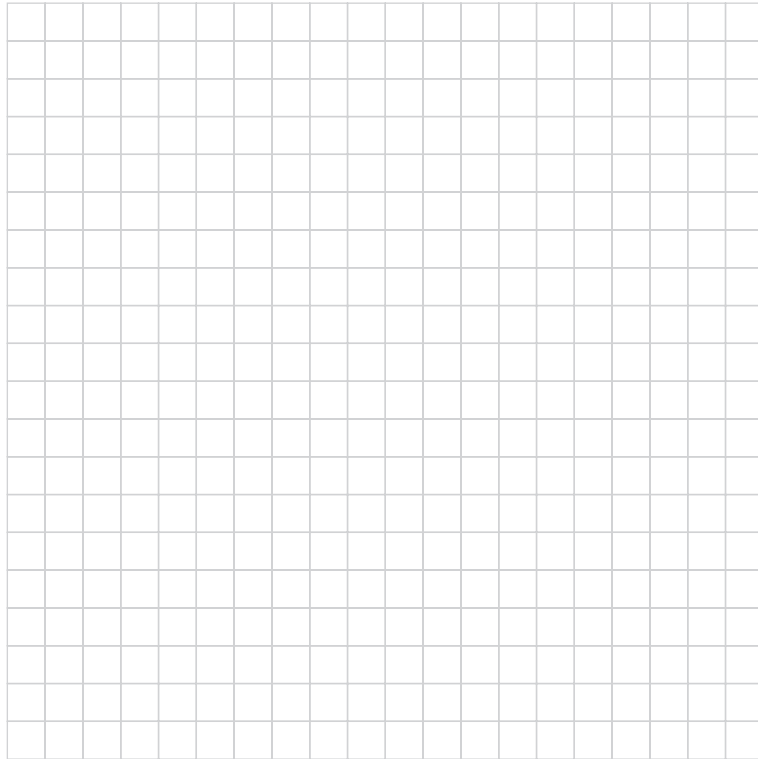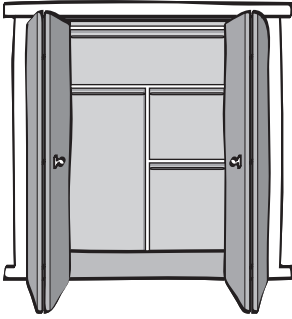
b) Design the interior of the closet with the following features:
  • At least 1 rod for hanging pants.
  • At least 1 rod for hanging shirts.
  • Drawers or baskets for socks, underwear, etc.
  • Compartments or a rack for sports equipment.
  • Shelves for sweaters, books, etc.

c) Add 1 other item of your choice to your closet design.

5. a) Measure the length and the width of your classroom. Use whichever units you prefer.

length = _____   width = _____

b) Count the number of squares along each side of

a piece of grid paper: _____ squares × _____ squares.

c) Choose a scale that allows your scale diagram to take up most of the page.

Scale: 1 square to _____ .

> Check pages 286–289 at the back of this book for grid paper.

d) Draw a scale diagram of the floor of the classroom as seen from above.

e) Mark the location of doors and windows on the diagram.

6. Your class is considering rearranging the furniture in the classroom.

a) Use another piece of grid paper to make scale templates of the big items in your classroom (desks, cabinets, white board, etc.).

b) Arrange and rearrange the templates on the diagram from #5 until you have a design you like. Do not attach the templates to the diagram.

c) Show your design to someone else. Do they have suggestions for improving it? Once you have decided on a final layout, attach the templates to the diagram.

☑ Check Your Understanding

1. Repeat #5 and #6 using an area of personal interest, such as
- another classroom, a computer lab, or a weight room
- a flower bed, a courtyard, or a parking area
- a bedroom, a garden, a kitchen, or a bathroom

2. What other situations might use a scale drawing?

Chapter

7

Skills Practice 12: The 3–4–5 Method of Checking for a 90° Angle
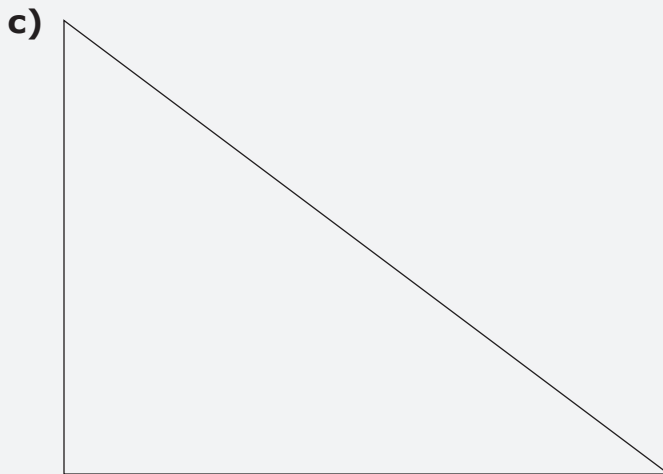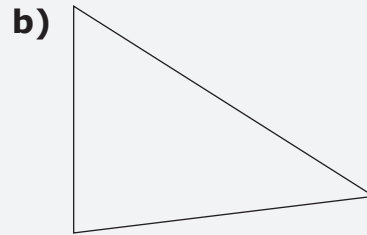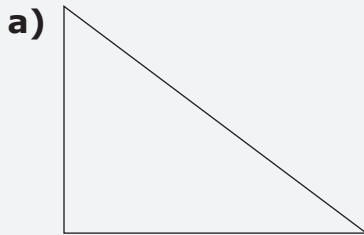
A triangle with a 90° angle has a special property.
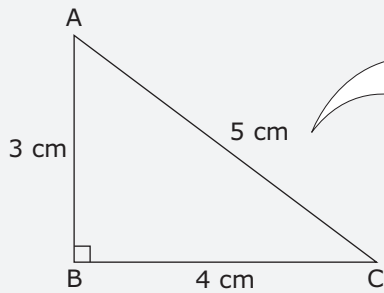
A 3–4–5 triangle is an example of a triangle that fits Pythagoras's model.

$$a^2 + b^2 = c^2$$
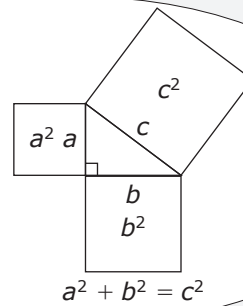
AB is 3 cm. $3^2 = 9$

BC is 4 cm. $4^2 = 16$ } $9 + 16 = 25$

AC is 5 cm. $5^2 = 25$

- When the sum of the areas of the squares on the short sides equals the area of the square on the long side, the triangle has a 90° angle.

1. Which of these triangles has a 90° angle? How do you know?

a)

b)

c)

Skills Practice 13: Start Square and You'll Finish Square

When installing floor tile, it is a good idea to start in the centre of the room and move outward toward the walls. It is important that your tiles flow perfectly horizontally and vertically from the centre. Below is a diagram of an empty room.

1. Measure the length of each of the 2 longer walls and mark the midpoint of each wall. Draw a light line between these 2 points.

2. Repeat step 1 using the 2 shorter walls.

3. The intersection of these 2 lines is the centre of the room. Use the steps below to check if the 2 lines meet at exactly 90°.

   a) Carefully measure 3 cm from the centre along the vertical line. Mark this location on the line.

   b) Measure 4 cm from the centre along the horizontal line. Mark this location on the line.

   c) Measure the distance between these 2 marks. _____

   > **Skills Practice 12: The 3–4–5 Method of Checking for a 90° Angle** on page 240 will help you with this.

4. Is your measurement in #3c) exactly 5 cm? If so, then you did #1 and #2 correctly so the lines meet at 90°. If the distance is not exactly 5 cm, your lines are not "square," meaning that they do not meet at exactly 90°. Redo steps 1 to 3.

Chapter
7

5. Why is it important to start laying tiles at the centre of the room using a 90° angle?

_____

_____

6. Check if the corners of your classroom are square.

a) Measure 3 ft along the wall from 1 side of a corner. Mark the location.

b) Measure 4 ft along the wall from the other side of the same corner. Mark the location.

c) If the corner is square and you have measured carefully, what distance should there be between the

2 marks? _____

d) Check it.

e) If you don't get the measurement you expect, redo parts a), b), and c). Is the corner square? YES   NO
Explain how you know.

_____

_____

7.2 Perimeter and Area Applications

Focus: scale, measurement, problem solving

Warm Up

1. Define perimeter.

2. Define area.

3. a) If the dimensions of a garden are given in feet, then the unit for expressing perimeter is

_____.

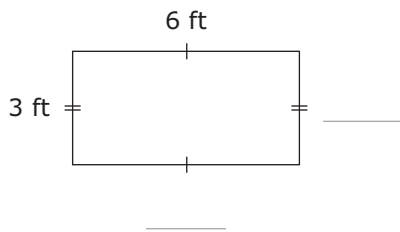**b)** The abbreviation for this unit of measure is _____.

4. a) If the dimensions of a playground are given in metres, then the unit for expressing area is

_____ _____.

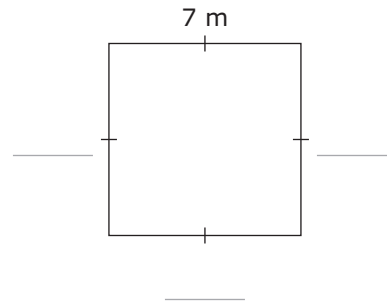**b)** The abbreviation for this unit of measure is _____.

5. Calculate $3^2 + 4^2$.

6. Calculate 5^2.

7. Fill in the missing dimensions.

6 ft

3 ft

_____

_____

8. Fill in the missing dimensions.

7 m

_____

_____

_____

9. a) Determine the perimeter of the rectangle in #7.

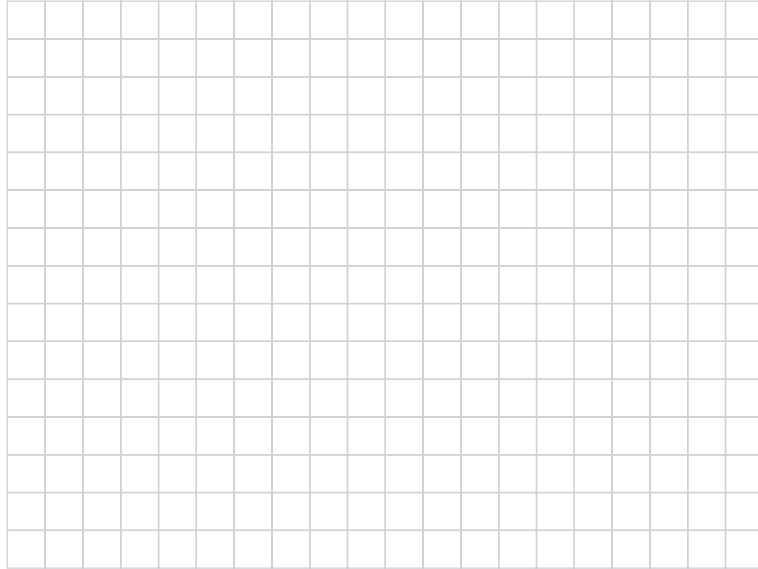**b)** Determine the area of the rectangle in #7.

10. a) Determine the perimeter of the square in #8.

b) Determine the area of the square in #8.

Applying Scale Diagrams

1. A bathroom floor is 8 ft long by 5 ft wide.

a) On the grid below, draw a scale diagram of the bathroom using a scale of 1 square to 6 inches.
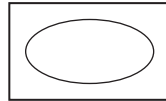
You worked with this bathroom in #1 on page 235.

For an interactive bathroom planner, go to **www. mcgrawhill. ca/books/ workplace12** and follow the links.

b) A bathtub is 5' × 3'. Draw a bathtub to scale. Use this symbol to draw the tub:

c) Mark a 2-ft wide door on your diagram.

d) Baseboard trim rests on the floor and is nailed to the base of the walls. Use a coloured pencil to show where there is baseboard in your diagram. How much baseboard do you need for the bathroom?
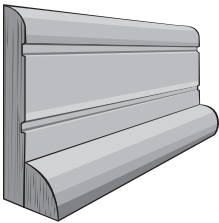
e) How many 8-foot lengths will you need? _____

f) If one 8-foot length costs $14.99, calculate the before-tax cost of all of the baseboard.

g) Calculate the cost of the baseboard, including tax.

h) Some bathrooms have vinyl flooring. On the diagram on page 244, colour the area that will be covered. Calculate the area of the floor.

i) Some bathrooms have ceramic tile flooring. How many 6" × 6" tiles would you need for this area?

j) Tiles come in boxes of 12. How many boxes do you need?

k) If a box of tiles costs $17.99, calculate the before-tax cost of the tiles you need to cover the room.
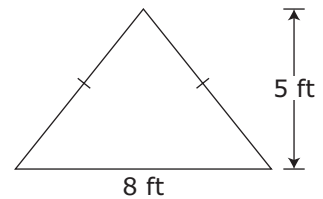
l) How much would the tiles cost after tax?
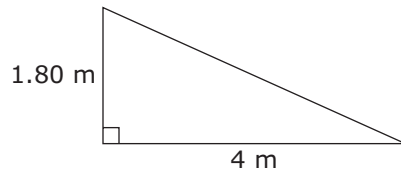
• Not all jobs or projects use just squares or rectangles.

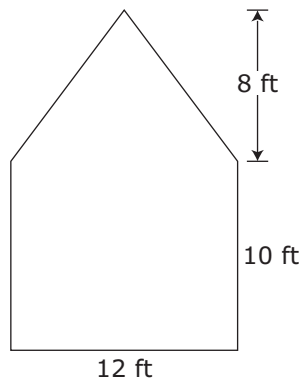**2. a)** Draw a diagonal line across the rectangle.
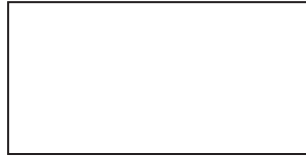
b) How does the area of each triangle relate to the area of the rectangle?

_____

_____

c) Determine the area of each of the following triangles.

1.80 m

4 m

5 ft

8 ft

d) Calculate the area of the back of a garage that needs to be painted.

8 ft

10 ft

12 ft

• Three friends have volunteered to paint their hockey team's logo at centre ice of the local rink.

• The outside edge of the circular crest must be 3 m from centre ice.

• The friends want to know the area of the ice that needs to be painted.

Estimating Circular Area

3. a) The distance between the centre of a circle and

the outside edge is called the _____. Make a sketch of the circle on the grid below.
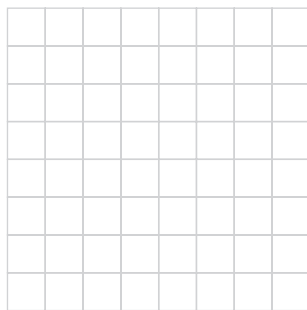
b) You can use the radius of a circle to help estimate the area of the circle. Draw 4 squares on the diagram above as shown below.
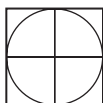
c) Calculate the area of each square.

d) Calculate r^2.

e) Calculate the area of the 4 squares.

f) Since the area of the circle is less than 4 times the radius squared, an estimate for the area of the circle to

be painted is _____.

Calculating Circular Area
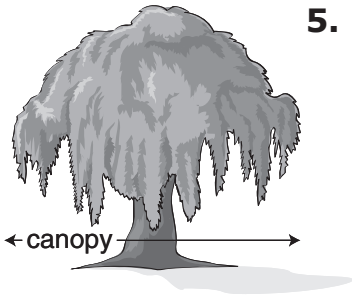
- The exact area of a circle is π times the radius squared, or $A = \pi r^2$.
- Use 3.14 to approximate π.

4. Calculate the area of the ice that will need to be painted.

$A = \pi r^2$

$= \rule{2cm}{0.4pt} \times \rule{2cm}{0.4pt} \times \rule{2cm}{0.4pt}$

$= \rule{2cm}{0.4pt}$

Rounded to the nearest square unit, the area to be

painted is _____ .

5. Suki is having a diseased willow tree removed. The grass beneath the canopy is dead, so she will put sod in its place. The tree canopy has an approximate diameter of 12 feet.

← canopy →

a) The radius of the tree canopy is _____ feet.

b) Make a sketch of the tree canopy as seen from above.

What is the scale of your diagram? _____
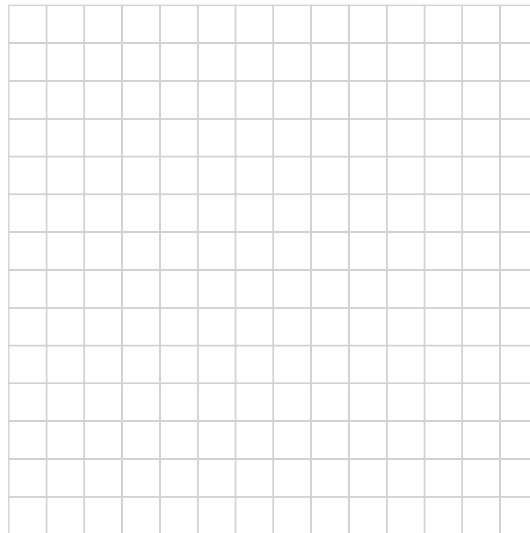
c) Estimate the area of the sod that Suki needs to buy.

d) Calculate the area of the sod needed. Round your answer up to the nearest square foot.

☑ Check Your Understanding

1. A city landscaper wants to put 3 flower beds in a rectangular grass area.

   a) The rectangle is 75 ft wide and 30 ft long. Draw a scale diagram of the rectangle on the grid below.

   What is the scale of your diagram? _____

   b) Each circular flower bed has a radius of 12 ft. Draw the flower beds to scale on the diagram.

   c) Calculate the area of each flower bed.

   d) Calculate the total area of the 3 flower beds.

   e) Calculate the area of the rectangle that is covered by grass.

7.3 Estimating the Cost of a Project

Focus: rounding, proportional reasoning, problem solving

Chapter 7

Warm Up	
1. Round to the nearest dollar. **a)** $18.99 _____ **b)** $11.29 _____ **c)** $47.88 _____	**2.** Round to the nearest $10. **a)** $18.99 _____ **b)** $11.29 _____ **c)** $47.88 _____
3. Without a calculator, add the rounded values in #1.	**4.** Without a calculator, add the rounded values in #2.
5. What is 10% of the rounded value in #3? _____	**6.** What is 10% of the rounded value in #4? _____
7. What is half of the value in #5? _____	**8.** What is half of the value in #6? _____

How Much Will It Cost?

- Estimating the cost of a project can help you decide if you will go ahead with it.
- To estimate the cost, you need to estimate the quantity of the materials needed.
- Rounding prices and estimating taxes also help you make a reasonable estimate for the total cost of a job.

1. Estimate the following values.

   **a)** 70 fence boards at $3.99 each.

   b) The tax on the 70 fence boards in part a).

   c) The perimeter of four $9\frac{1}{2}"$ by $11\frac{1}{2}"$ picture frames.

   d) The area of the glass needed for the 4 frames in part c).

2. Three cedar trees currently sit near the corner of a property.
The owners want to create a garden around the trees.
Then, they will add more cedars of the same size to fill the
garden. The scale of the diagram is 1 square to 1 foot.
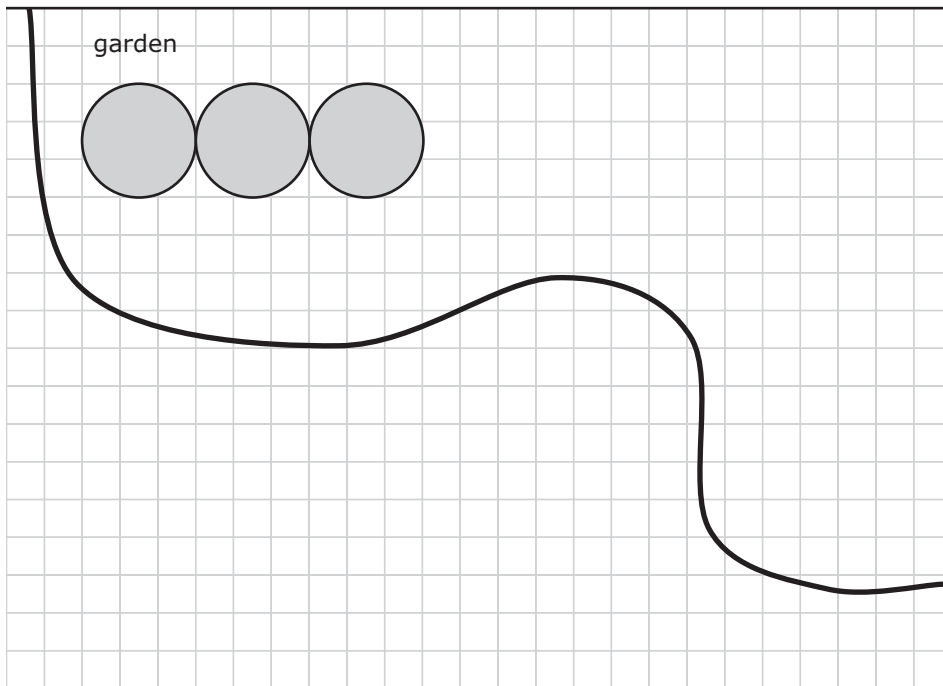
garden

a) Draw the additional cedars to fill the garden
on the diagram.

b) How many cedars did you add? _____

c) A local nursery is selling cedars for $47.99 each.
Without using a calculator, estimate the cost
of the additional cedars before tax.

d) Estimate the tax on the cedars.

e) What is your estimate of the total cost?

f) Calculate the exact total cost and compare this
to your estimate.

Chapter 7

3. Some schools run a Breakfast Club for students in the morning. Students are welcome to come for a free breakfast. Many students come because they enjoy eating with friends. The program is run by volunteers.

a) Create a list of non-food supplies that a Breakfast Club would need to get started. Complete the Estimated Cost column. Two suggestions are given.

Item	Estimated Cost	Actual Cost
Fridge	$100	
Toaster	$20	
Totals		

Go to **www. mcgrawhill. ca/books/ workplace12** and follow the links for online sources of inexpensive items.

b) Used appliances and materials are available free or for sale in most communities. Research the availability of free items or the cost of buying the items in part a). Complete the Actual Cost column.

c) Create a list of food items that the Breakfast Club would need to keep in stock.
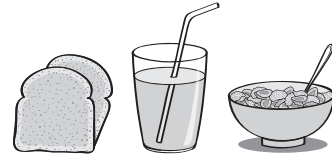

d) Survey another class in the school to determine the number of students who would attend a Breakfast Club. Express the result as a fraction. _____

e) Based on the population of your school, use the result in part d) to estimate how many students would attend the Breakfast Club.

f) Use flyers from grocery stores to create a shopping list with an estimated cost based on the number of students attending the Breakfast Club.

g) Students liked the Breakfast Club so much that the number of students attending increased by 25% during the first month. Which costs will increase by 25%?

_____

_____

h) Which costs will not increase?

_____

4. A hotel needs to clean the drapes of a large window in its front entrance.

- The drapes hang from a rod at the top of the window to the floor below.
- The rod is 10 ft above the floor.
- The window is 6' 10" wide.
- The material for the drapes is twice the width of the window.
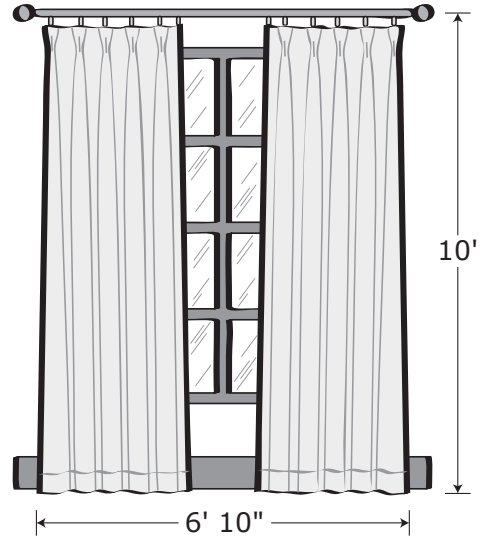
a) Estimate the area of the drapes.

b) Calculate the area of the drapes.

c) Dry cleaners charge by the square yard to clean drapes. Create a number of estimates you could submit to the hotel management based on the following costs.

Cost Per Square Yard	Estimated Cost	Estimated After-Tax Cost
Clean It Right $4.99		
Hotel Cleaning $5.23		
Drapes for Us $6.50		
Window Coverings Inc. $7.18		

- The hotel manager checks the reputations of the various companies.
- He also checks online to see about any specials.
- Drapes for Us has a monthly special. If you get 1 set of drapes cleaned at the regular price, you can have a 2nd set of drapes cleaned at 50% off.

Clean one set
of drapes,
Get 50% off the
second set.

This month only.

50%
off

5. The hotel restaurant has a set of drapes the same size as those in the hotel entrance.

a) If the manager does the 2 sets at the same time, estimate the cost of cleaning the second set.

b) Estimate the cost of cleaning both sets.

c) Calculate the cost of cleaning both sets.

☑ Check Your Understanding

1. Why might someone wish to consider a number of estimates before making a decision on a project?

2. What might happen if an estimate for material is
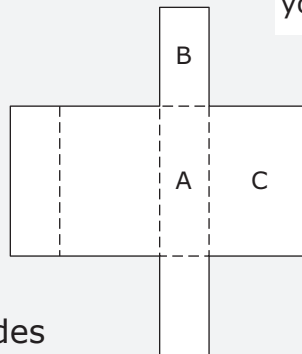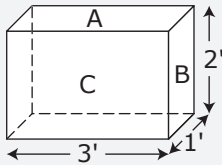
a) too small?

b) too large?

Chapter 7

Skills Practice 14: Calculating Surface Area

Surface area is the number of square units needed to cover the outside of an object.

Go to pages 187–188 to write the definition for **surface area** in your own words.
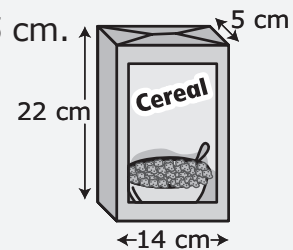
Rectangular Prisms

In all rectangular prisms, the 6 sides are made up of 3 pairs of rectangles.

2-D Shape	Area $A = l \times w$	Number of Matching Faces	Total Area
A. Top/Bottom	$3 \times 1 = 3$	2	$3 \times 2 = 6$ ft^2
B. Left/Right	_____ × _____		_____ × _____ = _____ ft^2
C. Front/Back	_____ × _____		_____ × _____ = _____ ft^2
		Total Surface Area	

1. A cereal box has dimensions 22 cm, 14 cm, and 5 cm.
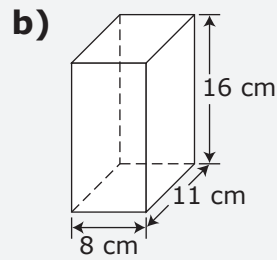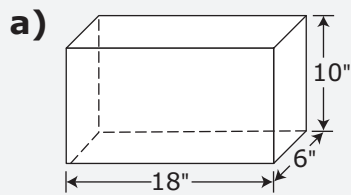
   a) Sketch a net of the cereal box.
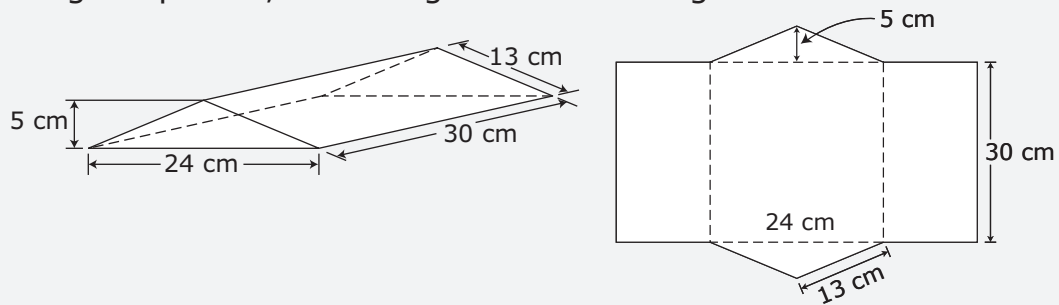
   b) Calculate the total surface area of the box.

2-D Shape	Area	Number of Matching Faces	Total Area
	Total Surface Area		

2. Find the surface area of the following rectangular prisms.

a)

10"
18"
6"

b)

16 cm
11 cm
8 cm

Triangular Prisms

In triangular prisms, the triangles are matching sides.

13 cm
5 cm
30 cm
24 cm

5 cm
30 cm
24 cm
13 cm

2-D Shape	Area	Number of Matching Faces	Total Area
Front/Back Triangles	$A = (base \times height) \div 2$ $= 24 \times 5 \div 2$ $= 60 \ cm^2$		
Left/Right Rectangles	$A = l \times w$ = _____		
Bottom Rectangle	$A = l \times w$ = _____		
		Total Surface Area	

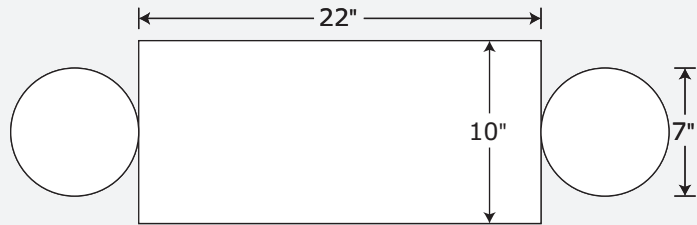**3.** Calculate the surface area of the following triangular prism.


6 cm
7 cm
15 cm
9 cm

Date _____
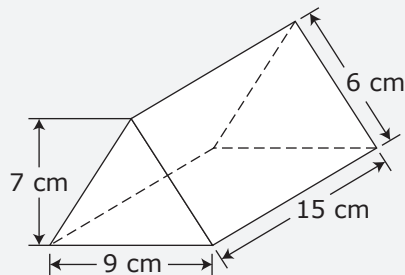
Cylinders

- The top and bottom of a cylinder are circles.
- If you cut the tube from top to bottom, it unfolds to become a rectangle.
- The width of the rectangle equals the circumference of the circle.

$C = \pi d$
$\approx 3.14 \times 7$
≈ 22
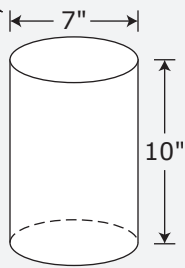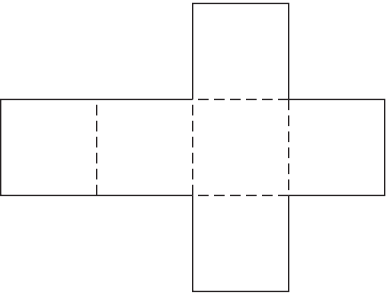
2-D Shape	Area	Number of Matching Faces	Total Area
Top/ Bottom Circles	$A = \pi \times r^2$ $\approx 3.14 \times 3.5 \times 3.5$ ≈ 38.5 in^2		
Rectangle	$A = l \times w$ $= \underline{\hspace{1cm}}$		
		Total Surface Area	

4. Find the surface area of the following cylinders.

a) ⊢— 10 yd —⊣

4 yd

b) ⊢———— 90 mm ————⊣

25 mm
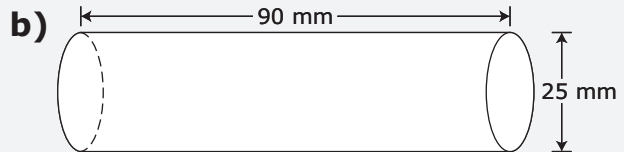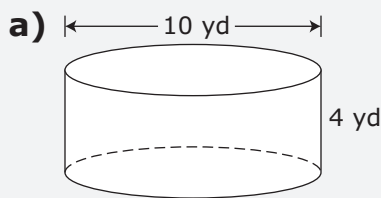
7.4 3-D Scale Models

Focus: measuring, rounding, proportional reasoning, problem solving

Warm Up

1. What is the highest number that can be rolled with 1 die?	**2.** Explain why your answer to #1 is correct.
3. A die has side lengths of 1.5 cm. What is the area of 1 face of the die?	**4.** What is the total area of all of the faces of the die?
5. What object can be made if you fold along the dotted lines? _____	**6.** Make a sketch of the object in #5.

Nets

- A **net** is a flat, 2-dimensional model representing a 3-dimensional object.
- A net is what an object would look like if it were *unfolded*.
- In #5 above, the drawing is a net of a cube.

Go to pages 187–188 to write the definition for **net** in your own words.

Chapter
7

1. a) Get a die. Draw the dots of 3 faces you can see at a time on the cube below.
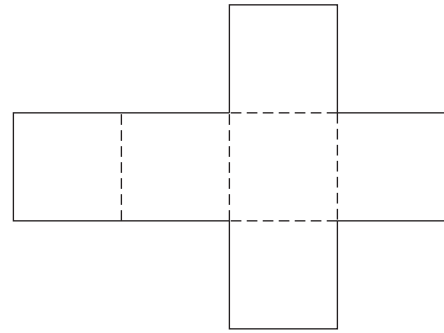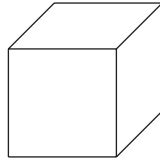
b) Pick up the die. Identify the number of dots on 1 face, and then the number on the opposite face. Draw the same dots on the net above.

c) Choose a 2nd face. How many dots are on the opposite face? Draw the dots on the net above.

d) What do you notice about the numbers of dots on opposite sides of a die?

2. a) The bottom of a toy car says, "1 : 70." What does this mean?

b) The toy has a length of approximately 6.5 cm. What is the approximate length of an actual vehicle of that make? Give your answer in metres.

c) The toy has a width of approximately 2.6 cm. What is the approximate width of an actual vehicle of that make? Give your answer in metres.

d) The toy has a height of approximately 2.4 cm. What is the approximate height of an actual vehicle of that make? Give your answer in metres.

e) If modelling clay or a similar material is available, create a 3-D model of the toy car. Otherwise, use paper or cardboard to create a box that the toy car could fit in. You may wish to sketch the net of your box below.
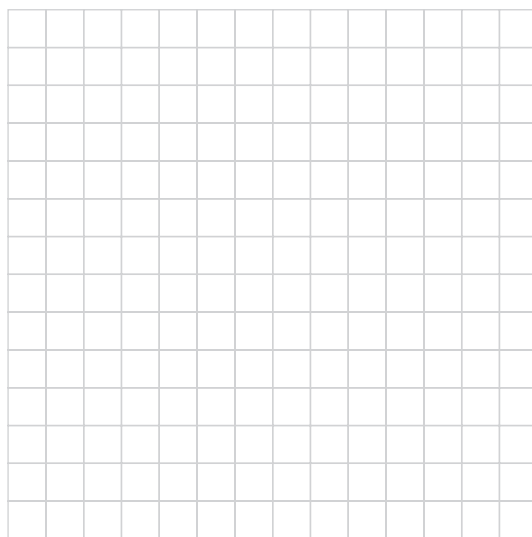
3. a) Find a rectangular, 3-dimensional object in your classroom.

Object: _____

b) Measure the 3 dimensions of the object.

length = _____   width = _____   height = _____

c) Select a scale for making a model. 1 : _____

d) Calculate the dimensions of the model.

length = _____   width = _____   height = _____

e) Create the model.

4. The company you work with makes candies. For the holidays, they are making mini mints with a diameter of 1". The container is a tube in the shape of a triangular prism. The dimensions are shown in the diagram.

2 in.

6 in.

|←2 in.→|
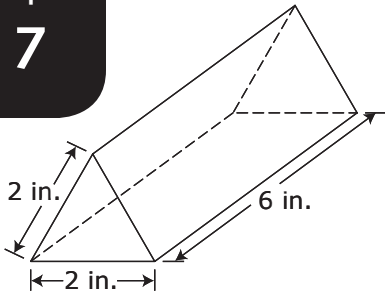
a) Your job is to design a 1-piece wrapper that will cover only the rectangular sides. What are the dimensions of the wrapper? length = _____   width = _____
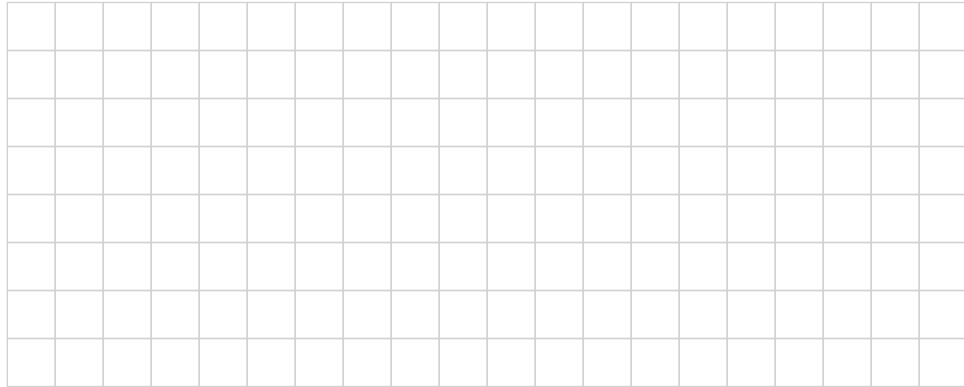
b) Design a wrapper, to scale, for the candy box.

c) How many candies will fit in the box? _____
Explain your answer.

_____

5. A type of chip used for card playing is 3 cm in diameter and 3 mm thick.

a) Make a reasonably accurate sketch of 1 chip.

b) Work in groups to build cylindrical tubes that will hold 20, 50, or 100 chips.

c) Calculate the total surface area of any 1 tube.

2-D Shape	Area	Number Needed	Total Area
Total Surface Area			

d) What would be the length of a tube that held 75 chips?

6. A golf ball has a diameter of approximately 43 mm. Imagine that you have been hired to design a cardboard container that will hold 4 balls.

a) What shape will you choose for the container?

_____

b) Make a sketch of the container. Include dimensions on your sketch.

c) Calculate the total surface area of the container.

2-D Shape	Area	Number Needed	Total Area
Total Surface Area			

d) Create an accurate 3-D model of your container.

☑ Check Your Understanding

1. Create a 3-D scale model of something of personal interest to you. It could be
  • a guitar or a skateboard
  • a piece of furniture like your favourite chair or a bookcase
  • a package that holds a cell phone or an item of clothing
  • something larger, like your bedroom or a planter box

7.5 Capacity and Volume Applications

Focus: unit conversion, rounding, proportional reasoning, problem solving

Warm Up

1. Solve without a calculator.

  a) $2 \times 3 \times 5 =$ _____

  b) $4 \times 4 \times 10 =$ _____

2. a) Show what 10^3 means.

  b) Therefore, $10^3 =$ _____.

3. a) 1 L = _____ mL

  b) 500 mL = _____ L

4. a) 1 gallon = _____ quarts

  b) 1 quart = _____ fluid ounces

5. List the following measures from least to greatest.

  1 oz, 250 mL, 1 gallon, 2 L, 1 quart, 16 ounces, 500 mL

  _____ , _____ , _____ , _____ , _____ , _____ , _____

Go to pages 187–188 to write the definitions for **capacity** and **volume** in your own words. Give an example of each.

Capacity and Volume

- **Capacity** is the amount of liquid a container can hold.
- **Volume** is the amount of space an object takes up.
- While the 2 terms do not mean the same thing, many people use the word volume when they are talking about an object's capacity.

1. In Canada, the label on most containers holding liquid gives their capacity in litres or millilitres. Estimate the metric capacity of the items below.

A. _____

B. _____

C. _____

D. _____

2. In the United States, many containers holding liquids state their capacity in ounces, quarts, or gallons. What is the Imperial capacity of the items in #1?

A. _____   B. _____

C. _____   D. _____

Painting

3. One of the first things that many people do when they move into a new home is paint. A typical large can of interior paint bought in a Canadian store has a capacity of 3.78 L.

3.78 L

a) Why do you think the container holds such an odd amount? Why not 3.5 L or 4 L?

Look at
section 6.5.

_____

b) Most paint manufacturers claim that 1 L of paint covers 10.5 m² or 110 ft². You can round the numbers to make this easier to remember:

"1 _____ of paint will cover about _____ m²,

which is about _____ ft²."

4. Steve wants to paint the TV room in his basement. It is a big room, measuring 31 ft by 12 ft. The walls are 8 feet high.

a) Calculate the surface area of the ceiling.

b) Steve wants to put 2 coats of paint on the ceiling. Use your answer in #3b) to estimate the number of cans of paint Steve will need.

c) The walls will be a different colour than the ceiling. Calculate the surface area of the walls.
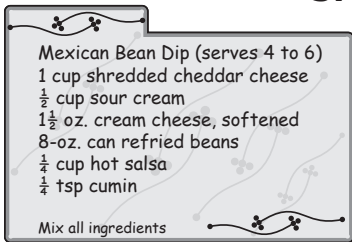
d) Estimate the number of cans of paint Steve will need

in order to apply 2 coats of paint to the walls. _____

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- Steve needs about _____ cans of paint for the ceiling.

- He needs about _____ cans of paint for the walls.

e) Research the price of a good quality interior latex paint. Calculate the total cost.

Area Painted	Brand of Paint	Price Per 3.78-L Can	Number of Cans	Cost of Paint
Ceiling				
Walls				
			Subtotal	
			Tax	
			Total	

Entertaining

5. Esther found a recipe for Mexican Bean Dip online.

Mexican Bean Dip (serves 4 to 6)
1 cup shredded cheddar cheese
$\frac{1}{2}$ cup sour cream
$1\frac{1}{2}$ oz. cream cheese, softened
8-oz. can refried beans
$\frac{1}{4}$ cup hot salsa
$\frac{1}{4}$ tsp cumin

Mix all ingredients

a) She is making the dip for a family reunion that 30 people will attend. How much of each ingredient will she need?

Ingredient	Amount
Cheddar cheese	
Sour cream	
Cream cheese	
Refried beans	
Salsa	
Cumin	

b) What did you multiply each ingredient by? _____

Why? _____

_____

**c)** When Esther goes shopping, she will likely find the ingredients sold in metric units. Use the conversion table on page 291 or do an Internet search for *unit converter*. Find one that will allow you to convert between Imperial and metric capacities.

Volume might be used instead of *capacity*.

Ingredient	Imperial Measure (from part a)	Exact Metric Conversion	Appropriately Rounded Metric Measure
Cheddar cheese			
Sour cream			
Cream cheese			
Refried beans			
Salsa			
Cumin			

d) There are 2 sizes of sour cream at the grocery store. The 500-mL tub is $1.89. The 1-L tub is $2.99. Which tub do you suggest she buy?

e) Salsa also comes in 2 sizes. The 350-mL jar is $1.99. The 700-mL jar is $4.49. Which jar should she buy? Explain your reasoning.

_____

_____

f) Get a local grocery flyer and make a shopping list for Esther. Estimate the total cost of making the dip for 30 people.

6. a) How many 2-cm cubes would you need to build a model of the volume of a brick with dimensions 8 cm × 2 cm × 2 cm?
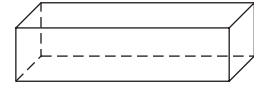
b) Use 2-cm linking cubes to build the brick.

How many did you use? _____

**c)** The volume of the brick is _____ cubic centimetres.

> An adjective that means "in the shape of a cube."

d) Using the same thinking, how many cubic inches are in a cubic foot? _____
Explain your answer and/or make a sketch below.

7. a) Use materials in the classroom to build a cubic foot.
b) How many cubic feet would you need to build a cubic yard? _____

c) Explain your answer to part b). _____

Landscaping

8. In section 7.3, you worked on a project involving the planting of cedar trees.
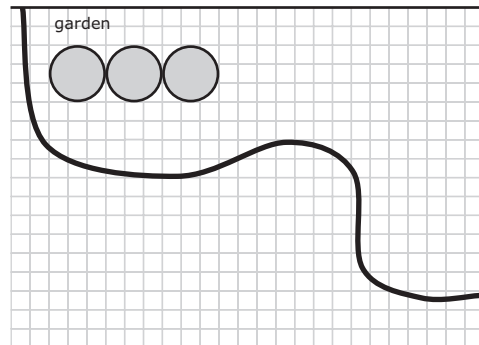
> garden

a) Sketch in the cedars that you decided on earlier.

b) Recall the scale of the diagram. Each square

on the diagram represents an area of _____ in the garden.

c) Estimate the area of the garden. _____

d) Compare estimates with other students. Discuss the strategies that you used. Do you need to revise your estimate?

• The owners of the property are laying garden fabric on the ground to prevent weeds from growing.

e) Estimate the area of the garden that will be covered with fabric.

f) Garden fabric is sold in rolls that cover 50 ft². How many rolls will the owners need to buy?

• The owners will cover the fabric with 4 inches of mulch.

g) If you know the approximate area of the garden that needs mulch, how can you determine the amount of mulch needed? _____

h) What fraction of a foot is 4 inches?

i) Estimate the volume of mulch needed in cubic feet.

j) Mulch is often sold by the cubic yard. Convert your answer from part i) to yd³.

k) Research the cost of mulch from a local retailer. Calculate the total price, including tax.

☑ Check Your Understanding

1. Looks easy! Painting. Landscaping. Entertaining. How many steps were involved in

a) painting the room? _____

b) finishing the garden? _____

c) making a dip? _____

2. Explain the difference between capacity and volume with respect to an in-ground pool made with 4-inch thick concrete walls.

Review the definitions on page 264.

_____

_____

7.6 Composite Shapes and Figures

Focus: measuring, rounding, proportional reasoning, problem solving

Warm Up	
1. Six inches is what fraction of a foot? _____	**2.** What is the approximate Imperial equivalent of 3.78 L? _____
3. How many square feet make up 1 square yard? _____	**4.** Which area is greater, 1 m² or 1 yd²? _____
5. Round $87.99 to the nearest **a)** $1. _____ **b)** $10. _____ **c)** $100. _____	**6.** Calculate the tax on $87.99.

Go to pages 187–188 to write the definition for **composite shape** in your own words.
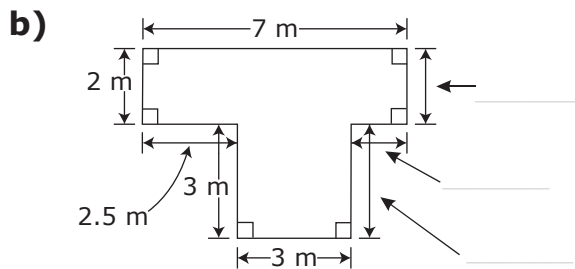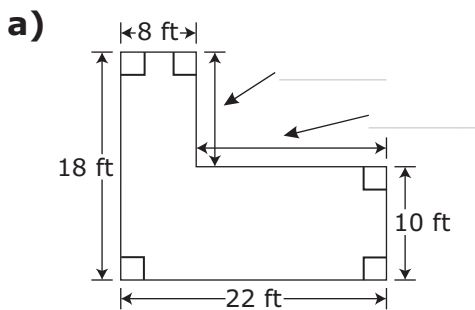
Determine the Area of a Composite Shape

• A **composite shape** is made of more than 1 shape. For example, the blueprint below consists of a rectangle and a square.

1. Felicia recently moved into a condo in downtown Ottawa. She wants to carpet her dining room and her living room. Below is a sketch of the area.
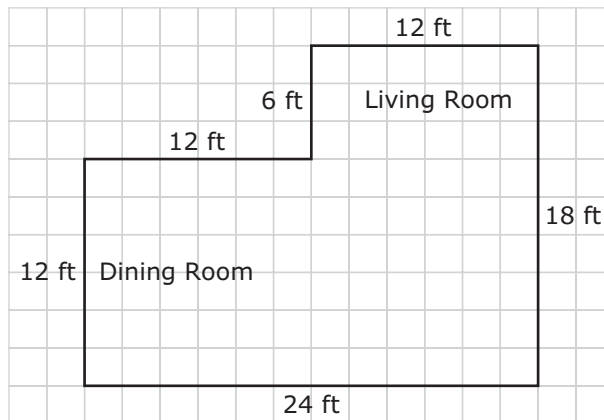
How can Felicia determine how much carpet is needed?

_____

**2.** Label the missing dimensions for each of the following composite shapes.

a)

b)

3. Divide the shapes above into groups of regular shapes.

4. Determine the area of each of the composite shapes in #2.

a)   **b)**

5. The key on a basketball court is in the shape of a rectangle. The free-throw area is in the shape of a semicircle. Often, these areas are painted so that they stand out from the rest of the court.
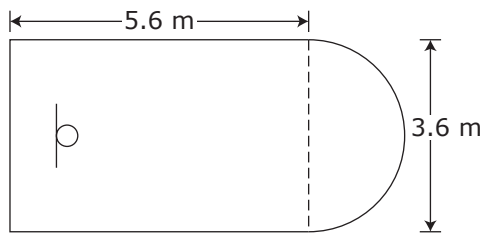
a) Recall the formula for the area of a circle. _____
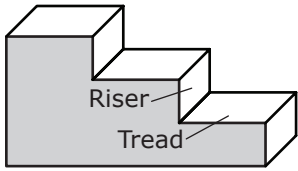
b) Calculate the area to be painted. Round to 2 decimal places.

Key: Free Throw Area:

Total Area:

c) How much paint do you need to paint both keys on the court with 2 coats?

Composite Figures

6. a) Use linking cubes to create a model of a set of 3 steps. The steps have 12-inch treads and 6-inch risers. The steps are 3 feet wide.

b) The scale of your model is 1 square : _____.

c) The surface of _____ squares represents 1 square foot.

d) The volume of _____ cubes represents 1 cubic foot.

Riser

Tread

7. a) If the steps are indoors, carpet could go from the tread of the top step down to the bottom of the riser of the bottom step. Shade the area to be covered on the drawing above.

b) Calculate the area of the carpet.

c) A flooring store sells carpet for $89 per square yard. How many square yards would you need to buy?

d) Calculate the before-tax cost of the carpet.

e) Calculate the after-tax cost of the carpet.

8. If the steps are outdoors, they could be made of concrete that is poured into a wooden frame.

a) Determine the volume of the steps.

b) Concrete is often ordered in cubic yards. Convert your answer from part a) to cubic yards.

☑ Check Your Understanding

1. You have volunteered at a daycare to help build a wooden sandbox for the children.

   a) Design a composite rectangular shape. Include dimensions.

   b) How many feet/metres of wood do you need to build the walls?

   c) How many square feet/square metres of plywood do you need to build the floor of the sandbox?

   d) How high will the walls of the sandbox be? _____

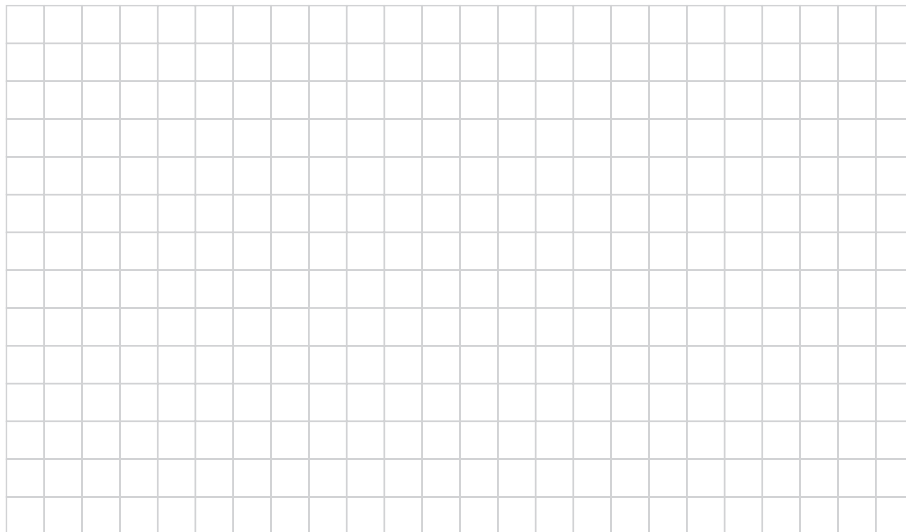   **e)** How many cubic yards/cubic metres of sand do you need to fill the sandbox?

Chapter 7 Review

1. a) The package of a model of a Lear jet says, "1 : 72." What does this mean?

_____

_____

b) Once built, the model of the jet is 15" long. What is the length of the jet?

**2. a)** Make a scale diagram of a wall measuring 3.6 m wide and 2.4 m high.

What is the scale of your diagram? _____

b) One litre of paint covers approximately 10 m². How many 1-L cans of paint do you need to put 2 coats of paint on the wall?

c) On the diagram of the wall above, sketch, to scale, the perimeter of an 80 cm by 60 cm piece of art.

3. a) This tent has nylon walls and a nylon floor. Calculate the approximate surface area of the tent.

Chapter 7
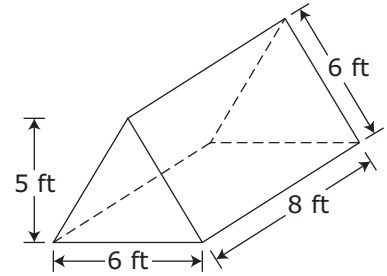
2-D Shape	Area	Number Needed	Total Area
	Total Surface Area		

b) Many campers hang a tarp above the tent to prevent rain from falling on it. What is the area of a circular tarp with a diameter of 10 ft?

c) The tarp has a sewn nylon edge around its perimeter to prevent fraying. What is the length of the material sewn around the edge of the tarp?

4. Bryan is replacing the vertical boards on two 8-ft sections of fence in his backyard. The boards he needs are $5\frac{3}{4}"$ wide. He will leave a $\frac{1}{4}"$ gap between the boards.
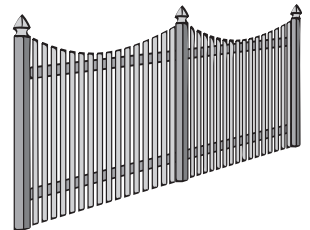
a) How many boards will Bryan need to buy?

b) Each board costs $3.19. What is the after-tax cost of the job?

5. The dark squares in the plan show an odd-shaped vegetable garden.

a) The scale of the diagram is 1 square : 2 feet. Fill in the blanks with the actual measurements of the garden.

b) On the diagram, divide the garden into a number of regular shapes.

c) Determine the area of the garden.
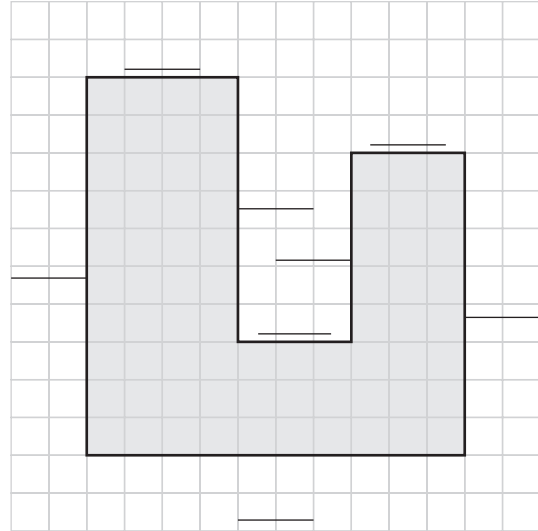
d) You want to add a layer of peat moss 3 inches deep. Determine the volume of peat moss needed.

e) A 3.8-ft^3 bag of peat moss costs \$4.99. Calculate the total cost of the peat moss.

Chapter 7 Practice Test

1. a) The blueprints for an addition to a school are drawn with a scale of 1 : 48. Explain the meaning of "one to forty-eight."

_____

_____

   b) A line 6 inches long on the drawing represents a wall of what length when the addition is built?

2. a) Make a scale diagram of a 110-yard long by 65-yard wide football field. Include the centre line. Put an end zone 10-yards long at each end of the field.
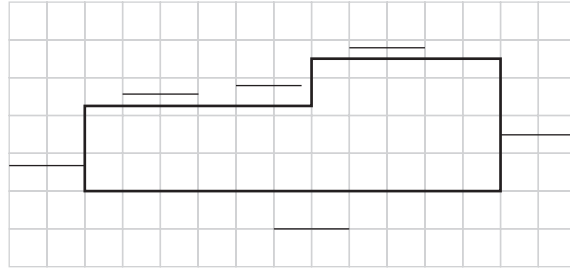
   b) What is the total area of the field including the end zones?

   c) The perimeter of the field needs the white border repainted. How many cans of white paint are needed if 1 can will make a line 35 yards long?

**3.** Determine the area of each of the following shapes.

a)

b)

12 miles

|◄5 miles►|
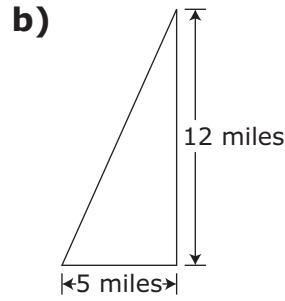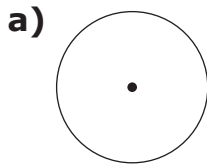
4. A landscaping company is building a retaining wall to enclose a raised flower bed.

a) The drawing has a scale of 1 sq : 2 ft. Fill in the blanks with the measurements of the wall.

b) The wall will be 2 ft high. Calculate the volume of topsoil needed to fill the flower bed.

c) Convert your answer from part b) to cubic yards.

d) Marigolds will be planted around the perimeter of the flower bed at 6" intervals. How many marigolds will be needed?

5. Some shingles on 1 side of a house were
damaged in a wind storm. A sketch
of that side of the roof is below.
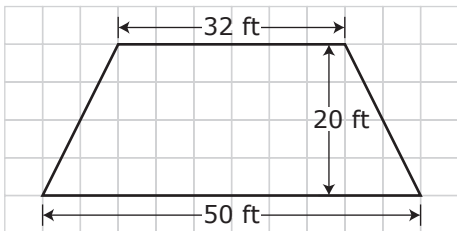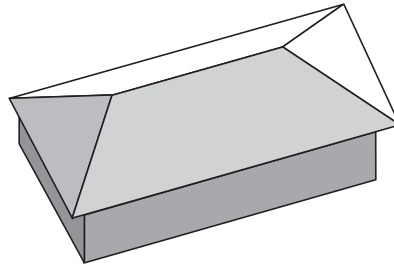
a) On the diagram, divide the side of the roof into regular shapes.

b) Determine the area of the side of the roof.

c) One bundle of shingles covers 32 square feet. How many
bundles do you need to cover the side of the roof?

d) Shingles come in different qualities. High quality shingles
that are supposed to last 25 years cost $17.99 per bundle.
Determine the before-tax cost of the shingles needed to cover
the side of the roof.

e) What is the after-tax cost of the shingles?

Task: Home Renovations

1. Choose a home improvement or design project that interests you. You could renovate a room in your home or landscape an area in your neighbourhood. You will have a budget of $2000.

Project: _____

_____

_____

2. Make a list of the steps involved in the project.
For example, to renovate your bedroom, you might repaint the walls, replace or install carpet, replace the electrical fixtures, replace windows, and refurnish the room.

_____

_____

_____

_____

_____

_____

_____

_____