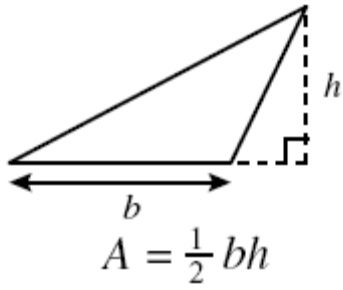
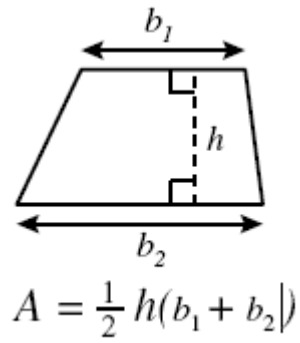


## Formulas for Area

### Area of Triangle

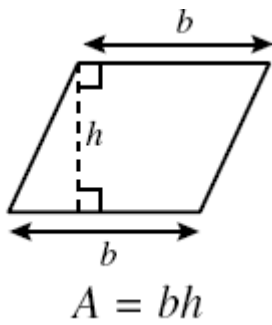
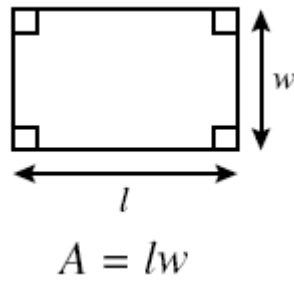


### Area of Trapezoid



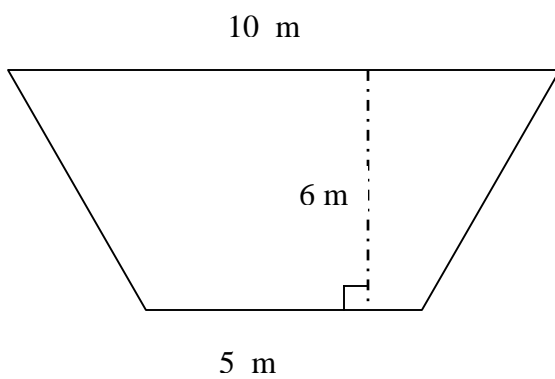
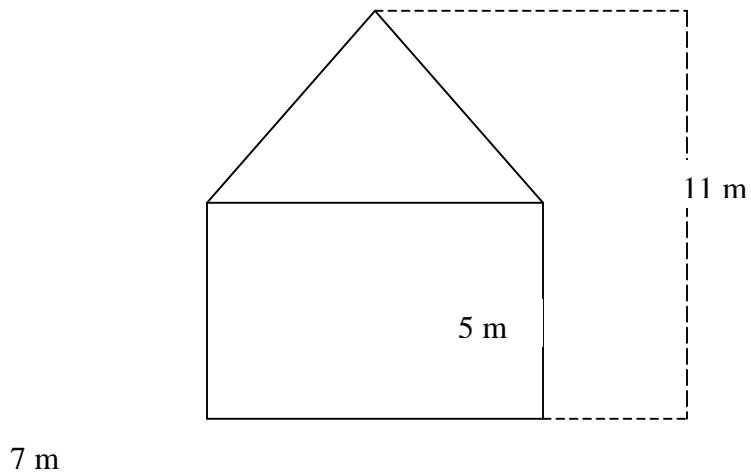
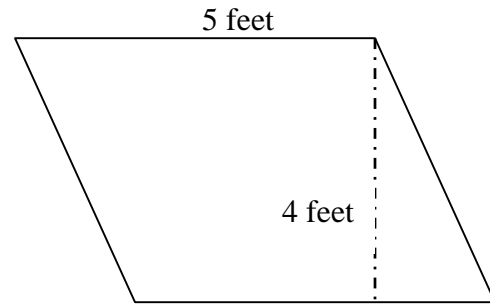
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### Area of Parallelograms



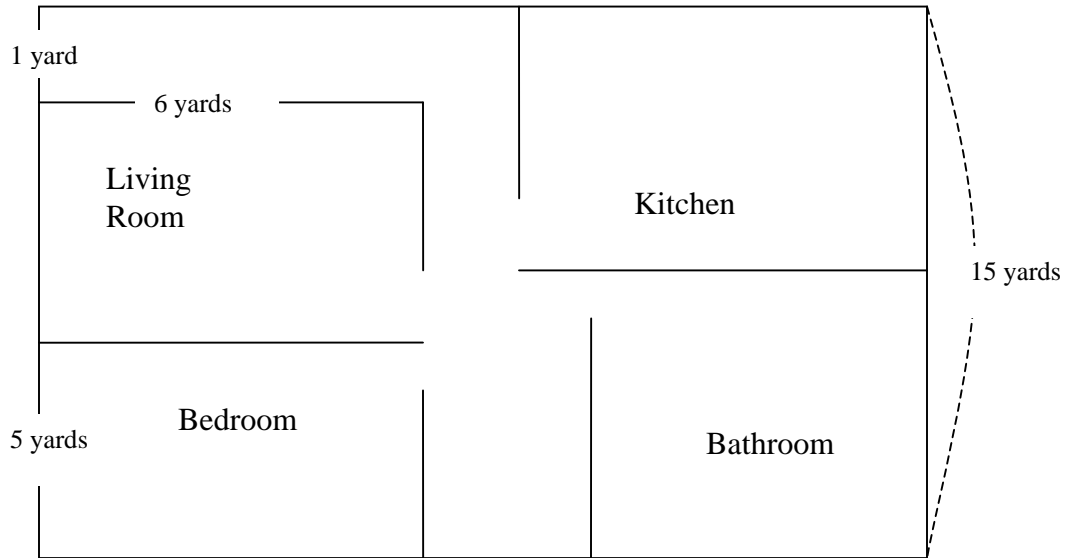
Use the formula sheet and what you know about area to solve the following problems.

Find the area.



### Area: Problem Solving

1. Mike wants to re-carpet his bedroom and living room floors in his apartment. The cost for the carpet Mike wants to buy is \$3.25 per square foot. Mike's bedroom and living room are both rectangular and they have the same length. How much carpet does Mike need and how much money will he need to buy the carpet? Below is a sketch of Mike's apartment.



**Area: Percent Increase**

1. Find the area of a 5in. by 6in. rectangle

2. Double the dimensions of the rectangle in question 1

Write the doubled dimensions here:

New Length \_\_\_\_\_

New Width \_\_\_\_\_

3. Find the area of the rectangle with doubled dimensions.

4. What is the percent increase of the area of the original rectangle?

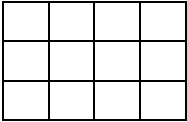
Name \_\_\_\_\_ Date \_\_\_\_\_

### Area of a Rectangle

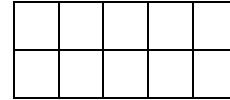
#### **Part 1**

Directions:

1. Write the dimensions (length and width) for each figure.
2. Write the area for each figure.



Length = \_\_\_\_ units  
Width = \_\_\_\_ units  
Area = \_\_\_\_ square units



Length = \_\_\_\_ units  
Width = \_\_\_\_ units  
Area = \_\_\_\_ square units

#### **Part II**

Directions:

1. Draw 2 different rectangles, each having an area of 36 square units.
2. Write the dimensions for each rectangle.

Rectangle 1

Rectangle 2

Length = \_\_\_\_\_ units  
Width = \_\_\_\_\_ units

Length = \_\_\_\_ units  
Width = \_\_\_\_ units

#### **Part III**

Without counting squares, how can you find the area of a rectangle?

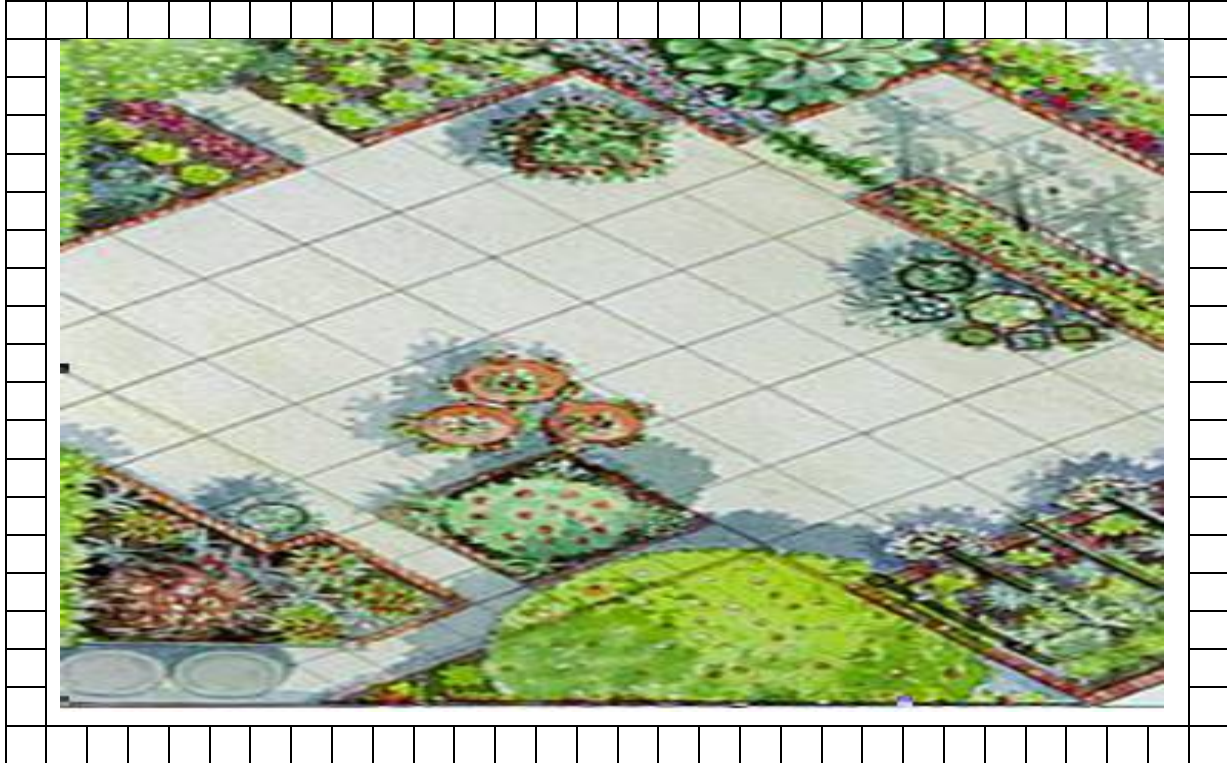
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## Problem Solving 1

### Directions

Answer the following questions based on the diagram below.



1. If  represents a square foot, what is the area of the garden?

2. Explain in words how you found the area of the garden.

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3. If you want to put a border around your garden, how many tiles will you need?

4. How did you get your answer for question 3?

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5. What is another way you can find the answer to question 3?

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6. If you want to put a border around the garden, how many **1 inch** square tiles will you need?

7. Explain in word how you get your answer for question 6.

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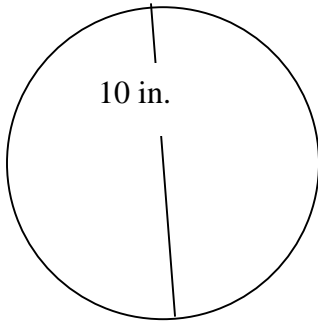
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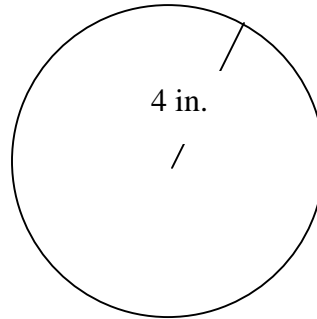
## Circumference and Area 1

1. Find the circumference and area of the circles below.



Circumference \_\_\_\_\_

Area \_\_\_\_\_



Circumference \_\_\_\_\_

Area \_\_\_\_\_

2. If the circumference of a circle is 314 cm, what is its diameter?

3. Maria's dog is tied to a pole with a piece of rope that is 6 feet long. What is the maximum amount of space the dog can roam (move around)?

4. A Medium pizza has a circumference of approximately 50.25in. What will be the dimension of the smallest box that can fit the pizza?

5. Lin is planting a circular garden of tulips. She plans to plant four different colors in equal amounts. The garden will have a diameter of 24 feet. How many square feet, to the *nearest foot*, of space will she have for each of the colors? (Source: regentsprep.org)

## Investigating the Relationship Between Circumference and Diameter.

### Directions

1. Distribute the circular objects to everyone in your group.
2. Use the ruler and string provided to find the diameter and circumference of your object.
3. Complete the table below.
4. Answer questions.

Group Members	Object Name	Circumference	Diameter	<u>Circumference diameter</u> (express as a decimal)

### Questions

- a. What do you notice about the data in your table?

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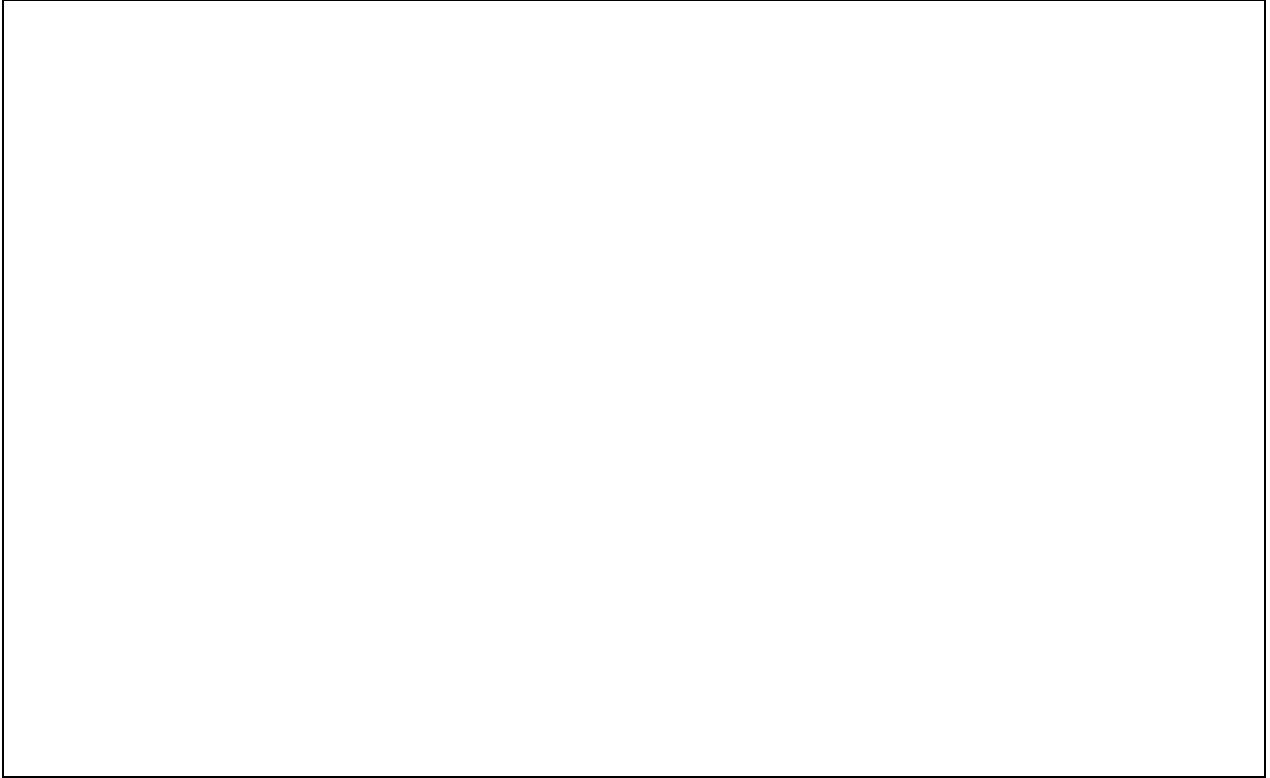
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- b. Use the information from the table to help you approximate the circumference of a circle that has a diameter of 5 inches.

Cost of Materials for \_\_\_\_\_

Draw and label the space you plan on buying materials for.



List the materials you need in the space below.

How much of each material do you need? Show your work below.

Use the internet to find the cost for your materials. Record cost and source below.

Material	Cost	Website
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Show how you will find the total cost of \_\_\_\_\_ in the space below.

**How does error in linear measurement affect percent error of area and volume?**

Maria wants to buy tiles and estimate the amount of money she will need for maintenance of her pool. She needs to calculate the surface area of her pool and the volume in order to buy tiles or get an estimate for maintenance. The actual dimension of Maria's pool is 30 feet by 20 feet by 6 feet. Maria made a mistake and all of the measurements she used to calculate the surface area and volume are a foot less. How will this error affect Maria's estimates for buying tiles and maintaining her pool?

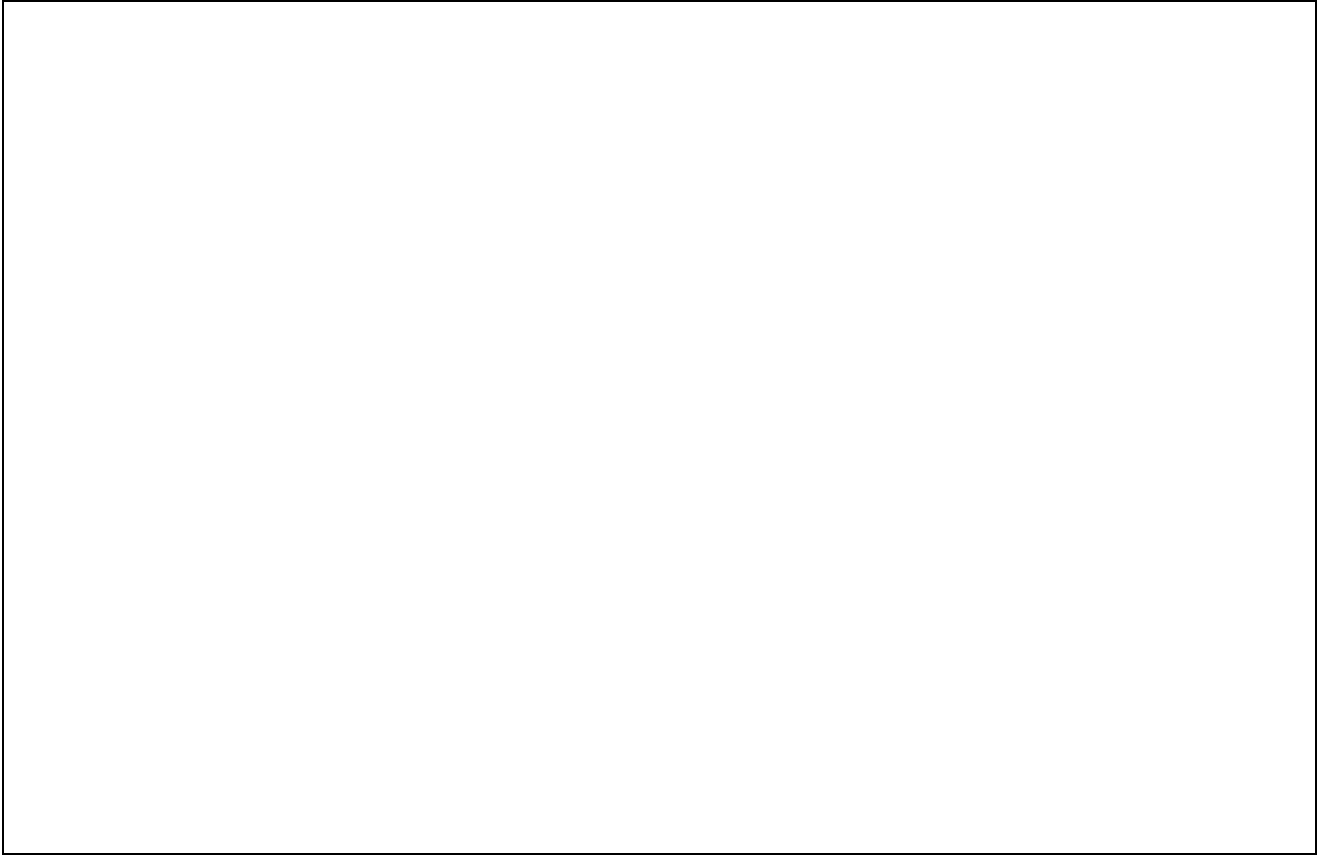
Draw and label a picture of Maria's Pool

Find percent error linear measure.

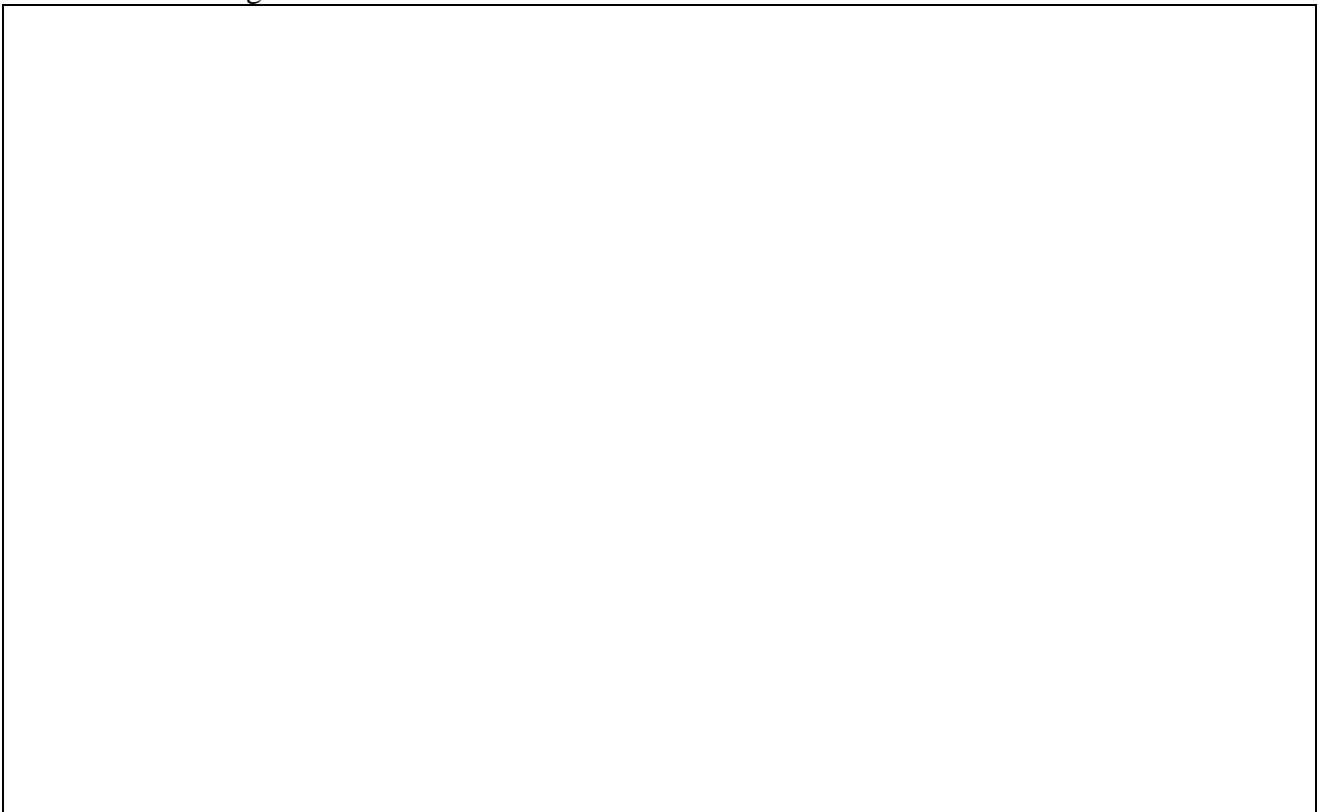
<u>Dimension 1</u> Actual Measurement _____                      Percent Error  Maria's Measurement _____
<u>Dimension 2</u> Actual Measurement _____                      Percent Error  Maria's Measurement _____
<u>Dimension 3</u> Actual Measurement _____                      Percent Error  Maria's Measurement _____

Find the percent error for surface area.

Surface Area using Actual Measurement



Surface Area using Maria's Measurement



Percent error for Surface Area.

Find the Percent Error for Volume. (Show your work below)

What do you notice is happening to the percent error as you move through different dimensions?

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## Exploring Volume of a Cylinder

**Question:** Which cylinder takes up the most space?

**Hypothesis:** If I use paper of the same size to construct two different cylinders, I think the \_\_\_\_\_ cylinder will take up the most space because \_\_\_\_\_.

### Experiment

Materials: rice, paper, scissors, tape.

Directions

1. Each group member will create 2 cylinders using paper of the same size.
2. Each group member will fill both of the cylinders with rice.
3. Each group member will record data in the table below.
4. The group will analyze the data and report findings.

### Data Collection

Name of Group Member

Cylinder that takes up more space

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### Analysis

What do you notice about the data collected?

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Is your hypothesis supported by the data collected? Why/ Why not?

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### Conclusion

Based on what we have learned from the experiment, what can we say determines the volume of a cylinder?

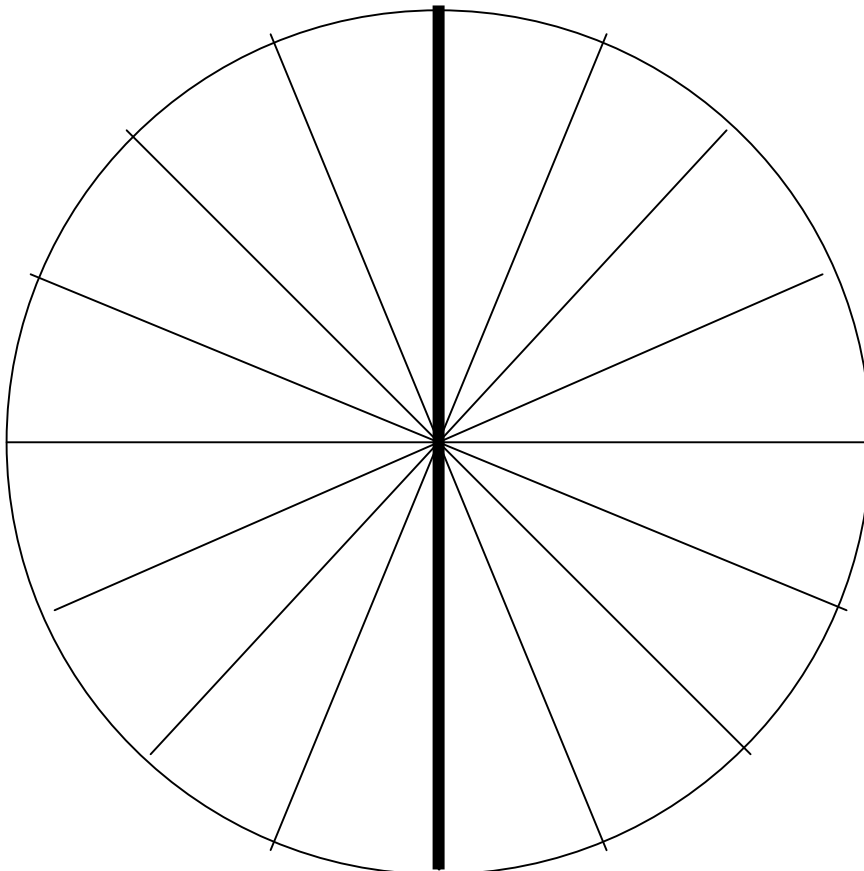
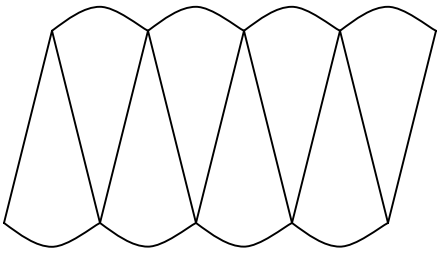
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## Investigating Area of a Circle.

### Directions

1. Cut out the circle.
2. Color the circumference of the circle
3. Label each radius "r"
4. Cut the circle in half along the solid black line.
5. Shade in half of the circle.
5. Cut out each sector of the circle.
6. Glue the sectors so that they interlock. (See picture below)



Glue your sectors here.

*Analysis*

What is the height of your shape? \_\_\_\_\_

What is the length of your shape? (Hint: use the formula for circumference to help you.)

\_\_\_\_\_

*Conclusion*

If your circle was cut into smaller sectors, it would look more like a rectangle. If the area of a rectangle is equal to length x width, how would you find the area of your shape?

Investigation: Area of a Triangle (Handout 3b)

Directions

1. Each group member must choose one of the figures below.
2. Answer question a.
3. Each group member will cut out the triangle that is shaded.
4. Answer questions b-d.

a. What fraction of the rectangle is the shaded triangle? \_\_\_\_\_

b. Use all 3 pieces of your figure to see if your answer is correct in question a.

c. Write a formula to show how you can find the area of a triangle.

\_\_\_\_\_

d. Explain in words or draw pictures to how you know your formula will work for all triangles.

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

Figure 1

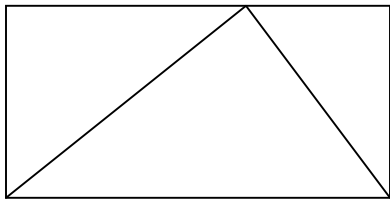


Figure 2

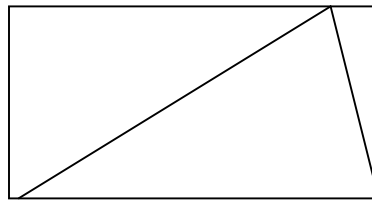


Figure 3

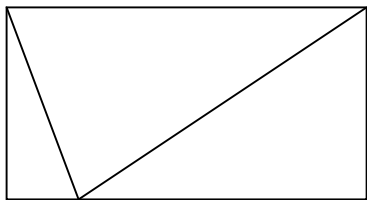
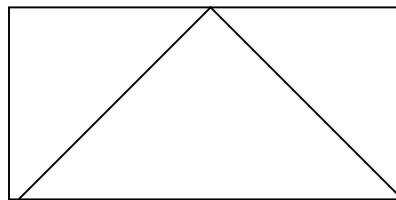


Figure 4



Handout 3b

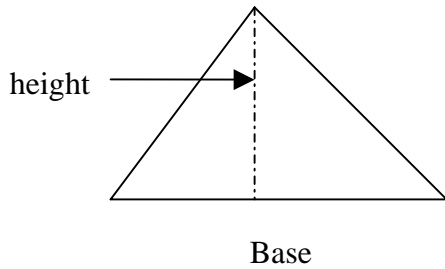
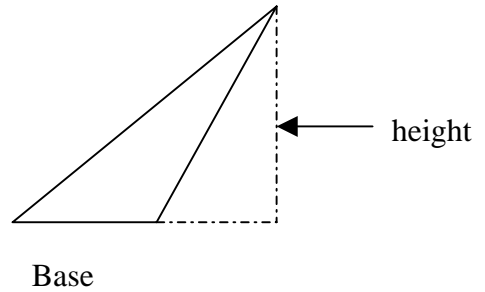
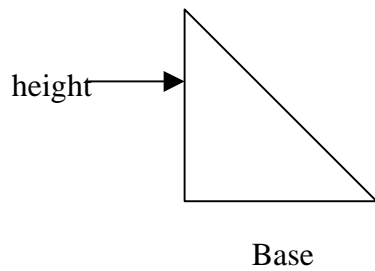
Students may represent the area of a triangle using the following formulas.

$$\frac{\text{base} \times \text{height}}{2}$$

$$\frac{1}{2} (b \cdot h)$$

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

Review base and height for triangles that look different.





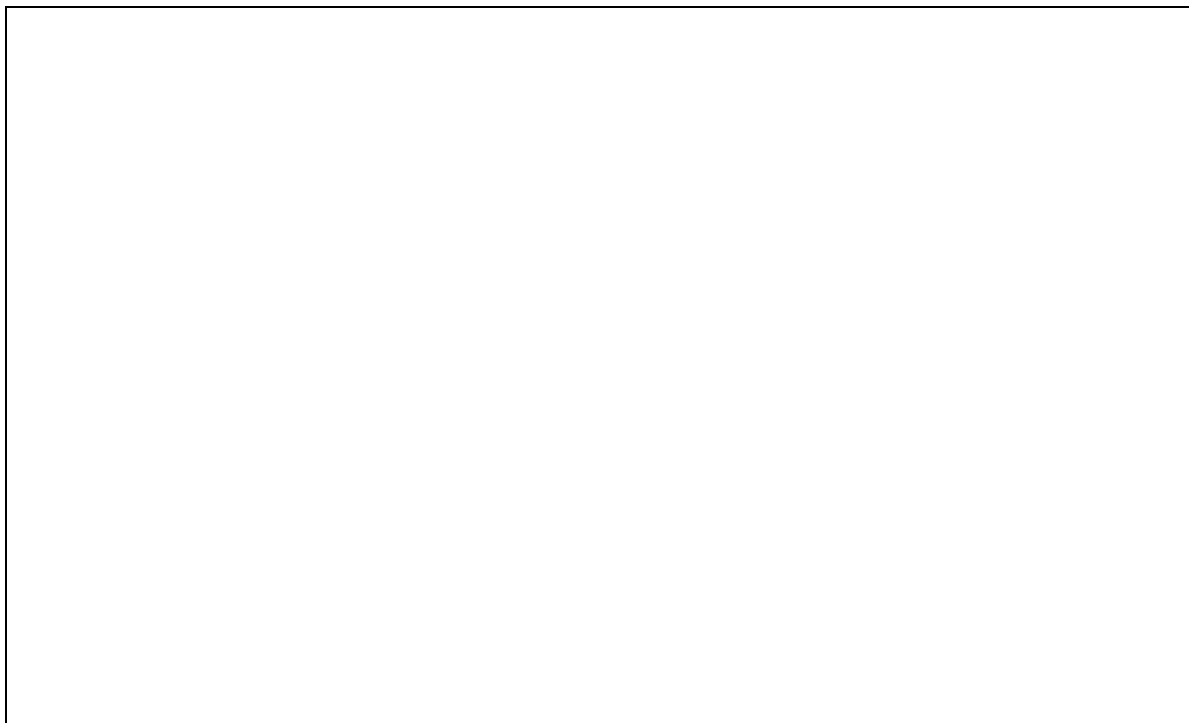
### Problem Solving 2

Maria and Lin love their dog Randy. They like to take him outside to play, but whenever he is left alone he goes over to their neighbor's yard and scares their children. The neighbors have complained several times, so the girls have decided to create an enclosed area where the dog can play. They have 38ft. of material to build a fence. If the girls want to create the maximum amount of space for their dog to play, what should be the dimension (size) of the enclosed space?

## PROJECT SITE

1. Estimate (guess) the area of the field. \_\_\_\_\_

2. Draw a picture of the field.



3. Measure the field to the nearest whole unit.

4. Label the picture of the field with your measurements.

5. Approximate the size (area) of the field based on your measurements.

*Show your work here*

6. What is the difference between your initial (first) estimation and the approximation based on your measurements?

## ERROR IN MEASUREMENT

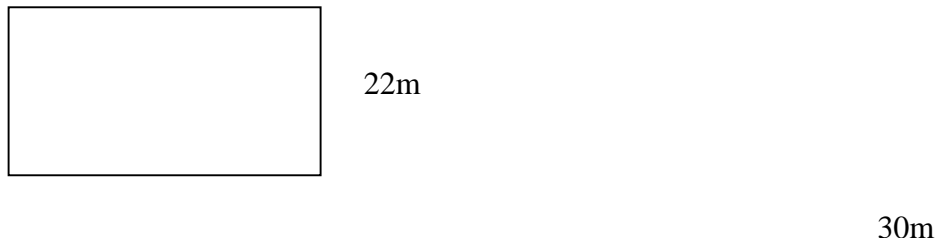
Directions: Answer questions 1 and 2 on the next page based on the reading below.

Any measurement you make with a measuring device (ruler, trundle wheel, etc.) is approximate. If you measure the same object two different times, the two measurements may not be the same. Different measurements can be valid depending on a minimum and maximum value. For example, if you measured the field outside to the nearest foot, the greatest possible error that is acceptable for your measurement would be  $\frac{1}{2}$  of 1 foot, which is 0.5 foot. If you measure to the nearest meter, the greatest possible error would be  $\frac{1}{2}$  of 1 meter.

Your measurement is acceptable if it falls within the range of minimum and maximum values. For example, if the length of the field measured to the nearest foot is 200 feet, the acceptable error in measurement will range from 200 feet  $\pm$  0.5 feet. This acceptable range of error of measurement is called the **tolerance interval**.

The length of your measurement can be as little as 195.5feet or as much as 200.5feet to be acceptable.

We can use the linear measurements of the field to determine the minimum and maximum area of the field. Let's use the rectangular field below that was measured to the nearest meter as an example.



The maximum possible error is  $\frac{1}{2}$  of 1 meter which is 0.5meter.

### **Minimum dimensions**

$$\underline{\text{Length}} = 30\text{m} - 0.5\text{m} = 29.5\text{m}$$

$$\underline{\text{Width}} = 22\text{m} - 0.5\text{m} = 21.5\text{m}$$

### **Minimum area**

$$29.5\text{m} \times 21.5\text{m}$$

$$\text{Minimum area} = 634.25 \text{ m}^2$$

### **Maximum dimensions**

$$\underline{\text{Length}} = 30\text{m} + 0.5\text{m} = 30.5\text{m}$$

$$\underline{\text{Width}} = 22\text{m} + 0.5\text{m} = 22.5\text{m}$$

### **Maximum area**

$$30.5\text{m} \times 22.5\text{m}$$

$$\text{Maximum area} = 686.25 \text{ m}^2$$

1. What is tolerance interval?

2. How is greatest possible error determined?

3. Find the greatest possible error for the following:

a. your height measured to the nearest 0.1cm.

\_\_\_\_\_

b. your height measured to the nearest foot.

\_\_\_\_\_

c. your height measured to the nearest 1/16 of an inch

\_\_\_\_\_

4. What were your measurements of the field?

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

5. Compare your measurements with another group. Why do you think your measurements are different?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

6. Find the maximum possible error for your measurements.

7. What is the minimum and maximum area of the field?

8. How do you think we can reduce error in measurement?

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9. Why do you think it is important to learn about error in measurement?

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Name \_\_\_\_\_ Date \_\_\_\_\_

### REFLECTION

1. What did you learn by completing this project?

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2. What is one thing you like about this project? Explain.

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3. What is one thing you dislike about this project? Explain.

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4. If you had to re-do this project, what would you do differently? Why?

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5. What advice can you give the teacher to help improve the project?

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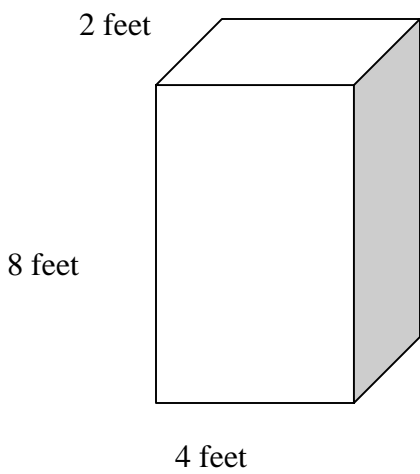
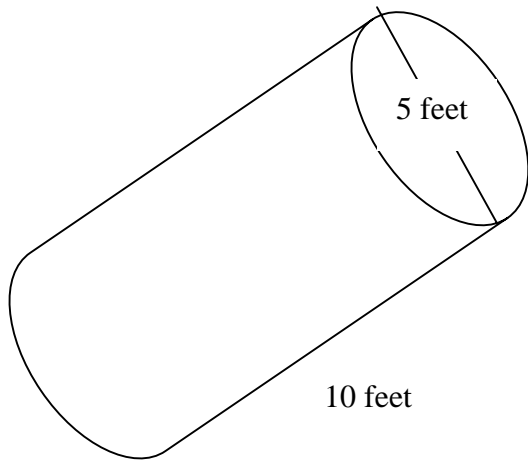
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**Surface area 1**

Find the surface area. Please show all work.



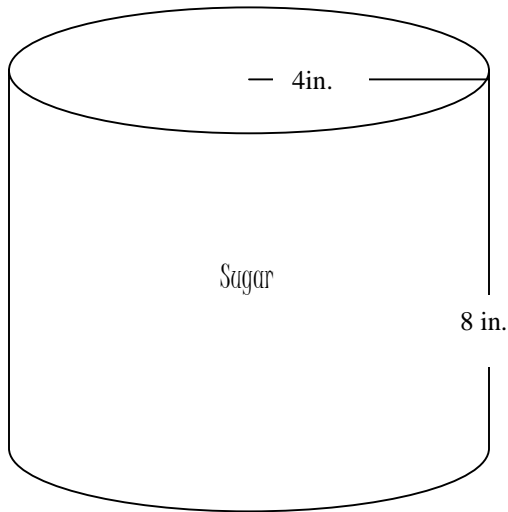
1. What is the minimum amount of paper needed to cover a box that measures 4 feet by 5 feet by 3 feet?

2. Create and solve a word problem that can be solved by finding surface area.

## Surface Area and Volume

1

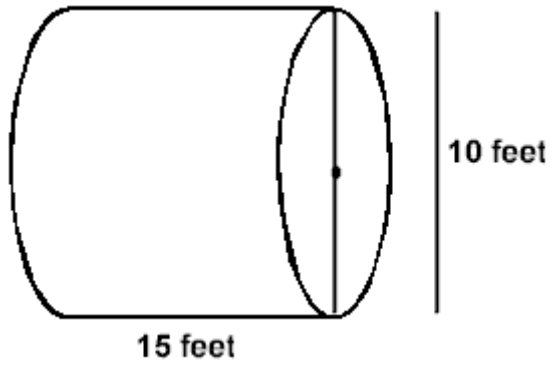
1. Find the surface area and the volume of the can below. Assume the can has no top



Surface Area

Volume

2.



**a.** Find the volume, to the *nearest tenth of a cubic foot*, of this container.

**b.** Find the surface area, to the *nearest tenth of a square foot*, of this container assuming it has a closed top and bottom.

3. When buying a room air conditioner, it is important to purchase a unit that is neither too big nor too small for the room. If the unit is too large, it will cool too quickly and will not remove humidity from the air, thus wasting money and energy. If the unit is too small, it will run continually without ever cooling to the desired temperature, again wasting energy and money.

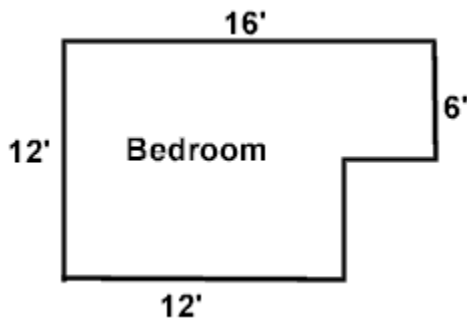
**a.)** Find the total cubic feet of living space for the bedroom below. The ceiling is 8 feet high.

**b.)** Which of these 3 air conditioning models would be the best purchase for this bedroom?

Model A: for rooms 900 to 1100 cubic feet

Model B: for rooms 1100 to 1300 cubic feet

Model C: for rooms 1300 to 1500 cubic feet



## Surface Area of a Cylinder

1. Use the supplies provided to create a cylinder.
2. Explain in words, the process of creating a cylinder.

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3. Draw the net of your cylinder.

4. Look at the net of your cylinder. How do you think you can find the surface area of a cylinder?

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Write a formula that can be used to find the surface area of a cylinder.

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## Surface Area of a Rectangular Prism

Find the surface area of the rectangular prism provided by your teacher.  
(Show your work here)

Explain in words how you found the surface area of your rectangular prism.

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Write a formula that can be used to find the surface area of a rectangular prism.

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How do you know this formula will work for finding the surface area of all rectangular prisms?

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## Volume of Rectangular Prisms

Given the volume of rectangular prisms, use the cubes to help you draw pictures and write the dimensions for the rectangular prisms

**30 cubic units**

Picture with labeled dimensions

**6 cubic units**

Picture with labeled dimensions

**16 units<sup>3</sup>**

Picture with labeled dimensions

**24 units<sup>3</sup>**

Picture with labeled dimensions

Compare your pictures and dimensions with your partner. What do you notice?

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Explain how to find the volume of a rectangular prism.

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## Writing Your Letter

You have to write a letter to persuade Ms. Alex to choose your design. Your letter must include 3 special features of your design and their benefits. (Remember the purpose of the “Common Space” is to build community). You must also inform Ms. Alex of the size of the field and explain the maximum number of students that should be allowed on the field at the same time. (Use mathematical reasoning to support your opinion.)

Before you begin, write 3 special features of your design and their benefits.

Special Features	Benefits

What is the maximum number of students that should be allowed on the field at the same time? (Think about safety and the number of students per square unit)

size of the field

number of students

number of students per square unit