Quick Start Expectations

1. Text book, pencil, paper, learning log
2. Warm Up:
    1. New Unit- Stretching & Shrinking!
    2. Read p. 3-4

Looking Ahead p. 3

You probably use the word *similar* in everyday conversation. For example, you might say that one song sounds similar to another song. You may also say that your friend's bike is similar to yours.

In many cases, you might use the word *similar* to describe objects and images that are the same shape but not the same size.

A floor plan of a house has the same shape as the actual house, but it is much smaller. The images on a movie screen are the same shape as the real people and objects they depict, but they are much larger. You can order your school portrait in a variety of sizes, but your face will have the same shape in each photo.

In this Unit, you will learn what it means for two shapes to be mathematically similar. The ideas you learn can help you answer questions like those on the previous page.

Looking Ahead p. 4

When you encounter a new problem, it is a good idea to ask yourself questions. In this Unit, you might ask questions such as:

What determines whether two shapes are similar?

What is the same and what is different about two similar figures?

When figures are similar, **how** are the side lengths, areas, and scale factors related?

How can I use similar figures to find missing measurements?

SS Inv. 1.1

Focus Question: *What does it mean for two figures to be similar?*

SS Inv. 1.2

Focus Question: *When you copy a figure at a certain scale factor (e.g. 150%), how does this value affect the measurements of the new figure?*

Vocabulary:

Similar	Scale drawing	Image
Corresponding sides		Corresponding Angles

New Unit - Stretching & Shrinking

Investigation 1

Enlarging and Reducing Shapes

In this Investigation, you will make **scale drawings** of figures. Your scale drawings will have the same shape as the original figure, but may be larger or smaller. The drawings will help you explore how some properties of a shape change when the shape is enlarged or reduced.

Common Core State Standards

7.RP.A.2 Recognize and represent proportional relationships between quantities.

7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

7.G.A.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

Also 7.RP.A.2b, 7.G.B.6

Instructions for Stretching a Figure

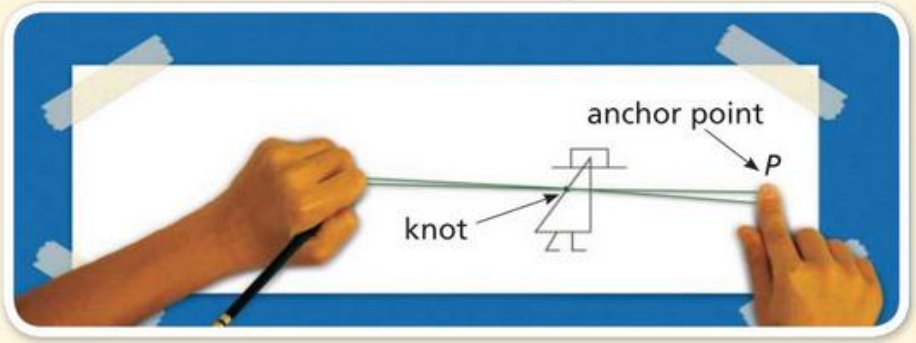
1. Make a "two-band stretcher" by tying the ends of two identical rubber bands together. (The rubber bands should be the same width and length.) Bands about 3 inches long work well.
2. Take the sheet with the figure you want to enlarge and tape it to your desk. Next to it, tape a blank sheet of paper. If you are right-handed, put the blank sheet on the right. If you are left-handed, put it on the left (see the diagram below).
3. With your finger, hold down one end of the rubber-band stretcher on point *P*. Point *P* is called the *anchor point*. It must stay in the same spot.
4. Put a pencil in the other end of the stretcher. Stretch the rubber bands with the pencil until the knot is on the outline of your picture.
5. Keep the rubber bands taut (stretched). Move your pencil to guide the knot around the picture. Your pencil will draw a copy of the picture. The new picture is called the **image** of the original. It is also a scale drawing of the original.

Model Using the Rubber Band Video

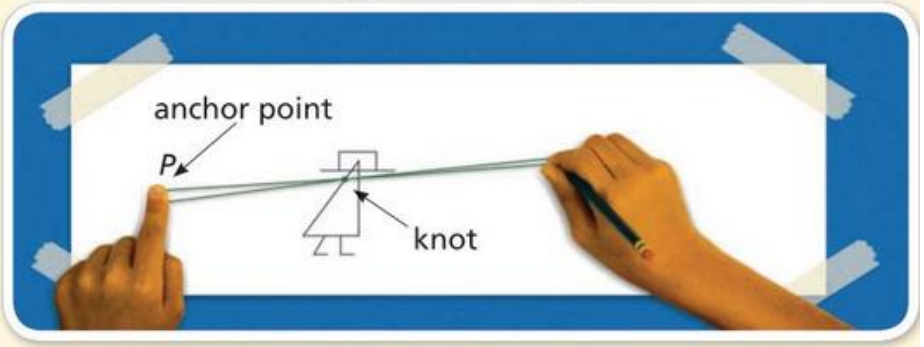
Vocab :

Image – The new picture is called the ***image*** of the original

Left-handed setup



Right-handed setup

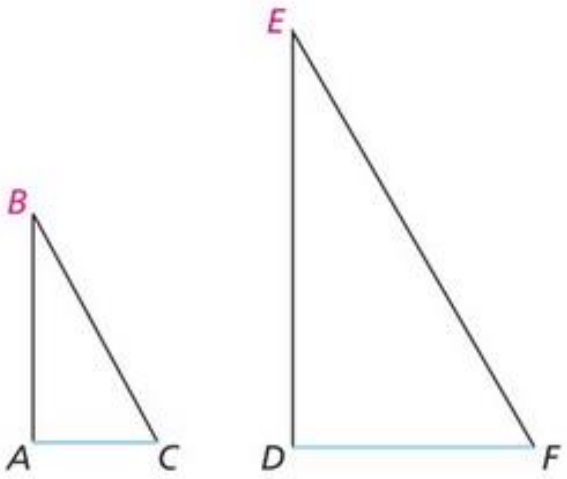


1.2 Scaling Up and Down

Corresponding Sides and Angles

In the last Problem, you worked with images, or scale drawings, that were similar to the original. Those scale drawings were larger than the original figure. In this Problem, you will work with scale drawings that are smaller than the original. You will also learn more about what it means for figures to be *similar*.

When you study similar figures, you often compare their sides and angles. To compare the parts correctly, mathematicians use the terms **corresponding sides** and **corresponding angles.** In every pair of similar figures, each side of one figure has a corresponding side in the other figure. Also, each angle has a corresponding angle.



Corresponding angles

B and E

A and D

C and F

Corresponding sides

AC and DF

AB and DE

BC and EF

Recall that there are two ways to identify angles.

You can identify an angle with three letters. The angles in the small triangle on the previous page have the following names:

Angle BAC	or	$\angle BAC$
Angle BCA	or	$\angle BCA$
Angle ABC	or	$\angle ABC$

Notice that the letter identifying the vertex of an angle is always the middle letter in its name. For example, point A is the vertex of $\angle BAC$.

You can also name an angle by its vertex. It is important to use this method only when it is clear which angle you are referring to.

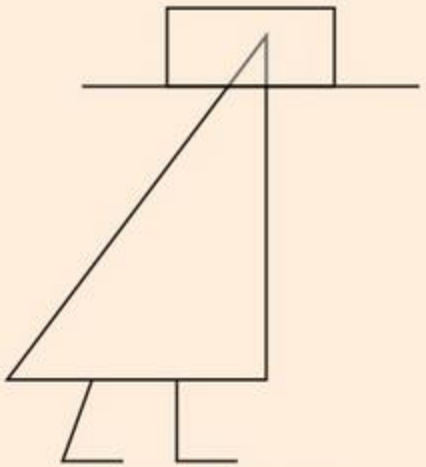
$\angle BAC$	can also be called	$\angle A$
$\angle BCA$	can also be called	$\angle C$
$\angle ABC$	can also be called	$\angle B$

- What names would you give the angles of the large triangle?

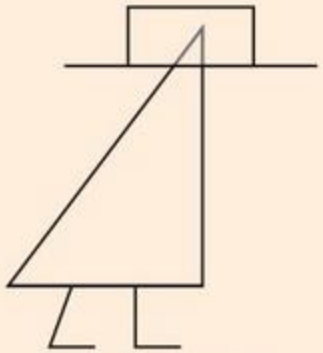
Did You Know?

Measurement is often used in police work. For example, some stores with cameras place a spot on the wall 6 feet from the floor. When a person standing near the wall is filmed, this makes it easier to estimate the person's height. Investigators take measurements of tire marks at the scene of auto accidents to help them estimate the speed of the vehicles involved. Photographs and molds of footprints help the police determine the shoe size, type of shoe, and weight of the person who made the prints.

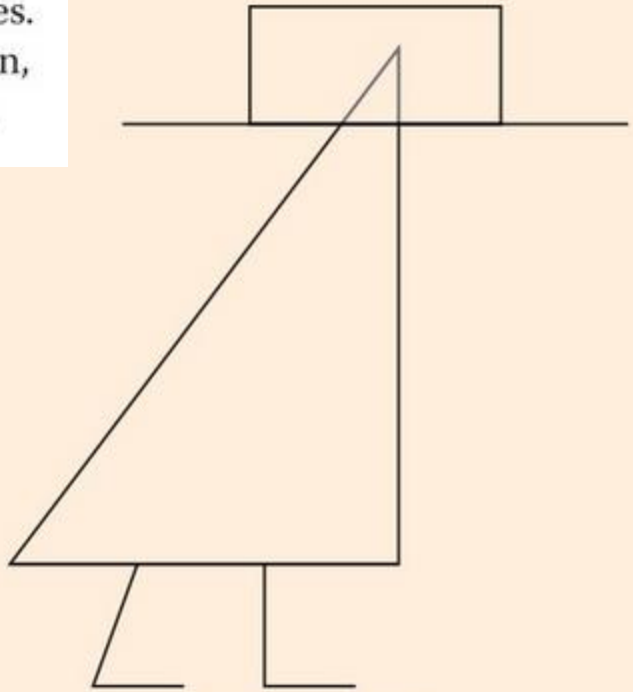
Daphne thinks the rubber-band method is clever, but she believes the school copier can make more accurate copies in a greater variety of sizes. She makes a copy of "Super Sleuth" with the size factor set at 75%. Then, she makes a copy with a setting of 150%. The results are shown below.



Original drawing



Copied at 75%



Copied at 150%

- How are these copies of the original logo like the copy you made with the rubber-band stretchers? How are these copies different from the rubber-band stretcher copy?
- How are these copies like the original? How are they different?

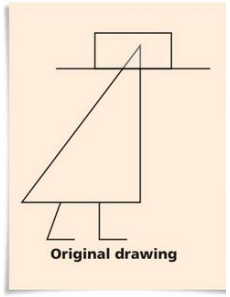
Problem 1.2

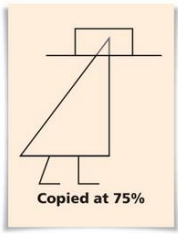
A Use the figures on the previous page. For each copy of Super Sleuth, do the following:

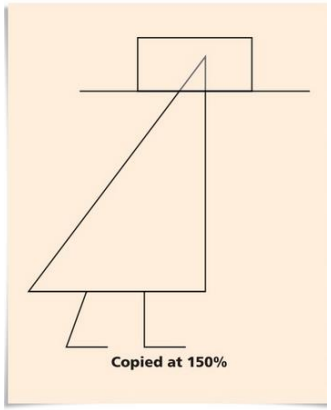
1. Describe how the side lengths compare to the corresponding side lengths in the original figure.

The **side lengths** of the **small figure** are **0.75** (or **75%**) **times as long** as the lengths of the original figure.

The **side lengths** of the **large figure** are **1.5 times (or 150%)** as large as the lengths of the original figure.



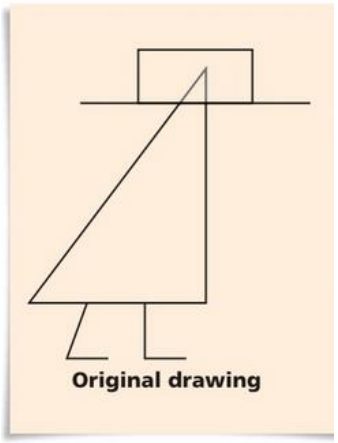


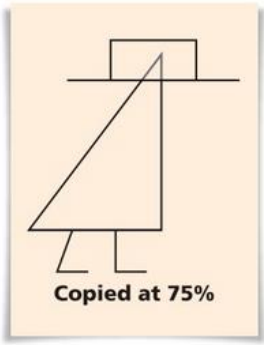


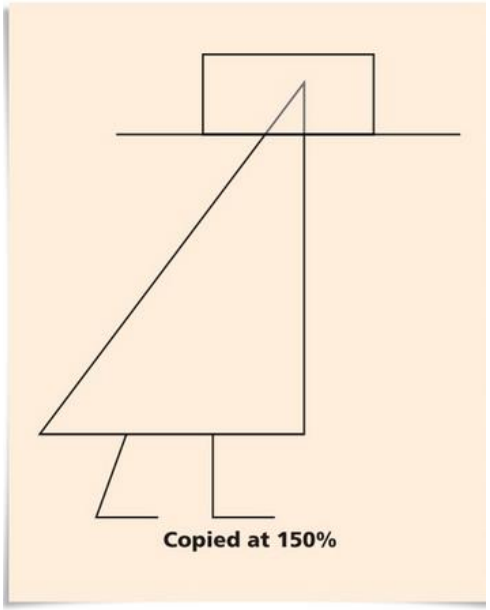
Problem 1.2

2. Describe how the angle measures compare to the corresponding angle measures in the original figure.

The **angle measure** remain the **same**!





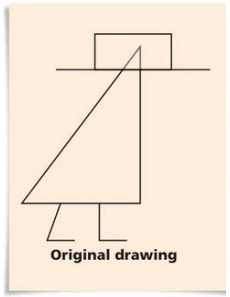


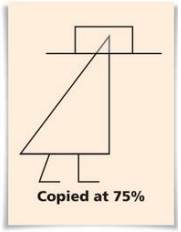
Problem 1.2

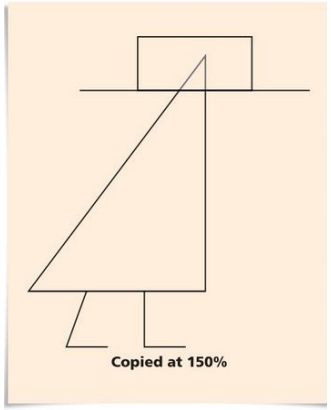
3. Describe how the perimeter of the triangle in each copy compares to the perimeter of the triangle in the original figure.

The **perimeters** of the **small figure** are **0.75 times as long** as the original.

The **perimeters** of the **large figure** are **1.5 times as long** as the original.





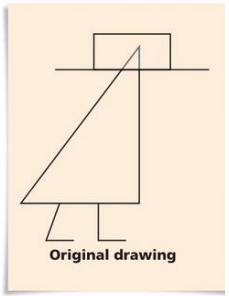


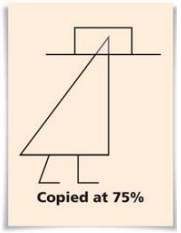
Problem 1.2

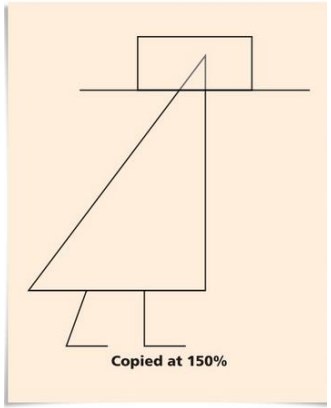
4. Describe how the area of the triangle in each copy compares to the area of the triangle in the original figure.

The **area** of the **smallest figure** is a **little more than ½ the area** of the original .

The **area** of the **largest figure** is a **little more than double the area** of the original.







Problem 1.2

B How do the relationships in the size comparisons you made in Question A relate to the copier size factors used?

The **length** and **perimeter** **comparison factors are the *same* as the copier size factors**.

$$0.75 = 75\%,\ 1.5 = 150\%.$$

How about the area?

Since the sides are changed by a factor, the **area** (**a product of the sides: l x w**) is changed by a product of the factor and itself.

(**Squares** of the copier size factors!)

$$0.5625 = 0.75 \times 0.75 \qquad 2.25 = 1.5 \times 1.5.$$

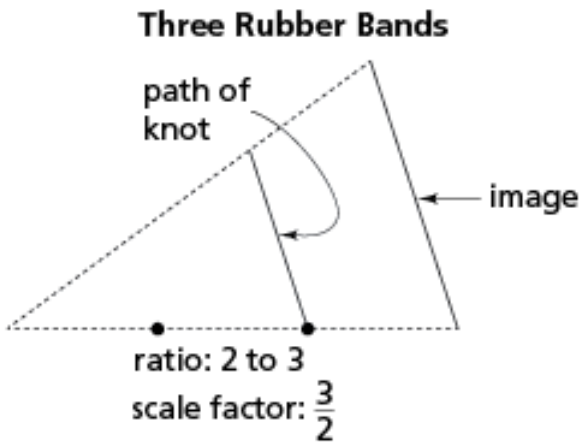
Problem 1.2

C 1. If two figures are similar, what is the same about the figures and what is different?

The measures of the **corresponding angles are the same**, but the **side lengths may be different**.
Each side length in the image is **found by multiplying the original length by the same number**.

2. If you wanted to achieve a 150% increase with the rubber-band method, what would you do?

You would use **3 rubber bands**, and use the **second knot** from the anchor point to trace the figure. Each side length is increased by a factor of **3/2 or 150%.**



HW: p16: 1-2, 5, 7, 13-15