

1.1 Solving a Mystery

An Introduction to Similarity



The Mystery Club at P.I. Middle School meets monthly. Members watch videos, discuss novels, play “whodunit” games, and talk about real-life mysteries. One day, a member announces that the school is having a contest. A teacher in disguise will appear for a few minutes at school each day for a week. Any student can pay \$1 for a guess at the identity of the mystery teacher. The student with the first correct guess wins a prize.

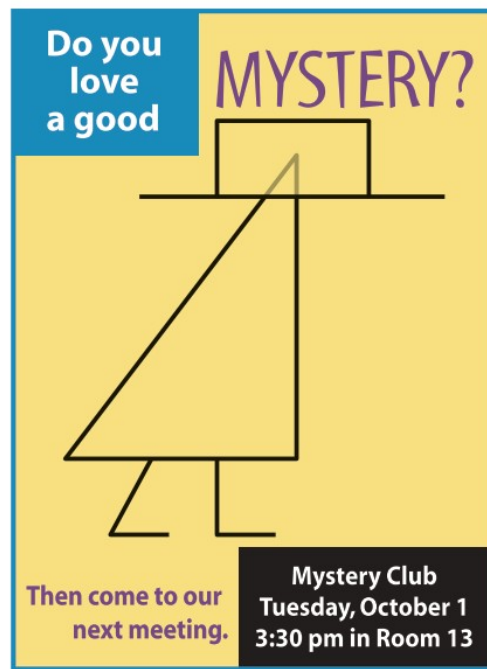
The Mystery Club decides to enter the contest together. Each member brings a camera to school in hopes of getting a picture of the mystery teacher.

One of Daphne’s photos looks like the picture below. Daphne has a copy of the *P.I. Monthly* magazine shown in the picture. The *P.I. Monthly* magazine is 10 inches high. She thinks she can use the magazine and the picture to estimate the teacher’s height.



- What do you think Daphne has in mind? Use the picture and the information about the height of the magazine to estimate the teacher's height. Explain your reasoning.
- The teacher advisor to the Mystery Club says that the picture is similar to the actual scene. What do you suppose the adviser means by *similar*? Is it different from saying that two students in your class are similar?

Michelle, Daphne, and Mukesh are the officers of the Mystery Club. Mukesh designs this flier to attract new members.

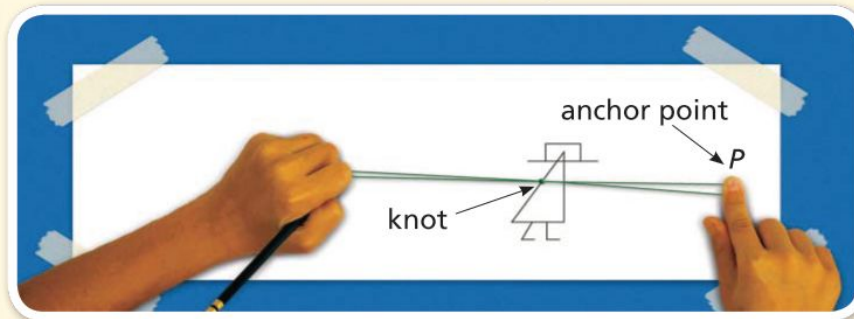


Daphne wants to make a large poster to publicize the next meeting. She wants to redraw the club's logo, "Super Sleuth," in a larger size. Michelle shows her a clever way to enlarge the figure by using rubber bands.

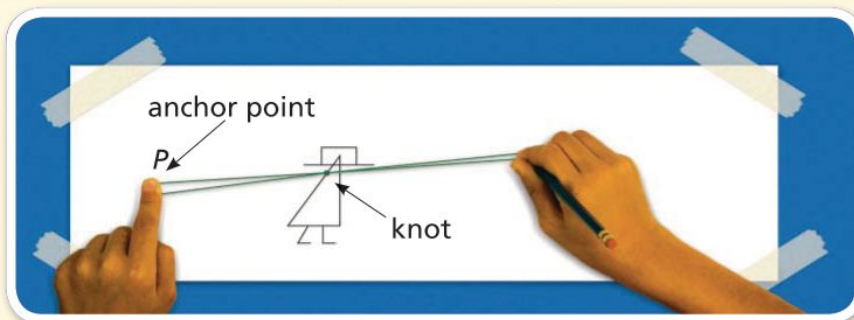
Instructions for Stretching a Figure

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.

Left-handed setup



Right-handed setup



- How are the original shape and its image alike? Different?

Problem 1.1



Use the rubber-band method to enlarge the figure on the Mystery Club flier. Draw the figure as carefully as you can, so you can compare the size and shape of the image to the size and shape of the original figure.

A Describe how the original figure and the image are alike and how they are different. Compare these features:

- the general shapes of the two figures
- the lengths of the line segments in the hats and bodies
- the areas and perimeters of the hats and bodies
- the angles in the hats and bodies
- the distance of corresponding points on each figure from P

Explain each comparison you make. For example, you may find that two lengths are different. Be sure to tell which lengths you are comparing and explain how they are different.

B Use your rubber-band stretcher to enlarge another simple figure, such as a circle or a square.

1. Compare the general shapes, lengths, areas, perimeters, and angles of the original figure and the image.
2. Would your comparisons in part (1) change if the location of P were changed? Explain why or why not.

C The original figure and its image are *similar figures*. What do you think similar means in mathematical terms? What things are the same about these similar figures? What is different?

A C E Homework starts on page 16.