

## Lesson 5-1: Using Proportions

### Hands-on Activity: *Pantograph*



#### Objective:

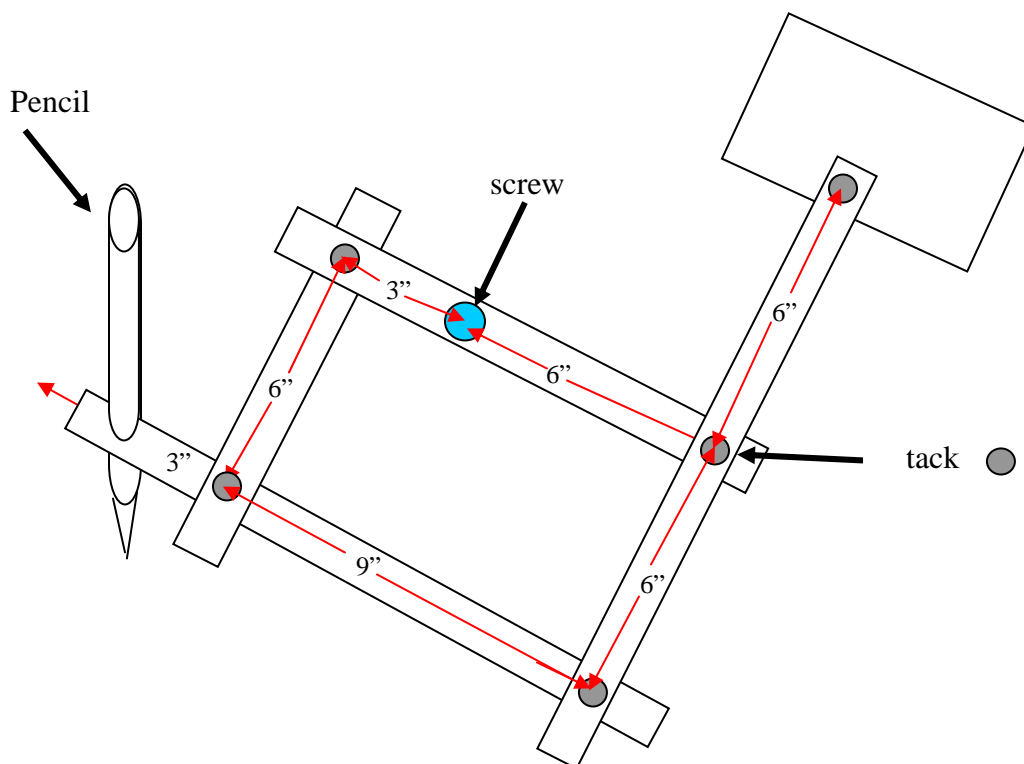
Construct a pantograph and use it to draw similar figures (reduced or enlarged). A pantograph is an instrument used to copy line drawings or pictures, and enlarging or reducing them as you draw. The pantograph in this exercise will allow you to double the size of your picture.

#### Materials:

- Sturdy cardboard (could be the back of legal pads or corrugated cardboard)
- 5 tacks or pushpins
- Pieces of pencil erasers (the tops of old pencils or dried out erasers) to cover the tips of the tacks
- A pencil with a sharp point
- A deck of cards or a small piece of wood about  $\frac{1}{2}$ " -  $\frac{3}{4}$ " high
- A 1" screw or nail
- Masking tape or duct tape

#### Procedure:

1. Cut the cardboard into four  $\frac{3}{4}$ " wide strips with lengths 14", 14", 11", and 8".
2. Using the diagram below, mark each "x" on your strips. Be sure to measure accurately **between the centers of the holes** as shown.
3. Use the nail to start the hole for the pencil and then push the pencil through.
4. Push 4 of the tacks through the cardboard intersections and cover the sharp tips with the erasers to keep them from pulling out (and to keep from sticking yourself on them).
5. Push the nail through the hole as shown so that about  $\frac{1}{2}$ " of it goes below that cardboard.
6. Tape the deck of cards (or wood block) to the table securely and fasten the cardboard strip to it with a tack.



### How to enlarge your picture:

1. Place a picture under the pantograph so that the tip of the screw is near the middle of the picture and just barely above the picture. . Move the pencil left, right, up and down to see that the screw tip will reach all areas of the picture. Once you have the right placement for the picture, tape it to the table so it won't slide around.
2. Tape another piece of paper next to the picture and under the pencil area. It should be fairly centered.
3. Put the pencil point onto the paper. Draw a new picture by moving the pencil around and making the tip of the screw trace over the original picture. Be careful not to put pressure on the pencil. Let the screw tip guide your moves.
4. Your picture should be a double size replica of your original and everything should be proportional.

Color your picture if you'd like!

