Transformational Puppet

Name _____

Class _____

## Problem 1– Constructing the puppet

Open a new document in *Cabri Jr*.

To construct the head of your puppet, use the **Circle** tool to place a circle near the **top right** of the screen.
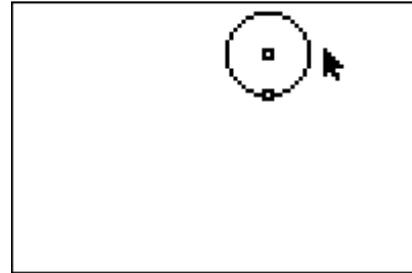
Now use the **Segment** tool to construct a segment to serve as the body of your stick figure puppet.
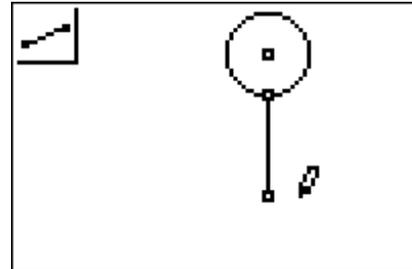
Place a point on the body to serve as the shoulder of the puppet. Be sure to use the **Point On** tool.
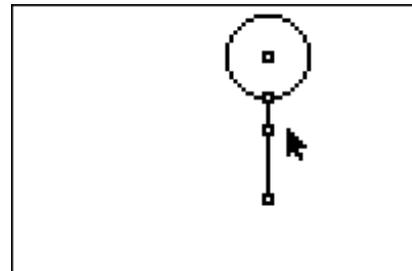
Construct a segment in the **bottom left** corner of the screen. This will serve as the translation vector that will be used to create an image point (the left hand) from the pre-image point (the shoulder).

It is important to start your segment at the bottom right since the order of creation of the segment will dictate the direction of the translation.

Move your pointer to the location you predict the hand (image point) will be located after the translation.

Translate the shoulder point, by choosing **Translation**, clicking on the shoulder and then clicking on the translation segment.
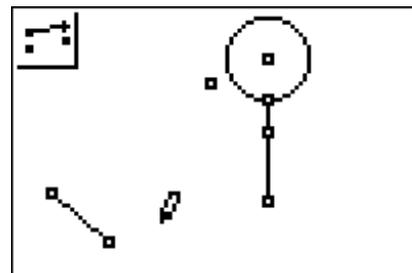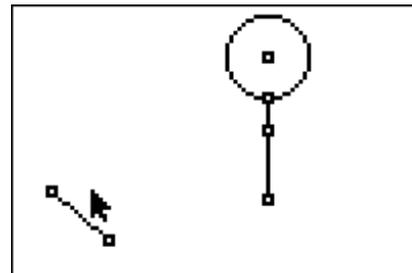
Connect the shoulder to the left hand using a segment.
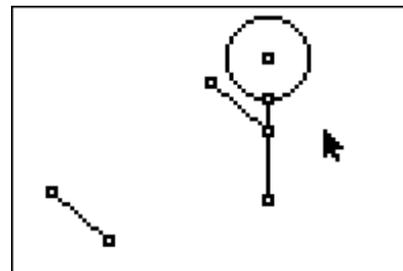
Move your pointer to the place on the screen where you think the right hand will be if you were to reflect the left hand with respect to the body of the stick figure.

Choose the **Reflection** tool. Reflect the left hand by clicking on the left hand and then the body of the puppet.
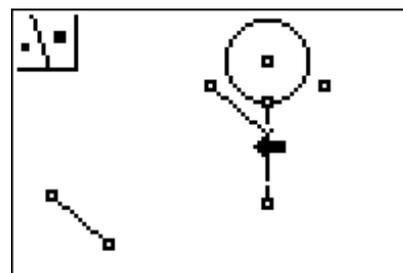
Connect the right hand and the shoulder using a line segment.
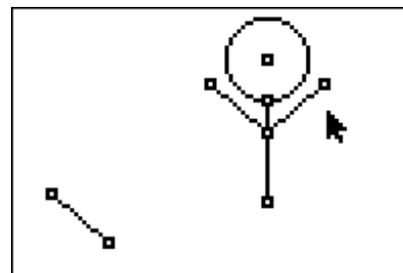
Click on the top point of your translation segment and press ALPHA. Drag the point up and down to watch the puppet's arms move.

- Why do the arms move when you are not dragging them?
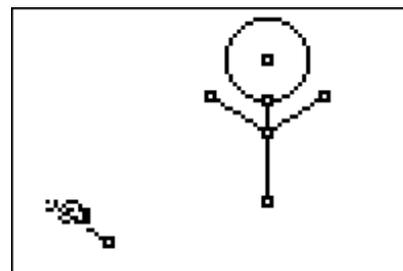
Next, construct the legs of the puppet. To begin, you need to create a translation segment for the legs. This is crucial to the working of the puppet.

Draw a segment that **starts** above and to the right of where your arm segment ended. Have the leg segment **end** on the same point that your arm translation segment ended.
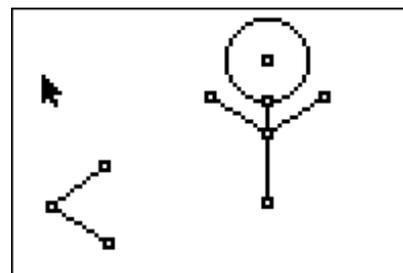
Move your pointer to the place on the screen where you think the left foot will be if you were to translate the hip using the leg translation segment you created in the previous step.

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In the same way you translated the shoulder point to get the left hand, translate the hip point to create a left foot.
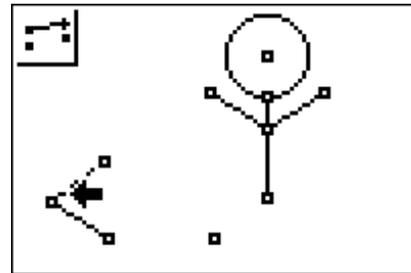
Connect the left foot and the hip using the **Segment** tool.
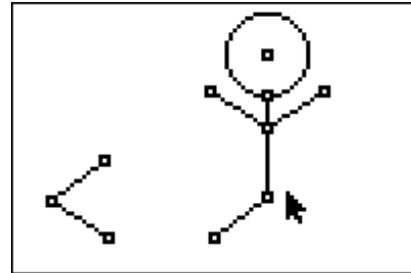
Move your pointer to the place on the screen where you think the right foot will be if you were to reflect the left foot with respect to the body of the stick figure.

Reflect the left foot with respect to the body to obtain the image point which will serve as the right foot. How good was your guess?
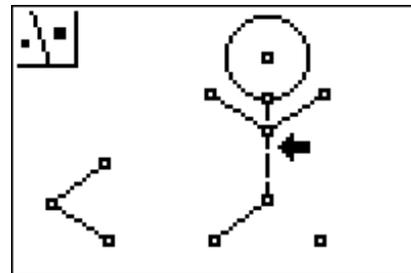
Connect the right foot to the hip using a segment and your puppet will be complete.
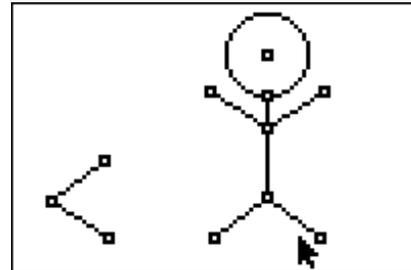
Problem 2– Moving the puppet

Move your cursor to the point where the arm and leg translation segments meet. Press [ALPHA] to grab the point. Move the point around and watch your puppet move on the screen.

- Why does moving one point results in the moving of two arms and two legs?
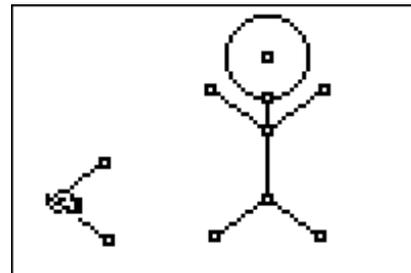
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- Experiment with stretching out the translation segments and shrinking them, observing what happens.

- How do you think the slopes of the two arms compare?

Test your theory by finding the slopes of the arms using the **Slope** tool from the Measure menu.
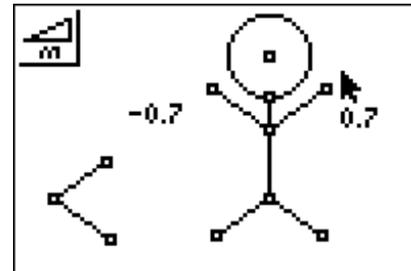
Now, grab the intersection point of the arm and leg translation segments again and move it around.

- What happens to the slope? Why?
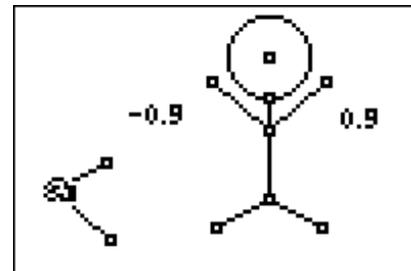
Use **Coord. & Eq.** tool to find the coordinates of the left and right hand. Grab the intersection point of the arm and leg translation segments and move the arms and legs.

- What happens to the coordinates? Why?