

LeeAnn Watts
 Geometer Sketchpad Worksheet
 October 17, 2006

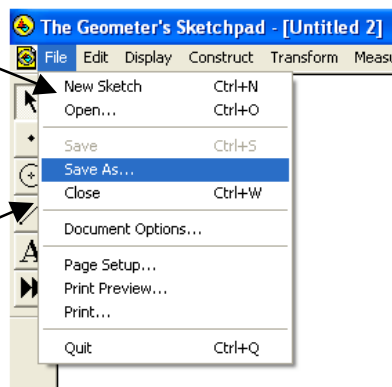
Investigation: The Centroid of a Triangle

In the investigation, you will discover properties of the medians in a triangle. Follow the instructions to create the sketch and complete the Investigation. Once you have finished completing the worksheet, turn in the Investigation portion of the worksheet.

Getting Started:

1. Start Geometer's Sketchpad
2. Choose **NEW SKETCH** from the **FILE** menu.

Any commands from the file menu will follow this window. i.e. "Save", "Print", and "New Sketch" are all possible commands that will drop down from this menu bar.



NOTE: At any time, if you need to undo your last operation, choose UNDO from the EDIT menu

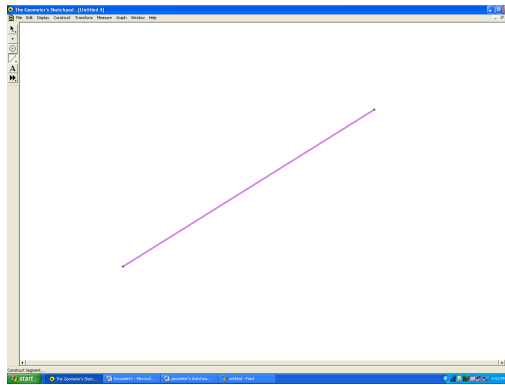
Sketch:

Step 1: Construct a Triangle ABC .

- a. Click on the **Straightedge Tool** in the toolbox.

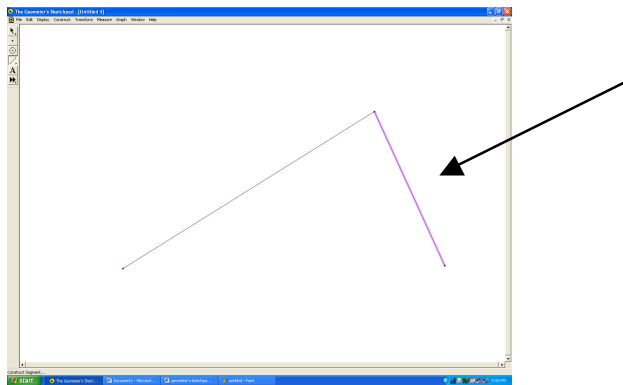


- b. Click once onto the sketch area – this will place a point on your sketchpad. As you move your mouse, you will see the cursor stretch a line segment. Move the cursor to any desired location on the sketch area and click once more – this will place another point creating a line segment.

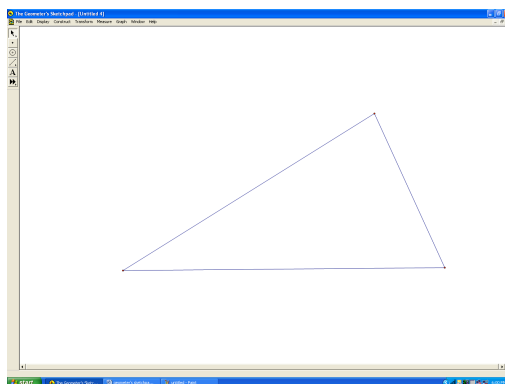


NOTE: The line segment will be highlighted once it is complete.

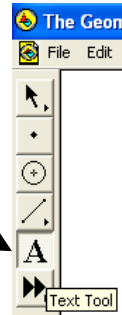
- c. Click on one endpoint of your line segment – it will become highlighted. Repeat the same steps in b. to create a second line segment.



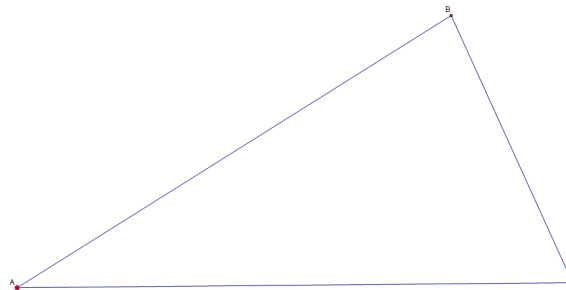
- d. Again, click one of the endpoints on the first or second line segment. Repeat the same steps to draw a third line segment – constructing a triangle.



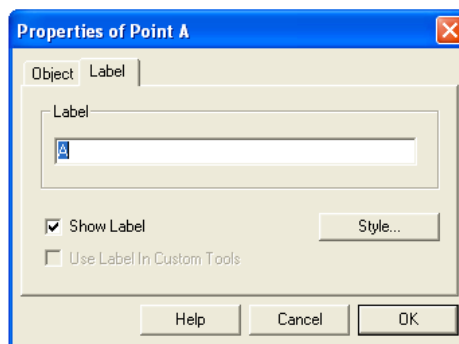
- e. Click on the **Text Tool** of the tool bar.



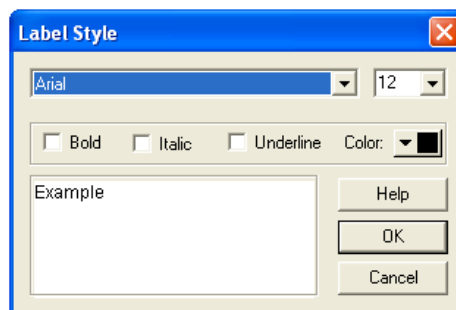
- f. Using the text tool, click on each point of the triangle. As you will see, the first point will be labeled *A*, the second point *B*, and the third point will be labeled as *C*.



- g. Since our points labels are so small, we are going to enlarge their size. Double click on any letter. **Properties of point A** will appear.

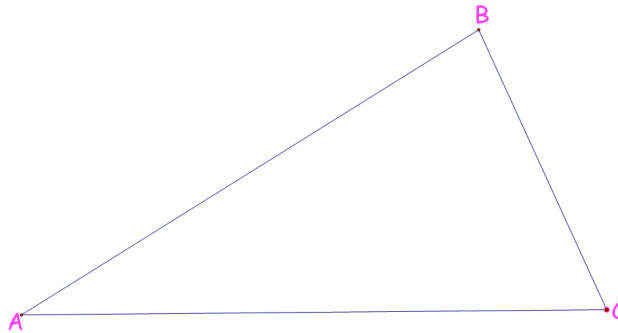


- h. In this menu click on **Style**. **Label Style** menu will appear. This menu allows you to change the font, color and size of your text. Choose which text font, color and size you desire (minimum of 18 pt.) and then press **OK** twice.



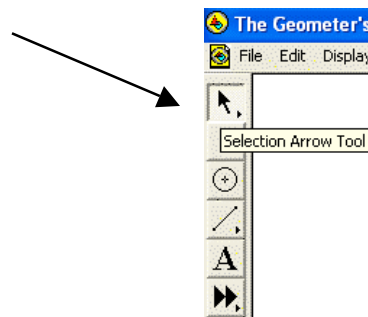
- i. Repeat steps *i.* and *j.* to label the other two points of the triangle.

NOTE: If the label is NOT easily seen, click on the letter and drag it to a more visible location.

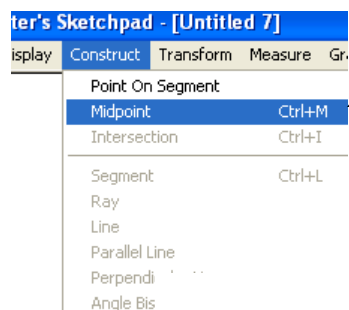


Step 2: Construct Midpoints, *D*, *E* and *F*, on each line segment of the triangle.

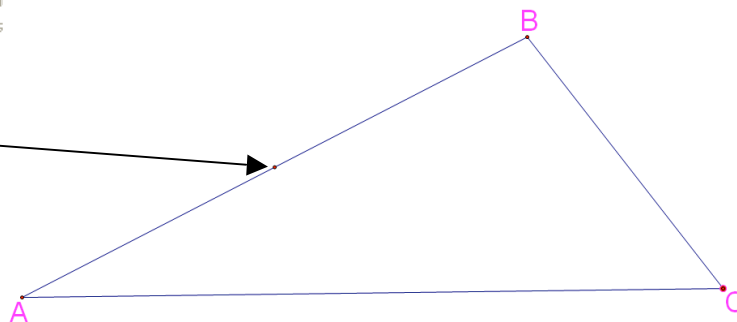
- a. Click on the **Selection Arrow Tool** from the tool bar.



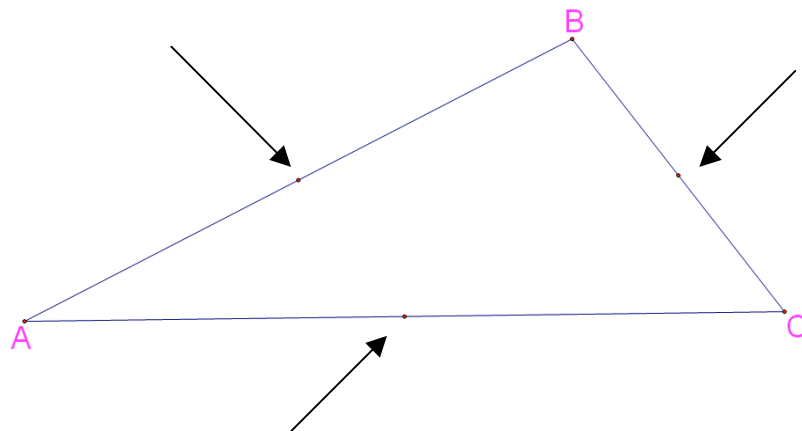
- b. Click on any one line segment to highlight it. Next, click on the **Construct** tab from the menu bar. A window will drop down where you will select **Midpoint**. This will place a point in the middle of the selected segment.



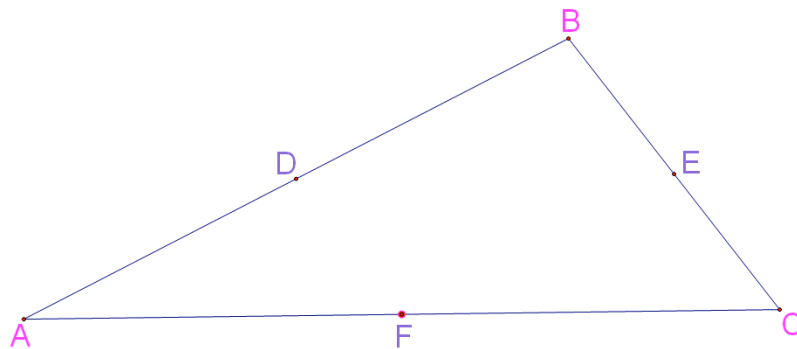
midpoint of AB



- c. Next, click on a blank space of the sketchpad to un-highlight the midpoint that was just placed and repeat step 2b. to construct the midpoints of the other two segments.

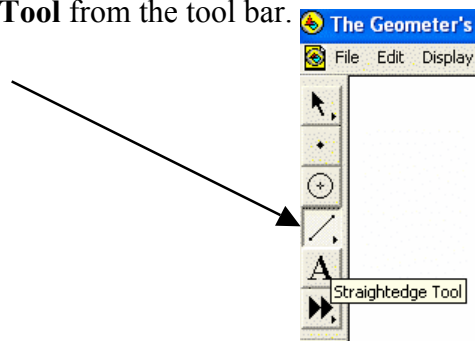


- d. Click once anywhere on the sketch area with the selection arrow to un-highlight any highlighted images.
- e. Now, that we have our midpoints of each line segment let's label each midpoint. Follow the same steps used to label the points of the triangle. (Steps 1g - j)

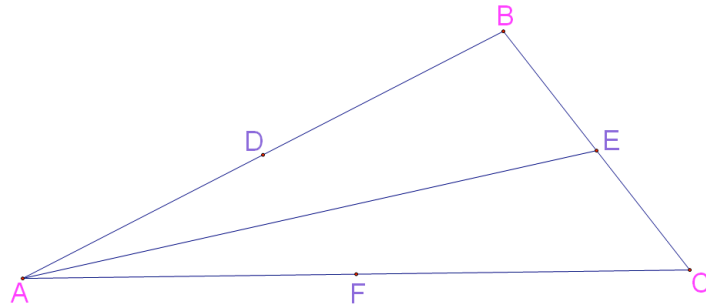


Step 3: Construct two medians and their point of intersection labeled G.

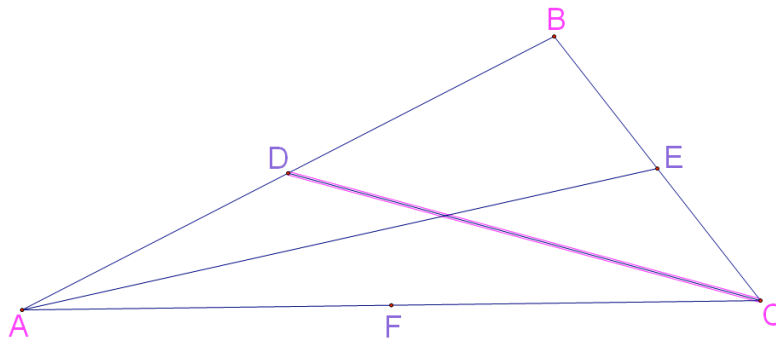
- a. Click on the **Straightedge Tool** from the tool bar.



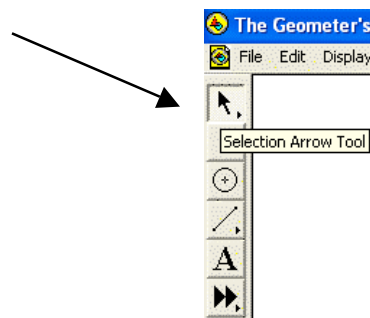
- b. Click on point A and drag the mouse to construct a line segment – median – to midpoint E .



Repeat and construct a line segment – median – from point C to midpoint D .



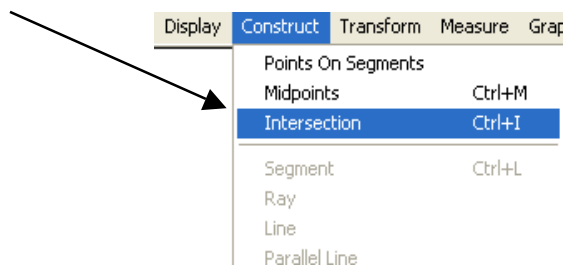
- c. Next, click on the **Selection Arrow Tool** from the tool bar.



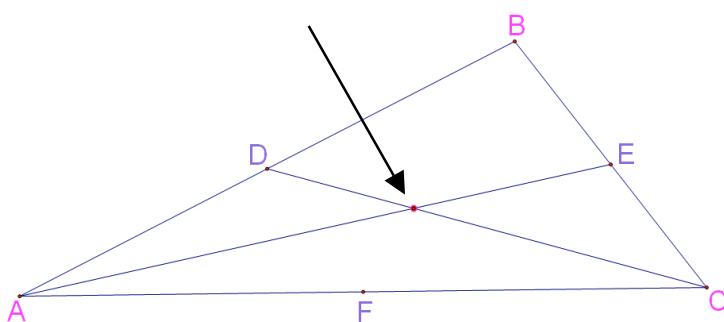
- d. Now, we want to find the intersection point of the two medians. Since we already have one median highlighted, we must only highlight the second median. Using the **Selection Arrow Tool** click on the median that is not already highlighted (the median from point A to midpoint E).

NOTE: Both medians should now be highlighted.

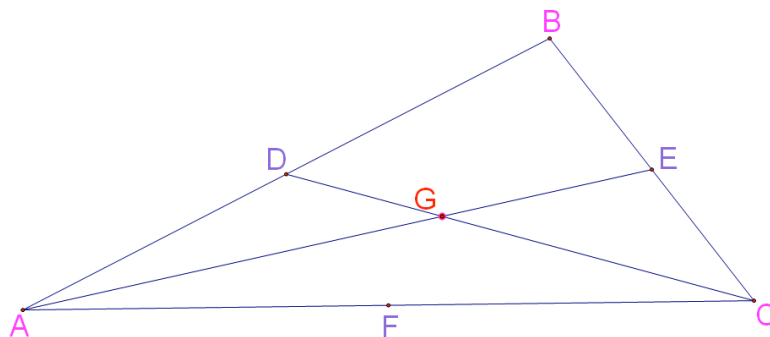
- e. Click on the **Construct** tab from the menu bar. A window will drop down where you will select **Intersection**.



This will insert a point in the intersection of the two medians.



- f. Click once anywhere on the sketch area with the selection arrow to un-highlight the intersection point.
- g. Now that we have constructed both medians and their intersection point, we must label the point of intersection. Again, let's follow steps *lg - lj* and label the point of intersection *G*.

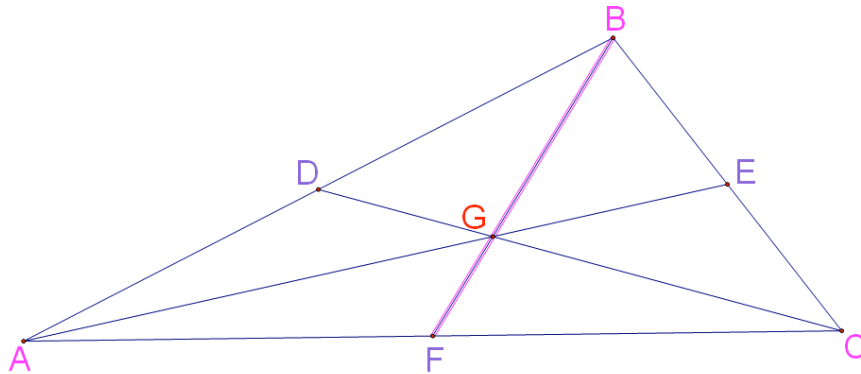


Step 4: Construct the third median.

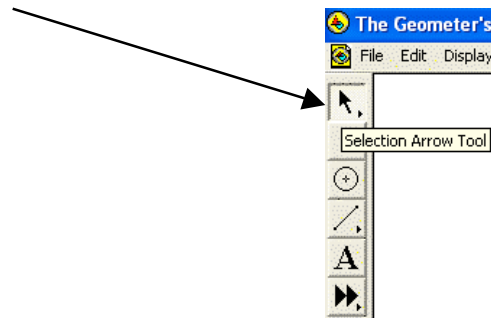
- a. Click once more on the **Straightedge Tool** on the tool bar.



- b. Again, click on point B of the triangle and drag the cursor toward midpoint F . Click once on F to draw the third median of the triangle.

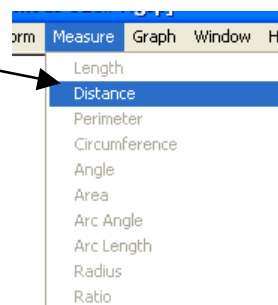


- c. Next, we want to un-highlight the third median. Click on the **Selection Arrow Tool** on the tool bar and click on any blank space on the sketch pad.



Step 5: Measure the distances from B to G and from F to G .

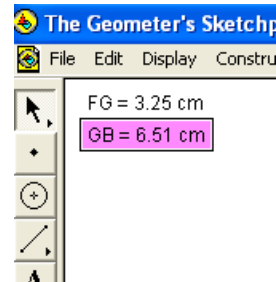
- a. Using the selection arrow, click on the point B and the intersection point G . (Both points should now be highlighted)
Next, click on the **Measure** tab on the menu bar. A window will drop down. Click on the **distance** option.



The distance from B to G will appear in the upper left hand corner of the sketch pad.

- b. Click once anywhere on a blank space of the sketch area to un-highlight the measurement.
- c. Repeat step 5a to measure the distance from midpoint F to the intersection point G .

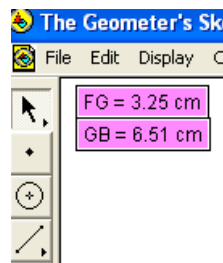
NOTE: Both measurements will appear as follows:



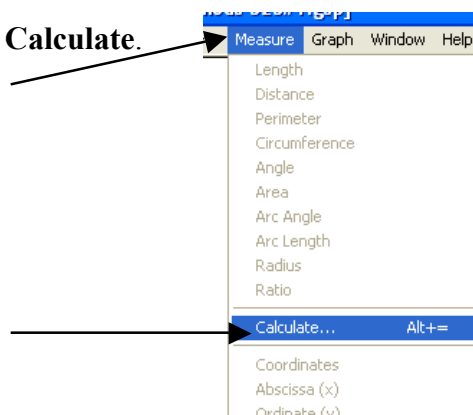
Step 6: Calculate $\frac{GB}{FG}$.

- a. Before we calculate $\frac{GB}{FG}$, both measurements must be highlighted. We already have GB highlighted. Using the selection arrow click on the measurement FG to highlight it.

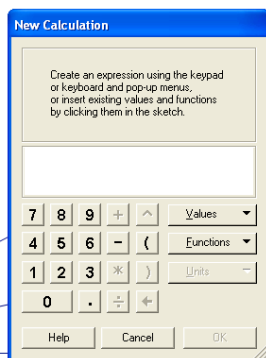
(Both measurements should now be highlighted)



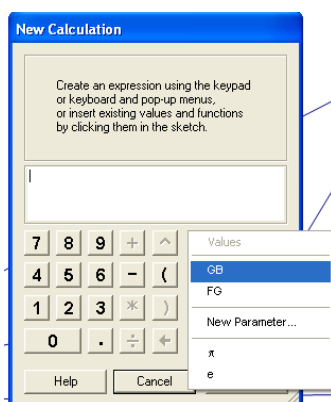
- b. Click on the **Measure** tab on the menu bar. As the window drops down select the option **Calculate**.



A **New Calculation** calculator will appear.



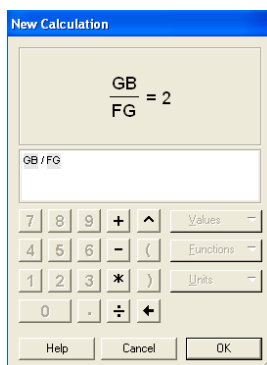
- c. Now we must calculate $\frac{GB}{FG}$. Click on the **Values** tab and select **GB**.



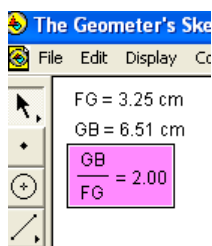
Click on \div and again click on **Values** and select **FG**.



- d. On the **New Calculation** calculator the solution to GB/FG will appear.



- e. Click on **OK** so that the calculation will appear on the sketchpad under both measurements.



- f. Once more, click on any blank area of the sketch pad to un-highlight the calculation.

Investigation:

- 1.) When you constructed the third median did it pass through the point of intersection of the other two medians?

yes it did

- 2.) Drag any point or side of the triangle.

- a. Do the three medians always intersect in a single point?

yes they do

- b. What happens to the value of GB/FG as you change the triangle?

it remains the same value/ it never changes

- 3.) Using the selection arrow highlight your two measurements and the calculation. Choose **Tabulate** in the **Graph** menu on the menu bar. In the **Graph** menu select **add graph table** and add “5” entries as values change and select **OK**. Move one point or side of the triangle. Every second that the triangle moves more entries will be recorded in your table. What are those entries:

$GB =$	<i>7.15cm</i>	<i>8.05cm</i>	<i>8.54cm</i>	<i>9.09cm</i>	<i>9.53cm</i>	<i>9.59cm</i>
$FG =$	<i>3.57cm</i>	<i>4.02cm</i>	<i>4.27cm</i>	<i>4.54cm</i>	<i>4.77cm</i>	<i>4.80cm</i>
$GB/FG =$	<i>2.00</i>	<i>2.00</i>	<i>2.00</i>	<i>2.00</i>	<i>2.00</i>	<i>2.00</i>

NOTE: The point of concurrency of the three medians is called the **CENTROID**.

Present Your Findings:

With your predetermined partner discuss your results. After you and your partner have completed sharing results, go back into your sketchpad and change the point of intersection label from G to **Centroid**. You will then add captions to you sketch, print it out and write a brief explanation of your investigation.