

# Circumcenter of a Triangle

Name: \_\_\_\_\_

Per: \_\_\_\_\_

Date: \_\_\_\_\_

## GETTING READY

- A) Open the Geometry Application (G).
- B) Select **File** and then **New**.

NOTE: If there is something already open in Geometry, make sure you save it if you want to keep it. If not, select **OK** when prompted with the **Clear All** menu.

## CONSTRUCTION

**TIP: To deselect a selection, tap in blank space.**

- 1) Create triangle ABC by **either**:

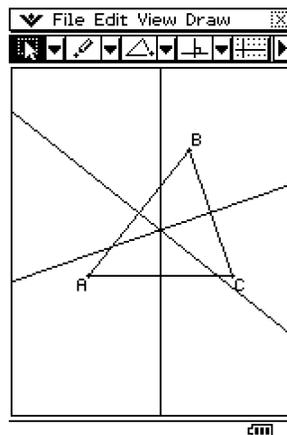
- a) tapping the toolbar button (O)

**OR**

- b) using the Draw menu (**Draw, Special Shape, Triangle**)

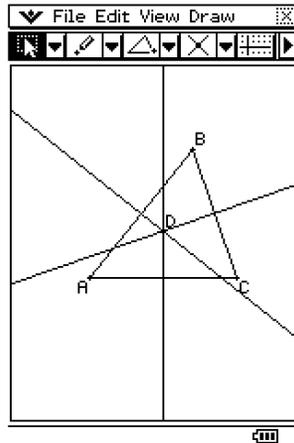
- 2) Create a boundary box for the triangle by pressing on the screen and dragging. When you let go, a triangle will appear inside the box.
- 3) Create perpendicular bisectors for each segment of the triangle (steps below).
  - a) Select the segment.
  - b) Select the command for perpendicular bisector (either on the toolbar (p) or in the **Draw, Construct** menu).
  - c) Tap on blank space to deselect all before creating the perpendicular bisectors for subsequent segments.

Result:



- 4) Construct the intersection point of all three perpendicular bisectors.
- Select two of the three perpendicular bisectors.
  - Select intersection command from the toolbar (7) or select **Draw, Construct, Intersection**. This intersection point is called the *circumcenter* of a triangle.

Result:

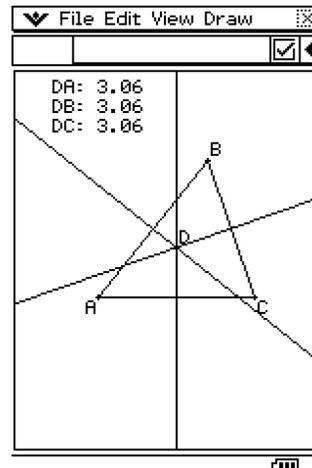
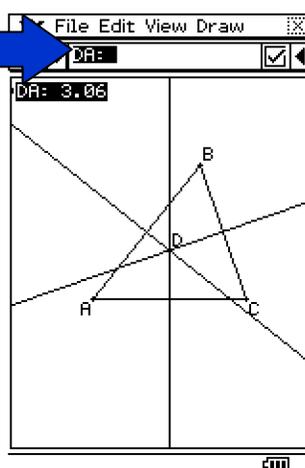


- 5) Measure and paste the distances from the circumcenter to each vertex.
- Tap on the circumcenter and then tap on vertex A of the triangle so both are selected.
  - Tap the . button at the right of the toolbar.
  - Now tap the m at the left of the toolbar to paste the measurement into the draw space.
  - With the u button showing, select the word **Length** and change it to **DA** using your k. (You press the k button on your keypad to access it and close it.)
  - Repeat steps a-d for lengths **DB** and **DC**.

Edit Name:

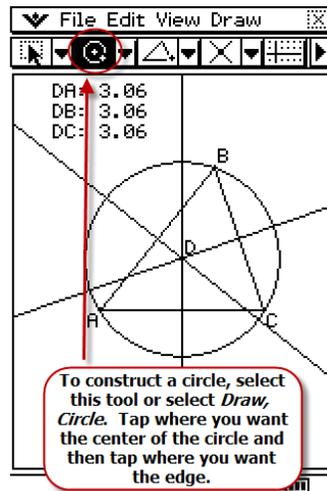
Result:

Edit name in the measurement box using your k.



- 6) Construct a circle where the center is the circumcenter of the circle and the edge of the circle is snapped to the one of the vertices of the triangle. (To **snap to**, press and drag near a point until you see "**Snap to Point \_\_\_**" in the status bar.)

Result:

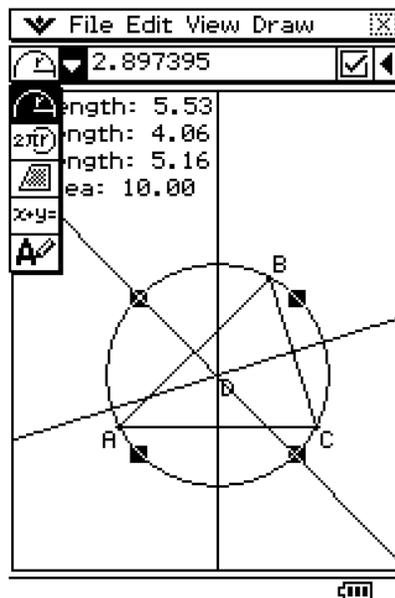


### INVESTIGATION

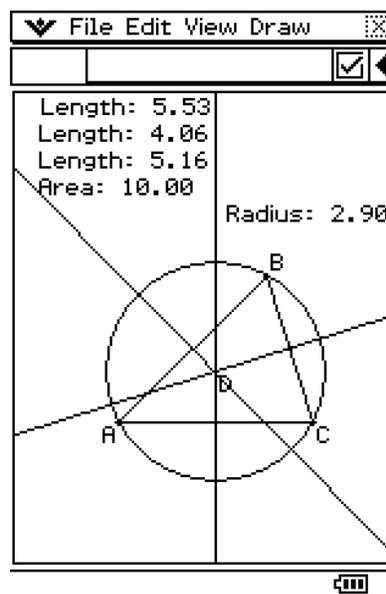
- 1) What do you notice about the lengths you pasted in Step 5? What do you think will happen with those values if you were to move a vertex or side of the triangle?
  
  
  
  
  
  
  
  
  
  
- 2) Move a side or vertex of the triangle. What happened to the values? Make a conjecture about the distances from the circumcenter of any triangle to its vertices.

- 3) Now clear the measurements you pasted (tap on them to select and then **Edit, Delete**). Measure and paste the *side lengths* and *area* of the triangle. Also measure and paste the *radius* of the circle.
- Tap on a side of the triangle to select it, and then tap the . button at the right of the toolbar to get to the measurement box.
  - Tap the length measurement (m) from the dropdown menu on the left side of the toolbar. (Use the C to drop down to get to these buttons.)
  - Continue taking measurements and pasting from the drop down menu. (To find the radius of the circle, you must first select the circle and then select the radius drop down button).
  - You can select any of the measurements and move them where you want them by pressing and dragging.

Pasting Measurements:

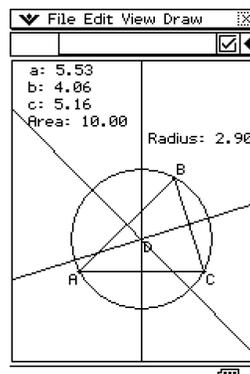


Result:



- Now rename the lengths of the triangle a, b, and c respectively. Select the name you want to change, select **Length** and change it to **a**, **b**, or **c**. Do this for all three lengths so that you have a length **a**, **b**, and **c**. (See CONSTRUCTION, Step 5 above for how to edit names.)

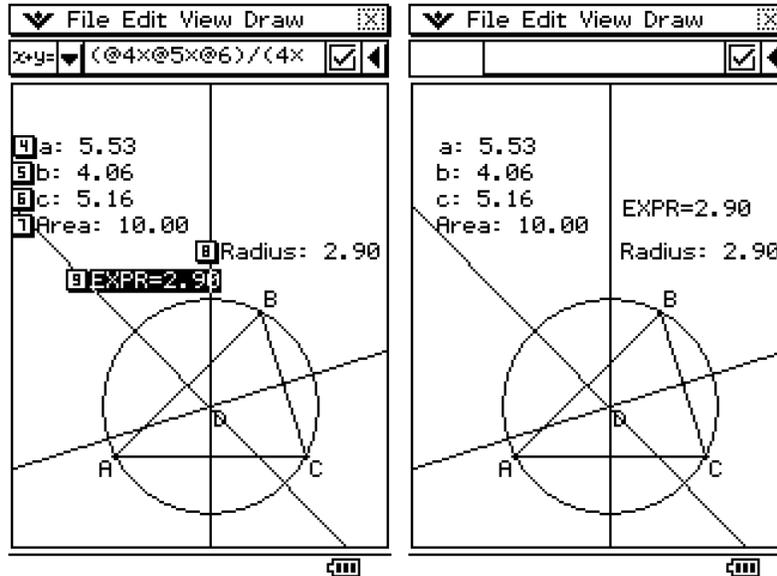
Result:



f) Select **Draw, Expression**. Open your  $k$  using the button on your keypad. Scroll up on the screen so you can see all the measurements. Enter ( from the keyboard and tap the 4 next to length **a**. Now enter a multiplication sign from your keyboard and tap the 5 next to length **b**. Enter another multiplication sign and then tap the 6 next to length **c**. Enter ) / ( **4** from the keyboard and another multiplication sign. Finally, tap the 7 next to **Area** and enter ) from the keyboard. Now press EXE and the  $k$  button again to close it. Scroll down.

Result:

You can also move the expression to a clear spot:



You just entered the expression  $\frac{a * b * c}{4 * (\text{Area of Triangle})}$ .

Look at all your measurements. What do you notice? Move a vertex or side of the triangle. Do your observations hold? Now, based on your observations, write an equation for the radius of any circle that is circumscribed around a triangle. (Note: You can use the variable  $t$  to represent the area of the triangle in your equation.)

4) Write your own definition of "circumcenter" using everything you have learned today.