**Supplementary Activity**

**Unit 5 Investigation 2**

**Perpendicular Bisector Theorem (with trace, part 1)**

Open the file: <http://tube.geogebra.org/material/simple/id/2500033>

Notice that point *C* is equidistant from *A* and *B*.   In this applet, ***C* will always remain equidistant from *A* and *B*.**  Also note that *A* and *B* are the endpoints of segment $\overbar{AB}$.

1. Drag *C* around as much as you'd like (without moving *A* and *B*).     What can you conclude about the locus (set of points) in the plane that are equidistant from the endpoints of a segment?  What does this locus look like?

2, Let's test this conjecture again. Change the location of point *A* and point *B*.       Hit the "Clear Trace" button to erase the previous traces of point *C*.  Repeat Step 1. What do you notice?

3. Use the GeoGebra tools in the applet to now show that your conjecture is true.

**Perpendicular Bisector Theorem (with measurement, part 2)**

Open the file: <http://tube.geogebra.org/material/simple/id/2505993>

﻿In this applet, the perpendicular bisector of the blue segment (with endpoints *A* and *B)* is shown.   Before completing the directions below, move\points *A* and *B* around to verify that the brown line is always the perpendicular bisector of $\overbar{AB}$.

**Use the tools of GeoGebra to do the following:**

a. Use the Point-on-object tool to plot a point anywhere on this perpendicular bisector.

b. Use the measurement tool to display the distance from this point to point *A*.

c.﻿ Use the measurement tool to display the distance from this point to point *B*.
d. Now drag this point along the perpendicular bisector as much as you'd like. Zoom out and keep dragging this point along this perpendicular bisector.

Answer these questions:

1.What do you notice?

2. Use your observations to complete the following statement:  **If a point lies on the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a      \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, then that \_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

3. Prove the statement you completed in question 2.

**Congruent Chords in a Circle**

Open the file: <http://tube.geogebra.org/material/simple/id/2178377>

Interact with the applet.

1. What can you conclude about two congruent chords drawn in the same circle?
2. Prove your conjecture. (Hint: Draw radii.)

**Properties of the Center of the Circumscribed Circle**

Open the file: <http://tube.geogebra.org/material/simple/id/1467785>

Recall that three or more lines are said to be concurrent if and only if they intersect at exactly one point. The three perpendicular bisectors of the sides of a triangle are concurrent. Their point of concurrency is called the **circumcenter** of the triangle. In the applet below, **point *C*** is the **circumcenter** of the triangle. Move the white vertices of the triangle around and then use your observations to answer the questions that appear below.

1. Is it ever possible for a triangle's circumcenter to lie **outside** the triangle? If so, under what circumstance(s) will this occur?

2. Is it ever possible for a triangle's circumcenter to lie **on the triangle itself**? If so, under what circumstance(s) will this occur?

3. If your answer for (2) was "YES", where on the triangle did point *C* lie?

4. Is it ever possible for a triangle's circumcenter to lie **inside** the triangle? If so, under what circumstance(s) will this occur?

5. Now, on the applet, construct a circle centered at ***C*** that passes through *J*. What do you notice? (*Hint: Look at points K & L.*)

6. Let's generalize: The circumcenter of a triangle is the **only point** that is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*(If you need a hint to complete this step, consider the lengths* $\overbar{CK}$and$\overbar{CL}$ *with respect to length* $\overbar{CJ}$*.)*

7. Use what you know about perpendicular bisectors to explain why the phenomenon you observed in step (5) and your response to this phenomenon (in step 6) occurred.