Honors Geometry Name:

Triangle Centers Activities

Activity 1: In Geogebra, place six dots anywhere on a blank page. Then connect pairs of dots.

Question 1: How many intersections did you create? _____

Question 2: How likely do you think it is that there will be one intersection in all? Look at your neighbor's results. Explain.

Activity 2: In Geogebra, create a scalene triangle.

- Choose one vertex of the triangle and its opposite side.
- From this vertex, draw the **altitude**, the **median** and the **angle bisector.**
- Draw the **perpendicular bisector** through its opposite side.
- Color code your four triangle features!

Question 1: Grab the same vertex of the triangle and drag it around. For which type(s) of triangle(s) are all four special features on top of each other?

Question 2: Grab the same vertex of the triangle and drag it around. Are you able to put some of the triangle features outside of the triangle itself? If yes, which ones and why?

Activity 3: In a general scalene triangle, construct the three perpendicular bisectors.

Observation 1:
Describe what you observe about the three perpendicular bisectors in a triangle. Sketch it below.

Definition:
The point of concurrency of the perpendicular bisectors is called the _____

This point is the center of a special circle. Add the circle to your Geogebra sketch. Sketch it below:

Activity 4: In a general scalene triangle, construct the three angle bisectors.

Question 1:
Describe what you observe about the three angle bisectors in a triangle. Sketch the diagram below:

Definition:
The point of concurrency of the angle bisectors is called the _____.

This point is the center of a special circle. Add the circle to your Geogebra sketch and Sketch below:

Activity 5: Quick circumcenters and incenters

- Task 1: Use just two perpendicular bisectors to make a circumcenter.
- Task 2: Use just two angle bisectors to make a quick incenter.

Activity 6:

Construct three altitudes on a general scalene triangle. Sketch below:

Definition:
The point of concurrency of the altitudes is called the _____ .

Activity 7: Construct three medians on a general scalene triangle. Sketch below:

Definition:
This point of concurrency of the medians is called the_____ .

Task 1: Measure the distances from the centroid to the vertex and the centroid to the midpoints. Write down any conjectures here:

Task 2: On Geogebra, highlight the three vertices of each triangle and use the polygon >tool for the six triangles created within your original triangle. Measure the areas of the six triangles created by this triangle center.

Make a conjecture about the areas of the triangles created by the centroid:

Optional Challenge Problem

Conjecture: The sum of the perpendicular distances from an arbitrary point in the interior of an equilateral triangle is equal to the height of the triangle. (See the diagram below.)

Challenge: Why is this true?

