

## Student Instructions for the Triangle Center Geogebra Activity

1. Which triangle centers always stay in the interior of Triangle ABC?
2. When all the centers are in the interior, is the triangle acute, right, or obtuse?
3. Where is the location of the orthocenter when Triangle ABC is formed into a right triangle?
4. Which triangle centers are always collinear?
5. View the Side Lengths and try to make an equilateral triangle. What appears to happen to the triangle centers?
6. View the Medians, Altitudes, Angle Bisectors, and Perpendicular Bisectors. Which of these lines always pass through the Midpoints?
7. View only the Altitudes and Perpendicular Bisectors. How are these lines related?
8. View the Circumcircle (Circle ABC) and drag point A across segment BC. What happens to the Circumcircle?
9. Compare and contrast the Circumcircle and the Inscribed Circle.
10. View the Inscribed Circle, Angle Bisectors and the Radii of Inscribed Circle. Look closely at how they meet Triangle ABC.
  - a. Does the Inscribed Circle reach where the Angle Bisectors intersect with Triangle ABC?
  - b. At what angle do the radii meet Triangle ABC?

### Harder Questions:

11. Think about cutting out the triangle and balancing it flat on your finger. Which triangle center evenly distributes the area (or weight) of Triangle ABC? In other words, where is the center of gravity? Explain your reasoning.
12. Now think of points A, B, and C as cities, and we want to build a hospital in the middle that has new Life Flight helicopters. We want to find the center location that is equidistant from all three cities. Which triangle center represents the point that is the same distance from each vertex of Triangle ABC? How can you be sure?
13. Next, think of segments AB, BC, and CA as major highways, and we want to build a fire station in the middle with three roads leading to the highways. We need to build the quickest access routes to the highways in order to reduce the amount of time it takes to for the fire trucks to get on the highways. Which triangle center represents the point that is the least distance from each side of Triangle ABC? How can you be sure?
14. Finally, what is the purpose of the Orthocenter? (Hint: you should have used the other three triangle centers for the 3 previous questions.) Show the Inner Triangles and make Triangle ABC acute. **Which inner triangle has the smallest perimeter?** Walking the edge of this inner triangle is the shortest path between the segments AB, BC, and CA.  
Can you think of a situation in real life when you might want to find the shortest path between the sides of a triangle?
15. Which of the inner triangles is similar to Triangle ABC?
16. Is the Centroid of Triangle ABC also the centroid of the inner centroid triangle?
17. What would happen if you continued to draw centroid triangles inside centroid triangles? Would they always be similar?