GSP Assignment
Centers of a Triangle

This assignment has a set of activities to help you become familiar with GSP and to review some basic geometry. Please construct and investigate each of the following activities for various triangles. Use a text box to write-up a two to three sentence description of your observations in Activities 1-4. You are asked to observe relationships among the various centers in Activity 5.

The construction for each activity should be on a separate page. Use the "tab" feature of GSP in order to create just one file with different pages for each construction. To activate this feature go to FILE, Document Options, Add Page, Blank Page. You should have one file with 5 pages. Suggested names for the pages are: centroid, orthocenter, circumcenter, incenter, all centers, which appropriately correspond to the 5 activities. Note that the names of the pages appear on tabs in the bottom of the window, allowing you to jump from one page to another.

After completing each investigation you should create a custom tool for the construction. The simplest way to create a custom tool is to complete the desired construction, select all (either from the menu or by drawing a box around it), and then using the Custom Tool in the toolbox. To save a custom tool so it is always available on YOUR computer, it must be saved to the TOOL FOLDER in the folder containing the Sketchpad application.

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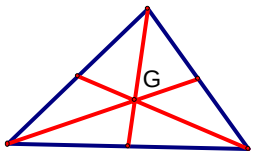
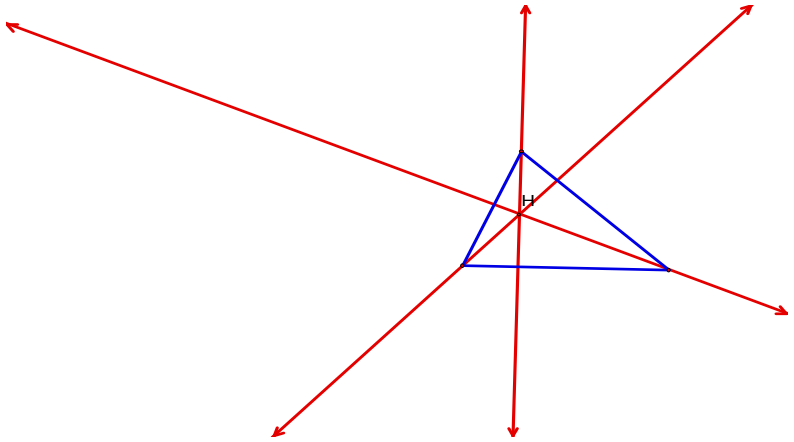
1. The CENTROID (G) of a triangle is the common intersection of the three medians. A median of a triangle is the segment from a vertex to the midpoint of the opposite side.

Use Geometer's Sketchpad (GSP) to construct the **centroid** and explore its location for various shapes of triangles.



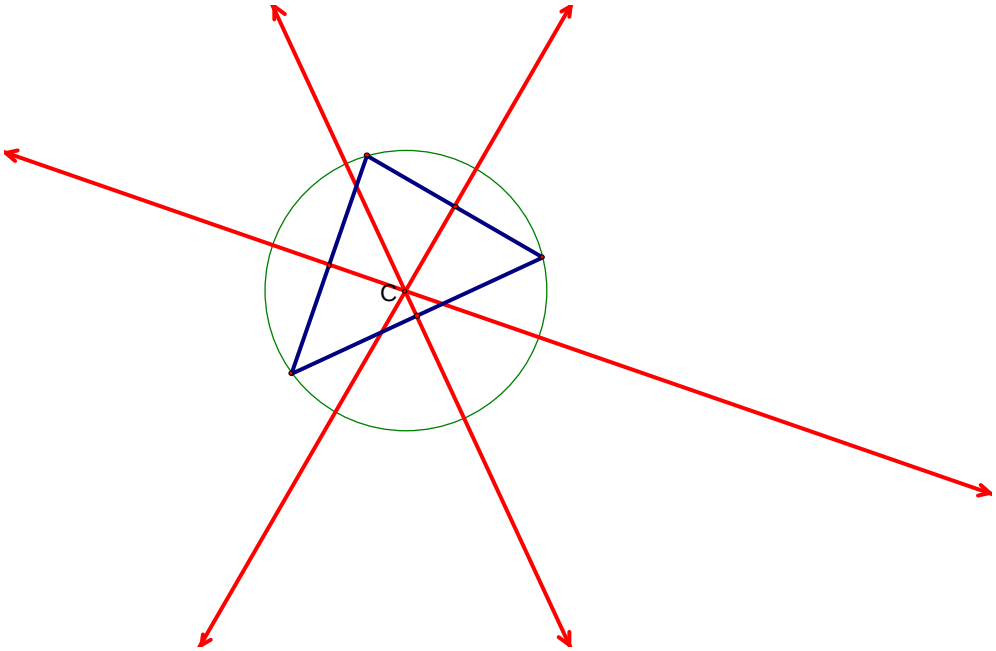
2. The ORTHOCENTER (H) of a triangle is the common intersection of the three lines containing the altitudes. An altitude is a perpendicular segment from a vertex to the line of the opposite side. (Note: the foot of the perpendicular may be on the extension of the side of the triangle.) It should be clear that H does not have to be on the segments that are the altitudes. Rather, H lies on the lines extended along the altitudes.

Use GSP to construct the **orthocenter** H and explore its location for various shapes of triangles. (Make sure your construction holds for obtuse triangles.)



3. The CIRCUMCENTER (C) of a triangle is the point in the plane equidistant from the three vertices of the triangle. Since a point equidistant from two points lies on the perpendicular bisector of the segment determined by the two points, C is on the perpendicular bisector of each side of the triangle. Note: C may be outside of the triangle.

Construct the **circumcenter** C and explore its location for various shapes of triangles. It is the center of the **CIRCUMCIRCLE** (the circumscribed circle) of the triangle.



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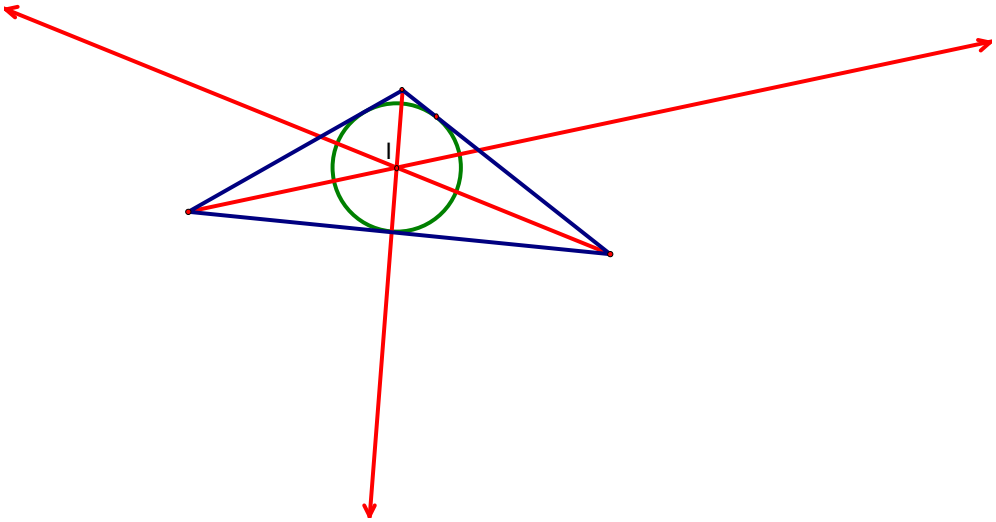
4. The INCENTER (I) of a triangle is the point on the interior of the triangle that is equidistant from the three sides. Since a point interior to an angle that is equidistant from the two sides of the angle lies on the angle bisector, then I must be on the angle bisector of each angle of the triangle.

Use GSP to find a construction of the **incenter** I and explore its location for various shapes of triangles. The incenter is the center of the **INCIRCLE** (the inscribed circle) of the triangle.



5. Use GSP to construct G, H, C, and I for the same triangle. What relationships can you find among G, H, C, and I or subsets of them? Explore for many shapes of triangles.