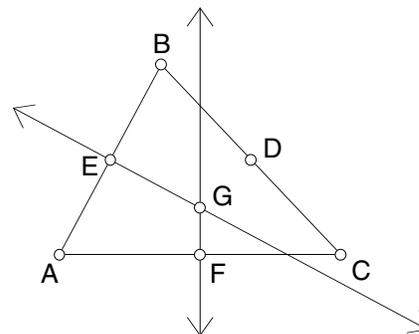## Perpendicular Bisectors
in a Triangle

Name(s): _____

In this investigation, you'll discover properties of perpendicular bisectors in a triangle. You'll also learn how to construct a circle that passes through each vertex of a triangle.

Sketch and Investigate

1. Construct triangle *ABC*.

2. Construct the midpoints of the sides.

Select a side and its midpoint; then, in the Construct menu, choose **Perpendicular Line**. →

3. Construct two of the three perpendicular bisectors in the triangle.

Click at the intersection with the **Selection Arrow** tool or with the **Point** tool. →

4. Construct point *G*, the point of intersection of these lines.

5. Construct the third perpendicular bisector.

Q1 What do you notice about this third perpendicular bisector (not shown)? Drag a vertex of the triangle to confirm that this conjecture holds for any triangle.

6. Drag a vertex around so that point *G* moves into and out of the triangle. Observe the angles of the triangle as you do this.

Q2 In what type of triangle is point *G* outside the triangle? inside the triangle?

Q3 Drag a vertex until point *G* falls on a side of the triangle. What kind of triangle is this? Where exactly does point *G* lie?

Select point *G* and a vertex; then, in the Measure menu, choose **Distance**. Repeat for the other two vertices. →

7. Measure the distances from point *G* to each of the three vertices.

8. Drag a vertex of the triangle and observe the distances.

Q4 The point of intersection of the three perpendicular bisectors is called the *circumcenter* of the triangle. What do you notice about the distances from the circumcenter to the three vertices of the triangle?

9. Construct a circle with center *G* and radius endpoint *A*. This is the circumscribed circle of △*ABC*.

Explore More

1. Make a custom tool that constructs the circumcenter of a triangle. Save your sketch in the **Tool Folder** (next to the Sketchpad application itself on your hard drive) so that the tool will be available for future investigations of triangle centers.

2. Explain why the circumcenter is the center of the circumscribed circle. *Hint:* Recall that any point on a segment's perpendicular bisector is equidistant from the endpoints of the segment. Why would the circumcenter be equidistant from the three vertices of the triangle?

3. See if you can circumscribe other shapes besides triangles. Describe what you try and include below any additional conjectures you come up with.