

Perpendicular Bisectors

Definition:

- The *perpendicular bisectors* of a triangle are lines (or rays or segments) that are perpendicular to the sides of a triangle at the midpoint of sides.
- A triangle's three perpendicular bisectors meet at a point; the point is called the *Circumcenter*.
- A *Circumcircle* of a triangle is the circle that passes through all three of the triangle's vertices. (*Detail exploration of circumcircle is in unit II*)
- The *Circumcenter* is the center of both perpendicular bisectors and circumcircles.

You can construct perpendicular bisectors and circumcircle using traditional compass and ruler. Here we will, however, explore how to construct using graphical software called [Geometer's Sketchpad](#).

Explore:

Perpendicular Bisectors GSP file (click on *script view* option of GSP to get details on construction).

Circumcircle GSP file (click on *script view* option of GSP to get details on construction).

Activity:

Question 1: Construct perpendicular bisectors and circumcenter for an acute triangle using GSP. What do you notice about the three perpendicular bisectors that you have constructed in your acute triangle?

Question 2: What do you think will happen if the shape of the triangle is changed to an obtuse triangle?

Now we will see what happens if we make our triangle an obtuse triangle. Move one of the vertices. Move the point while watching the measures of the angles. Stop when you have created an obtuse triangle. Notice that the perpendicular bisectors you have constructed will move also, but they will continue to be the perpendicular bisectors of the sides.

Question 3: What do you notice about the three perpendicular bisectors that you have drawn in the triangle? What is different from what you saw in the acute triangle?

Question 4: What do you think will happen if the shape of the triangle is changed to a right triangle? Where do you think that the perpendicular bisectors might meet?

Next we will see what happens if we make our triangle a right triangle. Again grab one of the vertices of the triangle and move it until one of the angles measures 90 degrees (or as close to 90 degrees as you can make it).

Question 5: What do you notice about the three perpendicular bisectors that you have drawn in the triangle? What is different from what you saw in the acute and the obtuse triangles?