Angle Bisectors in a Triangle

Name(s): ______________________

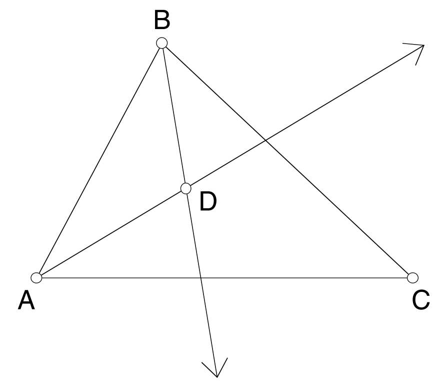
In this investigation, you'll discover some properties of angle bisectors in a triangle.

Sketch and Investigate

Select three points, with the vertex your middle selection. Then, in the Construct menu, choose **Angle Bisector**.

Click at the intersection with the **Arrow** or the **Point** tool. Or select the two bisectors, then, in the Construct menu, choose **Intersection**.

1. Construct triangle *ABC*.
2. Construct the bisectors of two of the three angles: $\angle A$ and $\angle B$.
3. Construct point *D*, the point of intersection of the two angle bisectors.
4. Construct the bisector of $\angle C$.



Steps 1–3

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

Select point *D* and one side of the triangle. Then, in the Measure menu, choose **Distance**. Repeat for the other two sides.

5. Measure the distances from *D* to each of the three sides.
6. Drag each vertex of the triangle and observe the distances.

Q2 The point of intersection of the angle bisectors in a triangle is called the *incenter*. Write a conjecture about the distances from the incenter of a triangle to the three sides.

Explore More

1. An inscribed circle is a circle inside a triangle that touches each of the three sides at one point. Construct an inscribed circle that stays inscribed no matter how you drag the triangle. (*Hint:* You'll need to construct a perpendicular line.)
2. Make and save a custom tool for constructing the incenter of a triangle (with or without the inscribed circle). You can use this tool when you investigate properties of other triangle centers.
3. Explain why the intersection of the angle bisectors would be the center of the inscribed circle. *Hint:* Recall that any point on an angle bisector is equidistant from the two sides of the angle. Why would the incenter be equidistant from the three sides of the triangle?

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