# Hanging with the Incenter

angbis.8xv

Problem 1 – Exploring the Angle Bisector Theorem

Start the *Cabri Jr.* application by pressing APPS and
selecting **CabriJr**. Open the file **ANGBIS** by pressing
Y=, selecting **Open…**, and selecting the file.

Line *BD* is the angle bisector of ∠*ABC*. Find *DE* and *DF*
using the **Distance and Length** tool (press GRAPH and
select **Measure > D.&Length**). Remember that *DE*
means "the length of $\overline{DE}$."
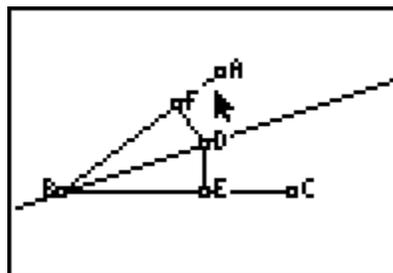
1. Move point *D* to 4 different positions and record the measurements in the table below. To
   move the point, move the cursor over the point, press ALPHA, move the point to the desired
   location, then press ALPHA again to release the point.

Position	1st position	2nd position	3rd position	4th position
DE				
DF				

2. What is the relationship between the measurements of *DE* and *DF*?

3. Complete the following statement: If a point is on the bisector of an angle, then the point is
   _____ from the sides of the angle.

Problem 2 – Exploring the Incenter of a Triangle

Open a new *Cabri Jr.* file by pressing Y=, selecting **New**, and answer **no** if asked to save.
Construct an acute △*ABC* and construct the angle bisector of all three angles. Using *Cabri Jr.*,
answer the following questions.

4. What do you notice about the angle bisectors of all three angles?

5. The point of concurrency for the angle bisectors is the incenter. Create and label this
   point *R*. Can you move vertex *A* so that the incenter is on a side of △*ABC*? If so, what kind
   of triangle is *ABC* in this case?

6. Can you move vertex *A* so that the incenter is outside of △*ABC*? If so, what kind of triangle
   is *ABC* in this case?

7. What kind of a triangle guarantees that the incenter is on the inside of the triangle?

8. Measure the distance from the incenter to each side of the triangle. What relationship is true about the distances?

Problem 3 – Extension

A family purchases a house with the plot given below. The deed states that the backyard of their property is from Fence 2 to Triangle Pond, and equidistant from Fence 1 and Fence 2. The family would like to build a fence around their property. (Assume that the backyard of the property starts at the horizontal axis.)

9. Find at least two possible coordinates for fence posts for the new fence. Keep in mind that the new fence is equidistant from Fence 1 and Fence 2. Round your answer to the nearest tenth.