Hey, Ortho! What's Your Altitude?

ACUTE.8xv, OBTUSE.8xv, RIGHT.8xv, TRIANGLE.8xv, EQUILATE.8xv, MEDIAL2.8xv

Name _____

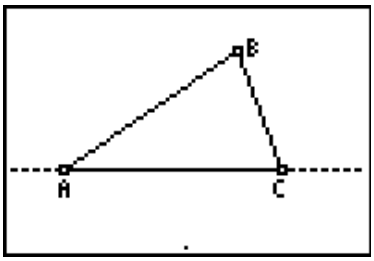
Class _____

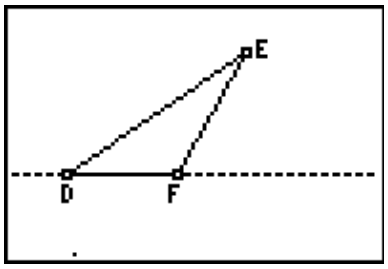
Problem 1 – Exploring the Altitude of a Triangle

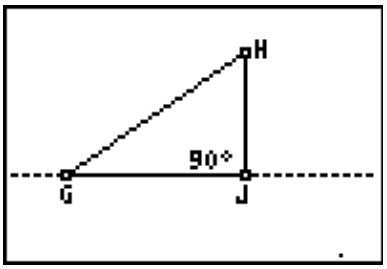
1. Define **Altitude of a Triangle**.

Draw the altitudes of the triangles in the *Cabri Jr.* files *ACUTE*, *OBTUSE*, and *RIGHT* and then sketch the altitudes on the triangles below. To do this, start the *Cabri Jr.* application by pressing APPS and selecting **CabriJr**. Open the file *ACUTE* by pressing Y=, selecting **Open…**, and selecting the file. Construct the altitude of △*ABC* on your handheld by pressing ZOOM, selecting **Perp.**, clicking on the side of the triangle, and then clicking on the opposite vertex. Repeat for the files *OBTUSE* and *RIGHT*.

2. Draw the altitudes for △*ABC*, △*DEF*, and △*GHJ* below.







3. Fill in the blanks of the following statements about whether the altitude of a triangle is inside, outside, or on a side of the triangle.

a. For the acute △*ABC*, the altitude of vertex *B* is _____ the triangle.

b. For the obtuse △*DEF*, the altitude of vertex *E* is _____ the triangle.

c. For the right △*GHJ*, the altitude of vertex *H* is _____ the triangle.

Problem 2 – Exploring the Orthocenter

Open the file *TRIANGLE*. You are given △*ABC*. Construct the altitude of each vertex of the triangle. Use your constructions to answer the following questions.

4. What do you notice about the altitudes of all three vertices?

5. The point of concurrency for the altitudes is the **orthocenter**. Create and label this point *R*. Is it possible to move vertex *B* so that the orthocenter is on a side of △*ABC*? If so, what kind of triangle is *ABC* in this case?

6. Can you move vertex *B* so that the orthocenter is inside of △*ABC*? If so, what kind of triangle is *ABC* in this case?

7. Can you move vertex *B* so that the orthocenter is outside of △*ABC*? If so, what kind of triangle is *ABC* in this case?

Problem 3 – Exploring the Altitude of an Equilateral Triangle

Open the file *EQUILATE*. You are given an equilateral triangle *ABC* with altitude $\overline{BD}$ and point *P* on the inside of the triangle. Find the distance from point *P* to the three sides of the triangle using the **Length** tool found by pressing GRAPH and selecting **Measure > D. & Length**. Also, find the length of $\overline{BD}$ and answer the following questions.

8. Use the **Calculate** tool to calculate *EP* + *FP* + *GP*. Move point *A* to 2 different positions and record the measurements in the table below. Next, move point *P* to 2 different positions and record the measurements in the table below.

Position	1st position	2nd position	3rd position	4th position
BD				
EP+FP+GP				

9. What is the relationship between the measurements of *BD* and *EP* + *FP* + *GP*?

10. Complete the following statement: The sum of the distances from any point in the interior of an equilateral triangle to the sides of the triangle is _____.

Problem 4 – Exploring the Orthocenter of a Medial Triangle

The **medial triangle** is the triangle formed by connecting the midpoints of the sides of a triangle.

Open the file *MEDIAL2*. You are given a triangle, its medial triangle, and the orthocenter of the medial triangle.

11. What triangle center (centroid, circumcenter, incenter, or orthocenter) for △*ABC* is the orthocenter, *O*, of the medial △*DEF*?