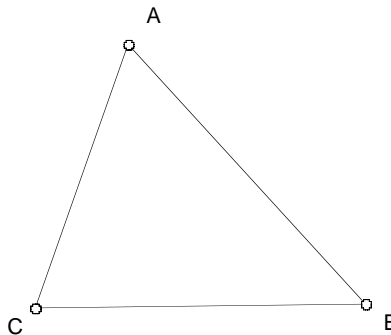


INVESTIGATION: Altitudes and Orthocenters of a Triangle

The **orthocenter** of a triangle is the intersection of its three altitudes. In this investigation you will discover a relationship between the altitudes and orthocenter of a triangle.

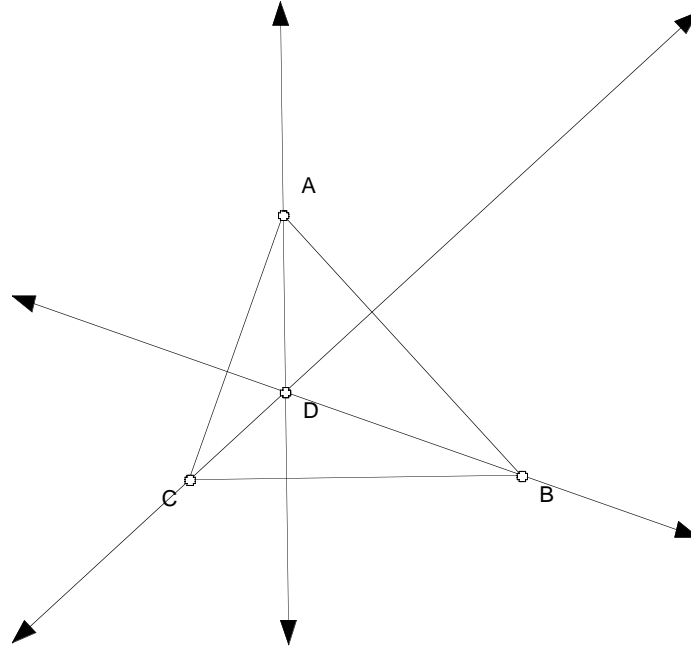
Sketch

- Step 1:* Select the **point tool** on the left side of your screen. Construct three points by clicking the mouse on three different places on your sketch. (Keep points relatively far apart.)
- Step 2:* Select the **arrow tool** on the left side of your screen. While holding down the shift key, click on two points. (Points will be surrounded by a bold circle when highlighted.)
- Step 3:* Click on the **Construct** menu at the top of your screen. Click on **Segment**. The two points you selected will now be connected by a line segment. Click on a blank space on your screen so the segment constructed is no longer highlighted. (When a segment is highlighted, two black squares will lie on that segment.)
- Step 4:* Repeat steps 2 and 3 two more times, choosing two different points each time. You have now constructed a triangle.

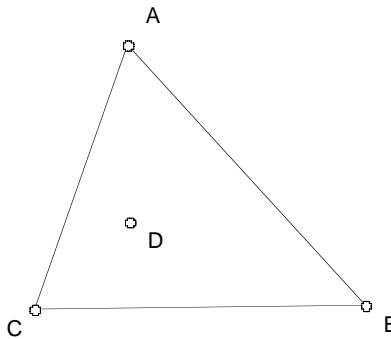


- Step 5:* Select all three points while holding down the shift key. Click on the **Display** menu. Click on **Show Labels**. Click on a blank space on the screen so that no object is selected. If you would like to move the labels, put the cursor on a letter. When a hand appears, click on the letter and it will move around the point.
- Step 6:* Click on a point and the segment opposite while holding down the shift key. Click on the **Construct** menu. Click on **Perpendicular Line**. This is the altitude for the point and segment you chose. (Do not be alarmed if the altitude lies outside of the triangle. This will occur when one of your angles is obtuse.) Click on a blank space so that no object is highlighted.
- Step 7:* Repeat step 6 for the remaining two points and their opposite sides. Click on a blank space so no object is highlighted.

Step 8: Click on any two of the altitudes that you constructed while holding down the shift key. Click on the **Construct** menu. Click on **Point At Intersection**. (Again, do not be alarmed if this point lies outside of the triangle.) This point is the *orthocenter* of your triangle. While the point is highlighted, click on the Display menu. Click on **Show Labels**. Click on a blank space so that no object is highlighted.

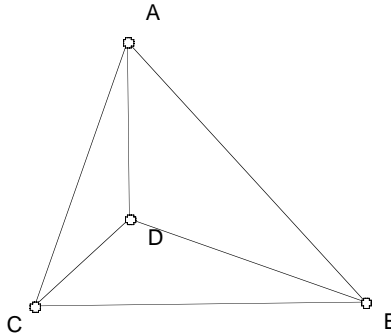


Step 9: Click on all three altitudes while holding down the shift key. Click on the **Display** menu. Click on **Hide Lines**.



Step 10: Click on the orthocenter and one of the vertices of the triangle while holding down the shift key. Click on the **Construct** menu. Click on **Segment**. Click on a blank space so no object is highlighted.

Step 11: Repeat step 10 for the remaining two vertices. Three new triangles have now been created.



Investigation

Using step 6, construct the altitudes and find the orthocenter for each of the three triangles. Keep track of the name of the triangle (3 letters) and its orthocenter (1 letter) below:

<u>Triangle</u>	<u>Orthocenter</u>
_____	_____
_____	_____
_____	_____

Describe what you have observed. What relationship do the orthocenters of your three smaller triangles have with the original triangle?

Present Your Findings

Discuss your results with your partner or group. Did they come up with similar results?

Attach a copy of your completed sketch to this handout and turn it in at the end of class. On your sketch, circle each of the orthocenters and label it with the triangle it belongs to.

Explore More

Construct a different triangle and see if you end up with similar results to those you found previously.