Orthocenter of a Triangle

Name:_____

Per:_____

Date:_____

GETTING READY

    A) Open the Geometry Application (G).

    B) Select **File** and then **New**.

    NOTE: If there is something already open in Geometry, make sure you save it if you want to keep it. If not, select **OK** when prompted with the **Clear All** menu.

CONSTRUCTION

    1) Create triangle ABC by **either**:

> **TIP: To deselect a selection, tap in blank space.**

        a) tapping the toolbar button (O)

        OR

        b) using the Draw menu (**Draw, Special Shape, Triangle)**

    2) Create a boundary box for the triangle by pressing on the screen and dragging. When you let go, a triangle will appear inside the box.

    3) Create altitudes for each segment of the triangle (steps below).

        a) Select the segment and opposite vertex.

        b) Select the command for perpendicular line (either on the toolbar (9) or in the **Draw, Construct** menu).

        c) Select the original segment and the altitude. Select intersection command from the toolbar (7) or select **Draw, Construct, Intersection**.

        d) Tap on blank space to deselect all before creating the perpendicular lines for subsequent segments.
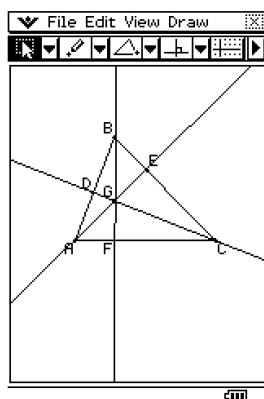
<div align="center">Result:</div>
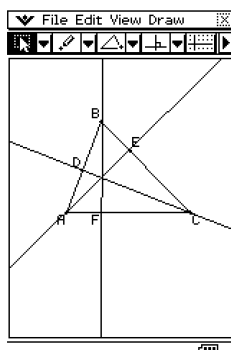
4) Construct the intersection point of all three altitudes.

   a) Select two of the three altitudes.

   b) Select intersection command from the toolbar (7) or select **Draw, Construct, Intersection**. This intersection point is called the *orthocenter* of a triangle.

5) Scroll so that your construction is toward the bottom of the screen. OPTIONAL: Select all three altitudes, select **Edit**, **Properties**, **Hide**. (This makes it easier to see the measurements in the next investigation.)

Result:

2
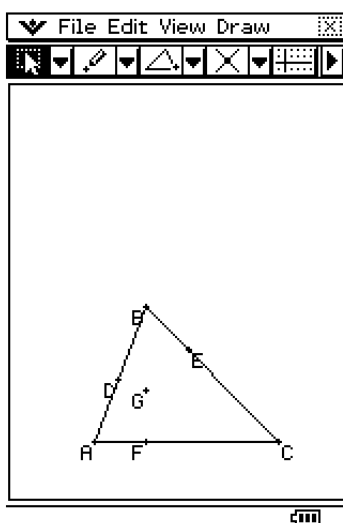
INVESTIGATION

1) Measure and paste the following distances: GF, GE, GD, BF, AE, and CD.

    a) tap on point **G** and then on point **F**

    b) tap the **.** button at the right of the toolbar

    c) now tap the m at the left of the toolbar to paste the measurement into the draw space
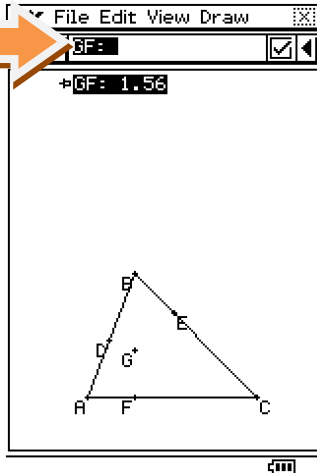
    d) with the u button showing, select the word **Length** and change it to **GF** using your k.
(You press the k button on your keypad to access it.)

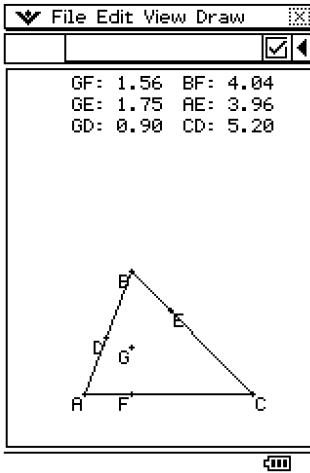   e) repeat steps a-d for lengths **GE**, **GD**, **BF**, **AE**, and **CD**.

    f) you can move measurements around by highlighting them, pressing and dragging

<u>Edit Name:</u>   <u>Result:</u>

Edit name in the measurement box using your k.

File Edit View Draw
GF:
⇒GF: 1.56

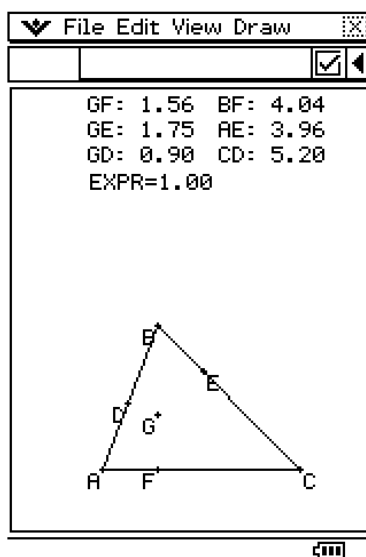| File Edit View Draw |
| --- |
| |
| GF: 1.56 BF: 4.04 |
| GE: 1.75 AE: 3.96 |
| GD: 0.90 CD: 5.20 |

2) Select **Draw, Expression**. Tap the 1 next to length **GF**. Now enter a division sign from your keyboard and tap the 4 next to length **BF**. Enter an addition sign. Tap the 2 next to length **GE** and then the division symbol. Then tap the 5 next to the length **AE**. Enter an addition sign. Tap the 3 next to **GD** and then the division symbol. Then tap the 6 next to the length **CD**. Press **EXE.**

<u>Result:</u>

```
W File Edit View Draw    ⊠

                     ☑◀

GF: 1.56  BF: 4.04
GE: 1.75  AE: 3.96
GD: 0.90  CD: 5.20
EXPR=1.00
```

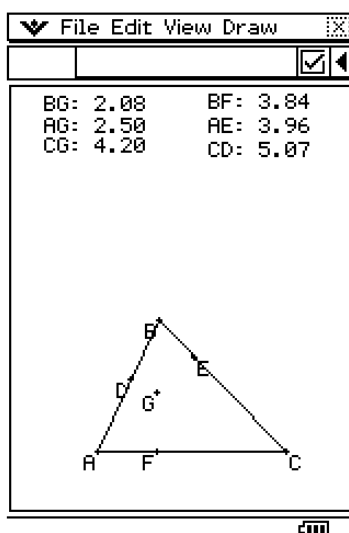You just entered the expression $\dfrac{GF}{BF} + \dfrac{GE}{AE} + \dfrac{GD}{CD}$.

QUESTIONS:

Look at all your measurements. What do you notice? Move a vertex or side of the triangle. Do your observations hold? Write a conjecture about this relationship for all triangles.

Use your measurements and observations to write a true equation involving the measurements and the expression you entered.

3) Delete the following measurements: **GF**, **GE**, and **GD**. (Tap on the measurement and press c.) Also, delete the expression you created.

4) Use part 1 of the <u>INVESTIGATION</u> above to help you measure and rename points **BG**, **AG**, and **CG**.

4

Result:

5) Select **Draw, Expression**. Tap the 7 next to length **BG**. Now enter a division sign from your keyboard and tap the 4 next to length **BF**. Enter an addition sign. Tap the 8 next to length **AG** and then the division symbol. Then tap the 5 next to the length **AE** and enter an addition symbol. Tap the 9 next to the length **CG**. Enter a division symbol and then tap the 6 next to the length **CD.** Press **EXE**.

Result:
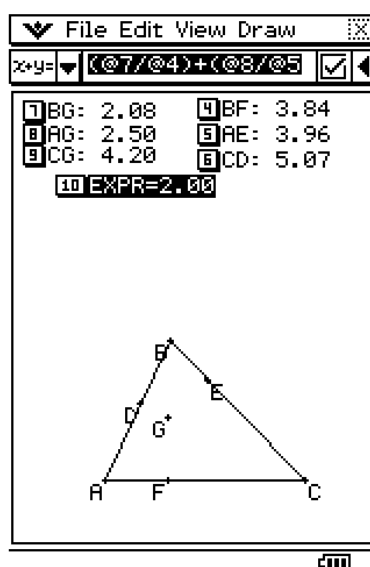
You just entered the expression $\dfrac{BG}{BF} + \dfrac{AG}{AE} + \dfrac{CG}{CD}$.

QUESTIONS:

Look at all your measurements. What do you notice? Move a vertex or side of the triangle. Do your observations hold? Write a conjecture about this relationship for all triangles.

Use your measurements and observations to write a true equation involving the measurements and the expression you entered.

6) After all the work you've done in this activity and the investigation, write down everything you now know about orthocenters of triangles.

7) Now watch the animation file to learn some more about orthocenters. What can you say about the orthocenter when the triangle is right? obtuse? acute? Now go back to question 6 above and add to what you've written about your knowledge of orthocenters.