INVESTIGATION 1: MIDPOINTS AND MEDIANS OF TRIANGLES

Terminology:
Midpoint: A point that divides a line segment into two equal segments.
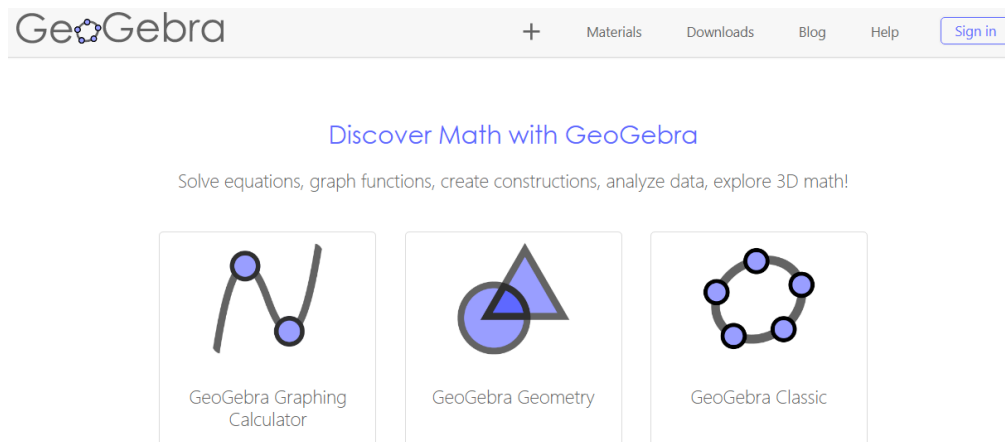
Median: the line segment joining a vertex of a triangle to the midpoint of the opposite side.

Bisect: Divide into 2 equal parts

Right Bisector: A line perpendicular to a line segment passing through its midpoint.
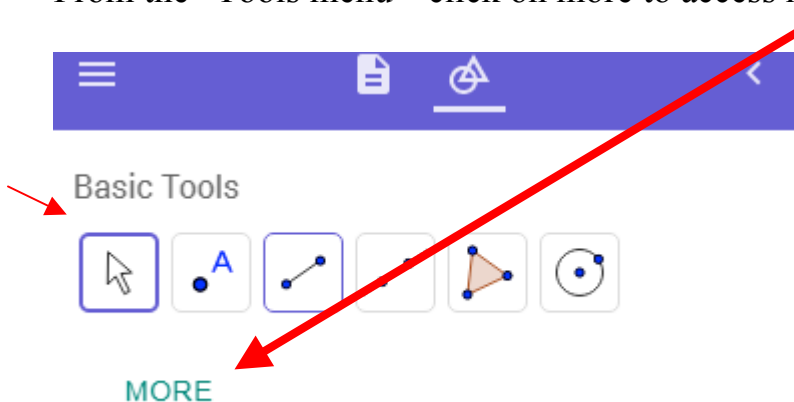
SET UP
Go to Geogebra.org

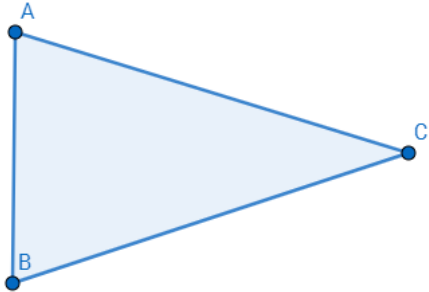
Click "GeoGebra Geometry"
From the "Tools menu" click on more to access more tools

You are now ready to move onto Task #1.

TASK #1

Use the polygon tool and construct a triangle. To do this you will have to click a location for A, click for B, click for C and then go back and click A. It does not need to look exactly like mine.
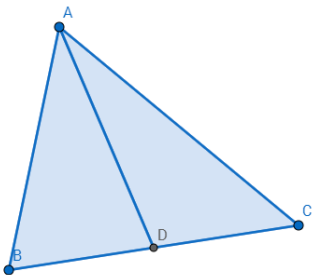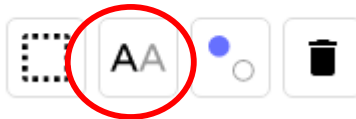

From the Construct tools select "Midpoint or Centre".
Then click line BC to construct the midpoint of BC (this should appear as D).

Use the "Polygon" option to construct triangle ABD and again to construct triangle ACD.
Keep the Labels for A, B, C and D. Note if your labels are different or not showing use the


labelling tool from the EDIT menu


The line AD is called the ***median*** of triangle ABC.

From the top of the tools menu, click on steps menu

On the left hand side, where the measurements are recorded, click on "t1 = polygon A, B, C" and drag it into the white space beside your triangle. The value for "t1 = polygon A, B, C" is the AREA of the first triangle you created, ABC.

☰	📄 🔺	‹
⬤	Point A	⋮
⬤	Point B	⋮
⬤	Point C	⋮
⬤	t1 = Polygon A, B, C	⋮
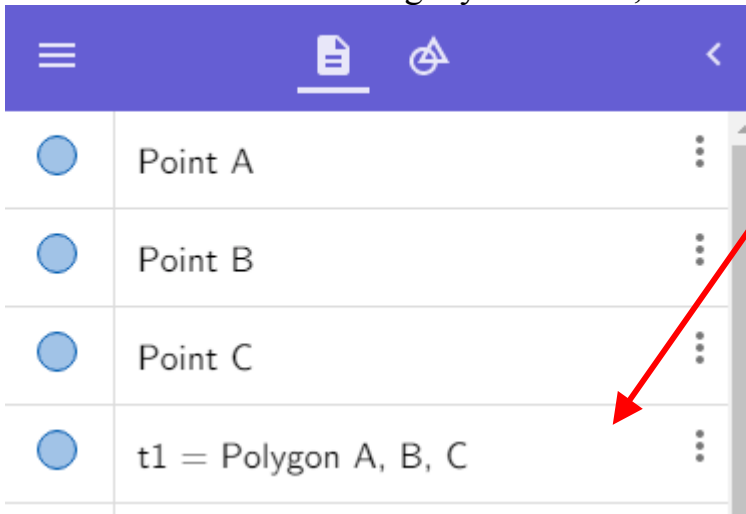
Repeat this process with "t2 = polygon A, B, D" (Area of ABD) and "t3 = polygon A, C, D" (Area of ACD). Use the button to move the areas so you can see them better.

$$t1 = 15.7$$
$$t2 = 7.8$$
$$t3 = 7.8$$
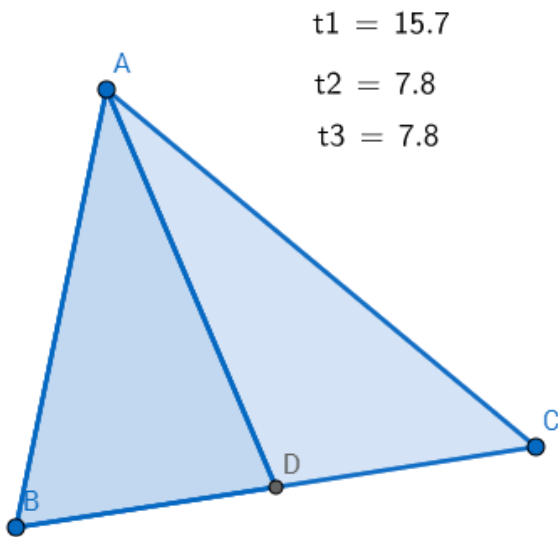
Conclusion 1
Complete the conclusion on your handout

TASK 2A
Clear the page and start a new drawing. You can do this by selecting. The 3 bars at the top of the tools menu


The select NEW, you can choose to save if you wish.

Construct a new triangle ABC using the Polygon tool. It doesn't have to look exactly like mine.

From the Construct tools select "Midpoint or Centre".

Then construct the midpoint of AB by selecting the line AB. Then repeat this process to construct the midpoint of AC.

Use the polygon tool to construct triangle ADE.
The line DE is called the **midsegment** of triangle ABC.
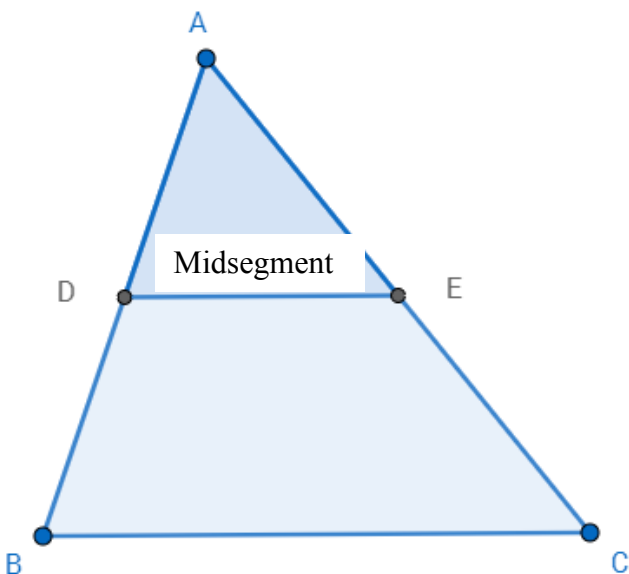
From the top of the tools menu, click on steps menu .

From the Algebra Bar on the side, click " $a = \text{Segment B, C}$ " and " $a_1 = \text{Segment D, E}$ " and drag the measures of the lines onto your picture.

Conclusion 2A
Complete the Conclusion on your handout.

Task 2B

Continue with the same triangle.

Under the construct menu select ⊥ "Perpendicular Line." Then click on vertex A and line BC to create the altitude from vertex A.

To construct an intersection point where the perpendicular line crosses the side BC and the midsegment (DE), click on MORE from the bottom of the tools menu. Then from the Points menu select "Intersect"
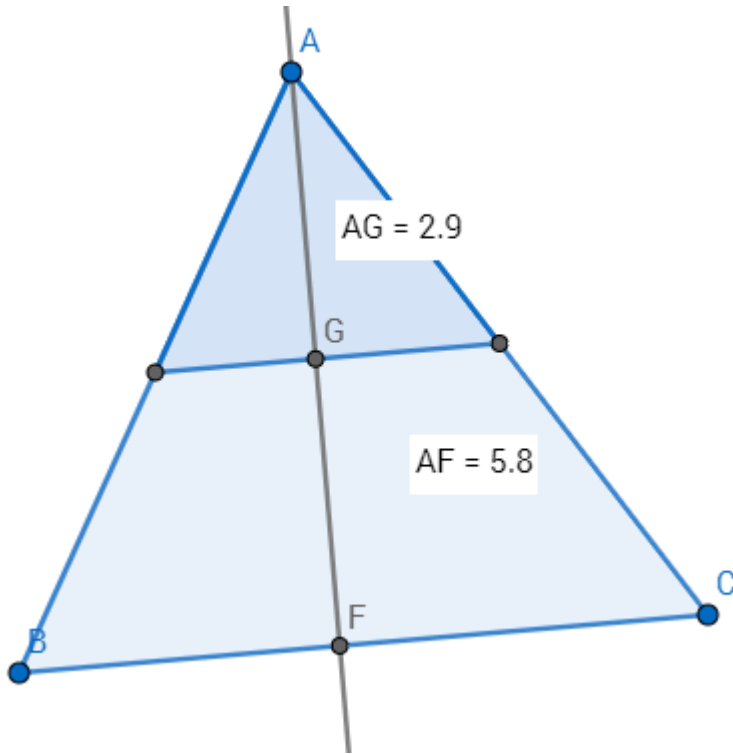
Points

Then click on segment DE and the perpendicular line to create an intersection point. Repeat this for segment BC and the perpendicular line. Label the new points G and F

$a = 7.7$

$a_1 = 3.9$
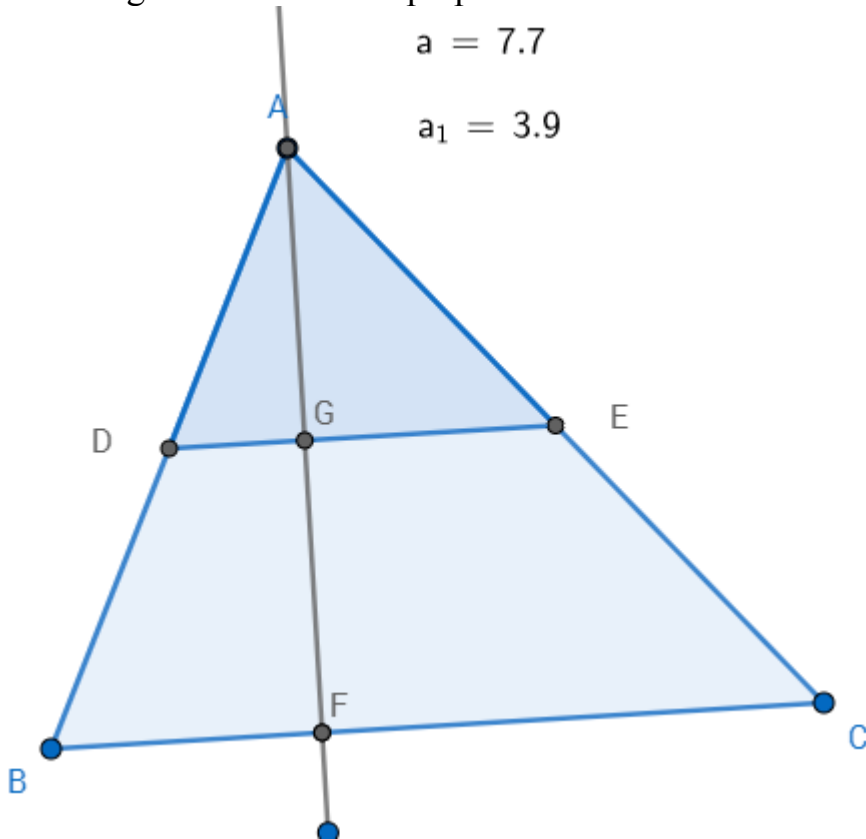
Now we want to measure the length of AG and AF.

Under the measure menu select ![cm icon] icon. Click on vertex A, then point G to measure the length of AG. Then repeat this process by selecting vertex A and then point F to measure the length of AF.
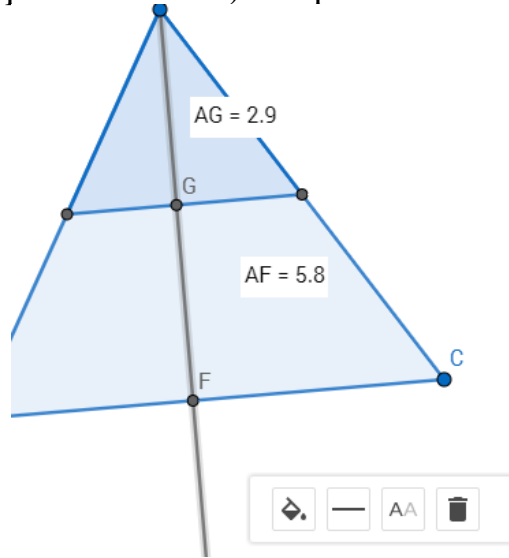
AG = 2.9

AF = 5.8

Conclusion 2B

Complete the conclusion on your handout

Task 2C
Continue with the same triangle.

Use the select tool to delete the altitude (the perpendicular line) and point G and F by clicking
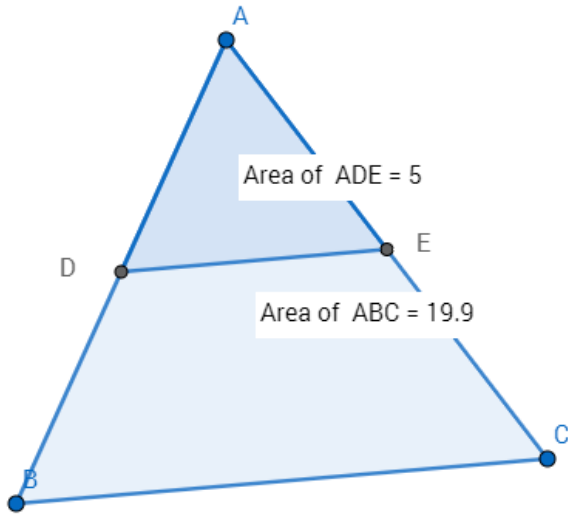
AG = 2.9

AF = 5.8

on the line then selecting the garbage can icon.

Measure the Area of triangle ABC by using the [cm²] tool from the measure menu. Then click
on the area once. Repeat for triangle ADE.

Area of ADE = 5

Area of ABC = 19.9

Conclusion 2C
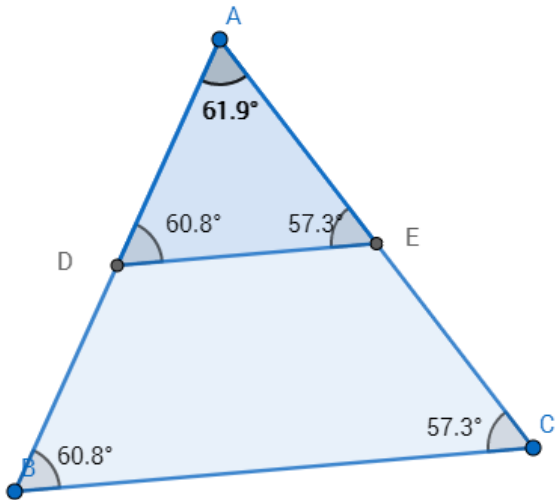Record your conclusions on your handout.

Task 2D

Continue with the same triangle.

Delete the area textboxes.

Measure the angles in triangle ABC by selecting [tool icon] tool and click inside the area af the triangle once. Repeat for triangle ADE
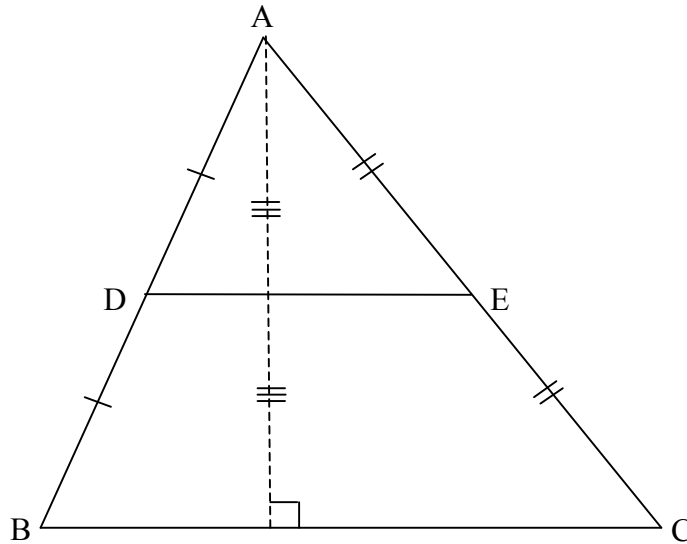

Conclusion 2D

Record your conclusions on your handout

SUMMARY of Key Concepts:

1. A line segment joining the midpoints of two sides of a triangle is _____ to the third side and is _____ as long

2. The height of a triangle formed by joining the midpoints of two sides of a triangle is _____ the height of the original triangle.

A

D   E

B   C

3. The area of the triangle formed by joining the midpoints of two sides of a triangle is _____ the area of the original triangle.

4. The _____ of a triangle _____ its area.

A

Median

Area 1   Area 2

B   D   C
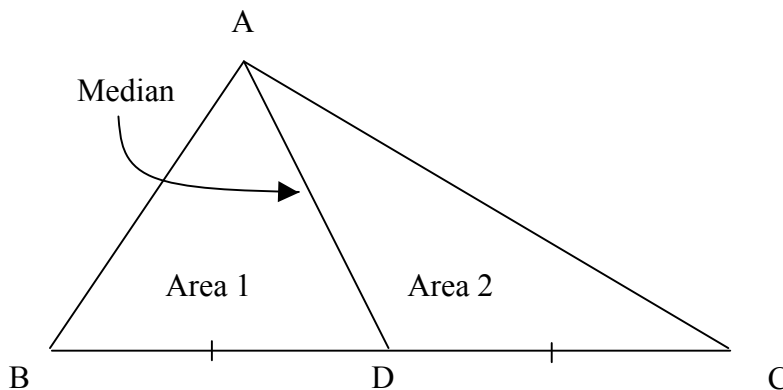
Area 1 = Area ____
Area 1 = _____ Area ABC
Area 2 = _____ Area ABC

** NOTE: Your homework may ask you to prove something is not true by showing a COUNTER – EXAMPLE. This just means draw an example where you show what they are saying is not true.