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Part one: Activities
Geogebra is an online dynamic graphing resource that can be used in a variety of different ways. Students can use this to graph and construct 2-D and 3-D pictures. Teachers can use this as a tool to generate animations, models and online activities. This can be used in any math class from basic geometry to advanced calculus.
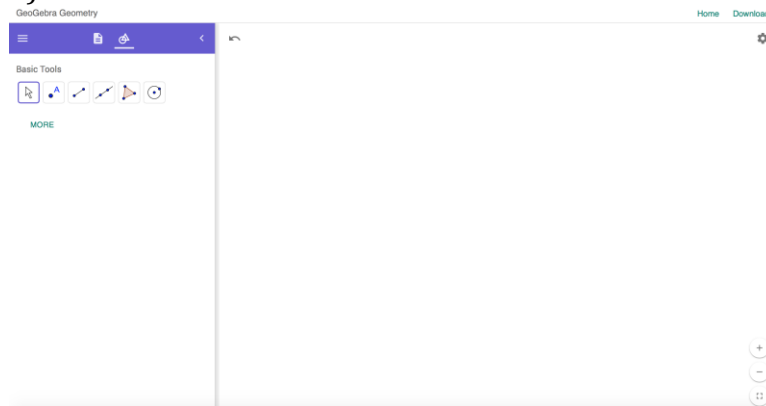
Accessing Geogebra-Geometry:
1) Go to www.geogebra.org.
2) To get to the geometry specific section of Geogebra click on the center icon that

GeoGebra Geometry

looks like this:

3) Your screen should looks like this:

4) To see all the tools, click on MORE (in green writing under the first row of basic tools).
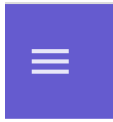
Creating Triangles

1) Click on the polygon button under the construct menu. It looks like this: .
This button allows you to create any shape you want.

2) To the right of the tool menu is a black space this is called the workbook. In the wordbook, click once anywhere to make your first point. This point will automatically be labeled A.
3) Click two more times anywhere to make the other two remaining points of your triangle then close the triangle by clicking the point A again.

4) Generate 3 more triangles. Notice that the points automatically get labeled with the next sequential letter.

Creating Regular Polygons
1) Create a new workbook page by clicking on the Icon in the top left corner that looks like this: .
2) Click on the word "File" then "New". You do not need to save your old workbook page.

3) Construct a regular polygon with 5 sides with the regular polygon tool under the polygon menu. The <u>regular polygon </u>tool looks like this: . After clicking on that button you must create two points. After creating two points a pop up menu will appear asking how many sides you would like your figure to have. Create a figure with 5 sides. Notice that the points will automatically be labeled.
        You can move labels by simply clicking them and dragging them where you desire.

Measuring Segments
1) Using the pentagon you just created we will be measuring the length of two sides.
2) Click on the "distance or length" button under the Measure menu. It looks like:

 .

5) Then click on any two points that are connected in your figure. The measurement should pop up right away and be labeled according to the points that you clicked.
6) Measure two more sides. Notice that they are all the same measurements. This is because all regular polygons have sides of equal lengths.

Measuring Angles
1) Again using the same polygon, we will measure the angles. Click on the "angle" button under the Measure menu. It looks like this: .
2) After the "angle" button is selected, click on the three points that make the angle you would like to measure. Make sure you click the points in the correct order for the angle you are wishing to measure. The measurement will show up right next to the angle.

Constructing Altitudes
Remember, altitudes of triangles are segments that start from any angle and intersect the opposite side at a right angle.

1) Draw an equilateral triangle. (Or one that looks approximately equilateral)
2) Select the "perpendicular line" button under the Construct Menu. It looks like:

. After that button is selected click the point A and then the segment BC. You will see a line appears through point A, intersecting segment BC.
3) You must create a segment from point A to where the new line intersects segment BC. To do this click the "segment" button under the Basic Tools menu that looks like

. The new point will automatically be labeled as D.
4) To hide the line, you must right click the line and select settings, then deselect the box that says "Show object" in the settings menu.
5) To ensure that this is truly an altitude, measure the angle ADC. You will see that it is in fact a 90° angle.
6) Create the other two remaining altitudes of the triangle.

Angle Bisectors

1) Create a new triangle on the same workbook page that looks like an isosceles triangle.
2) Click on the "angle bisector" button under the Construct menu, it looks like this:

. You must then click on the three points that make the angle you wish to bisect, make sure you are putting the point that is the vertex of the angle in the middle of the three points.
3) You will notice that an entire line is created. Make the segment from the vertex of the angle to the point of intersection with the opposite side.
4) Hide the entire line.
5) Measure both of the angles that were created by the angle bisector line. Notice that both measurements are equal.
6) Create the angle bisectors for the other two angles and measure the angles of bisection to ensure they are the same.
7) Move one of the vertices of the triangle, notice that all you measurements change accordingly.

Constructing Medians
        Remember that medians are segments in a triangle that extend from each angle and divide the opposite side into two equal segments.

1) Construct any new triangle; it can look like a right, equilateral, isosceles or obtuse triangle.
2) Create a midpoint of one of the sides by clicking the "midpoint or center" button

underneath the Construct menu. It looks like this: [   ] . After selecting this tool click the two endpoints of the segment you would like to find the midpoint of.
3) Once the midpoint is drawn, create the segment that connects that point to the opposite vertices of the triangle.
4) Create the other two medians in the same way.
5) To verify that these lines actually are medians, measure the lengths of each segment that is created by the medians. These values should be the same.

Part two: Exercises:

1) Construct one triangle and record the lengths of the sides in the table below:

	Side a	Side b	Side c
Triangle one			
Triangle two			
Triangle three			

Once you have the first three measurements, move each vertex and record the lengths of the sides, do this process once more. (You should have a total of 3 triangles measured.

2) Create a new workbook page and create a 6-sided regular polygon.
Measure one of the angles and write the value of that angle below:

_____

 Measure two more angles and write their degree measurements below:

_____

 What does this show about all angles of regular polygons?

3) Create a new workbook page and create an equilateral triangle. Measure all the angles to insure that it is in fact and equilateral triangle. Create all the altitudes of this triangle. Create all the angle bisectors of the triangle. Create all medians.

What does this picture show us about altitudes, angles bisectors and medians of equilateral triangles?