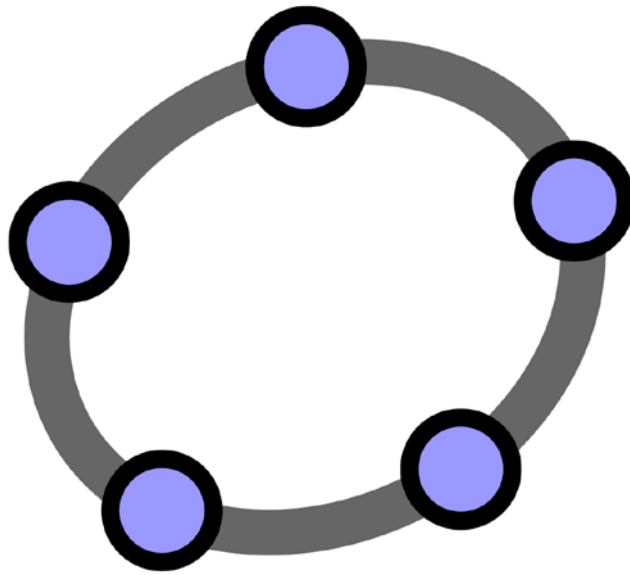


GeoGebra



Take-home assignment

Constructing a Quadrilateral

TTO 1

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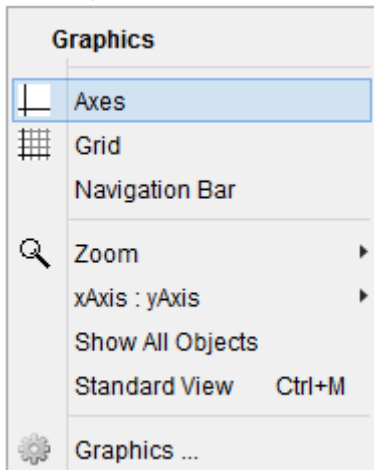
Exercise

We will be constructing a quadrilateral.


Step 1: Start up GeoGebra. If asked to install updates, refuse to do this.

Step 2: Maximize the screen for the best overview, and set the language to English UK under Options.

Step 3: Right-click with your mouse on the field on the right (this is called "Graphics"). It shows a set of Axes, and we'll disable them by clicking on the word Axes click (see picture below).




If the grid is visible, turn it off in a similar way.

Step 4: The function of your mouse pointer is now to Move  things.

To change this we need to select a different function in the Taskbar (the row of all the pictures).

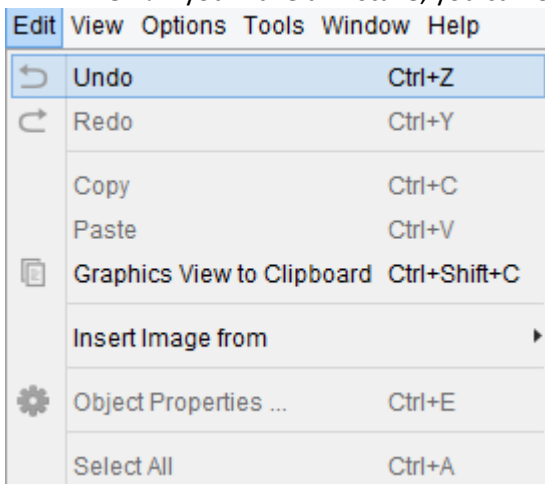
We will select a function known as Point 


Step 5: Now put two new Points with some distance between them in the Graphics field. You will see that these new points are called A and B. GeoGebra automatically gives every point a different name.


Step 6: We will now be drawing a line through these two points. This function is called Line. 

As you can see, your cursor "catches" the points when you come near them. It glows with a lightblue edge. If you click when an object is lit up in this way both the old and new object are in the exact same place (mathematically speaking). In our case our line will go precisely through our Points.

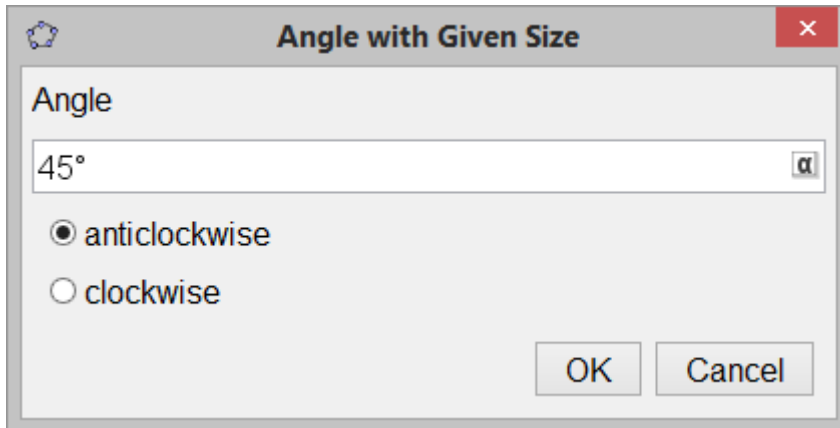
ATTENTION! If you make a mistake, you can Undo your last step under Edit.



Step 7: You now have a Line going through Point A and B, continuing beyond both points. We will make an Angle at Point A. For this we will need a function named "Angle with Given Size" .


You will find this under Angle .


Step 8: Now click on Point B, and then Point a (this is how we draw $\angle A$). A pop-up will open that looks like this:



We will be making our Angle anticlockwise.

The amount of degrees that this Angle will be is **40 + the last two digits of your student number**. Is your student number 10777? The amount of degrees will be $40 + 77$, and therefor 117 degrees.


Just to check: You now have a line with Points A and B on it, an Angle at A, and somewhere above the line you will find Point B'. If you can't see it, you'll have to zoom out or drag  the Graphics field.

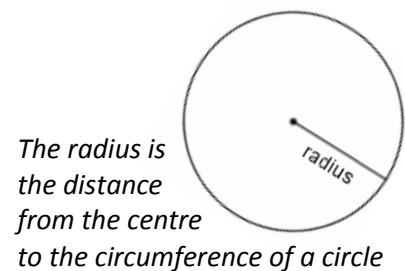
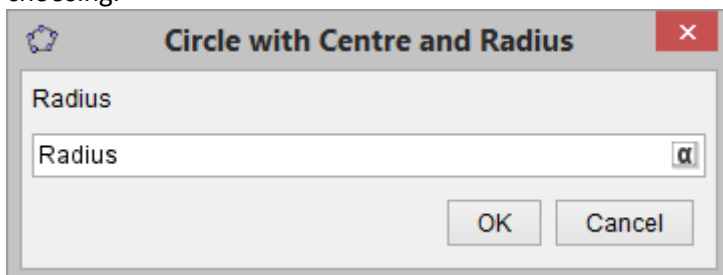
Step 9: Now draw a Ray  from Point A through Point B'.

Step 10: We will now **construct** two of the sides of our quadrilateral. These two sides will be equally long. We've learned to use our pair of compasses to construct multiple points that are all equally far away from our original Point.

In GeoGebra we will use the function named "Circle with Centre and Radius" .

Step 11: We want A to be the point that our next two points (C and D) to have an equal distance to.


So using the "Circle with Centre and Radius"  on Point A will give us a circle with a Radius of our choosing.




The length of your radius has to be equal to **3 + the last digit of your student number**.


Is your student number 10777? The length of the radius (and therefor AC and AD) will be $3+7 = 10$.


Checking in again: Right now you should have two lines (a Ray and a Line), three Points (A, B and B'), an Angle and a Circle. If you do not have this, you made a mistake somewhere along the way.

Step 12: We will now put in Points C and D using the function Intersect  (found in the list under Point). When you have selected the correct function click, in order, the line that Point B' is on, and then the Circle (be sure that the Ray and Circle light up like what happened at Step 6). Point C is now created as a point of intersection.

Now do the same by clicking the Line going through A and B and then the Circle. Points D and E have now been created. Here's is a thinker; why did that last move create TWO points of intersection??

Step 13: Now we need to hide some elements. We no longer need much of what we have just created. Right-click on the line that goes through A and B and click  Show Object, it will hide it from view. Do the same with the other line, and with Points B and B'. The only thing remaining should be Points A, C, D and E, our Circle, and the Angle at Point A.


Step 14: Since this looks a bit weird let's draw some of the missing line segments. Find the function named Segment  and connect A with C. Also connect A to the other point (this could be D or E) so that our Angle is once again between two lines. Complete the triangle.



Step 15: Since we are not constructing a random quadrilateral, but a special one. For this we need to construct an angular bisector, using the tool we use as a pair of compasses: "Circle with Centre and Radius" 


We need to draw the two circles needed for our angular bisector. So just like Step 11, make a circle at Point C, but this time with a radius of **4 + the last digit of your student number**. Draw another circle, with the same radius, at the other vertex of our triangle (not Point A).

Step 16: Hide the circle going through point C, D and E, just like you did in Step 13.


Checking in again: You now have a triangle where Point A has an Angle, and the other two points are both the centre of a circle. There is also a Point that we don't need (probably named D or E). Hide that one.


Step 17: Let us put in the other Angles of our triangle. Find the function Angle  and click in order: Point A, Point C and Point E. Try to put in the other Angle. Make sure it's INSIDE the triangle. What kind of triangle have we got here (look at the Angles)? Write this down, you need this answer later.


Step 18: Time to finish our Quadrilateral. With the function Intersect  click on our two remaining circles. Two more Points will have appeared named F and G. Connect these Points with a Line .


Step 19: This line also Intersects  one of the sides of our triangle. Draw it, this will be Point H.

Step 20: Hide our remaining two circles, and hide F or G, whichever is the closest to A. Also hide the line we just drew through F and G.

Step 21: Draw a Ray  from Point H to Point F.

Step 22: Using the function Point on Object  put a Point on the line we have drawn in Step 21. This will be Point I. After this hide the line again.

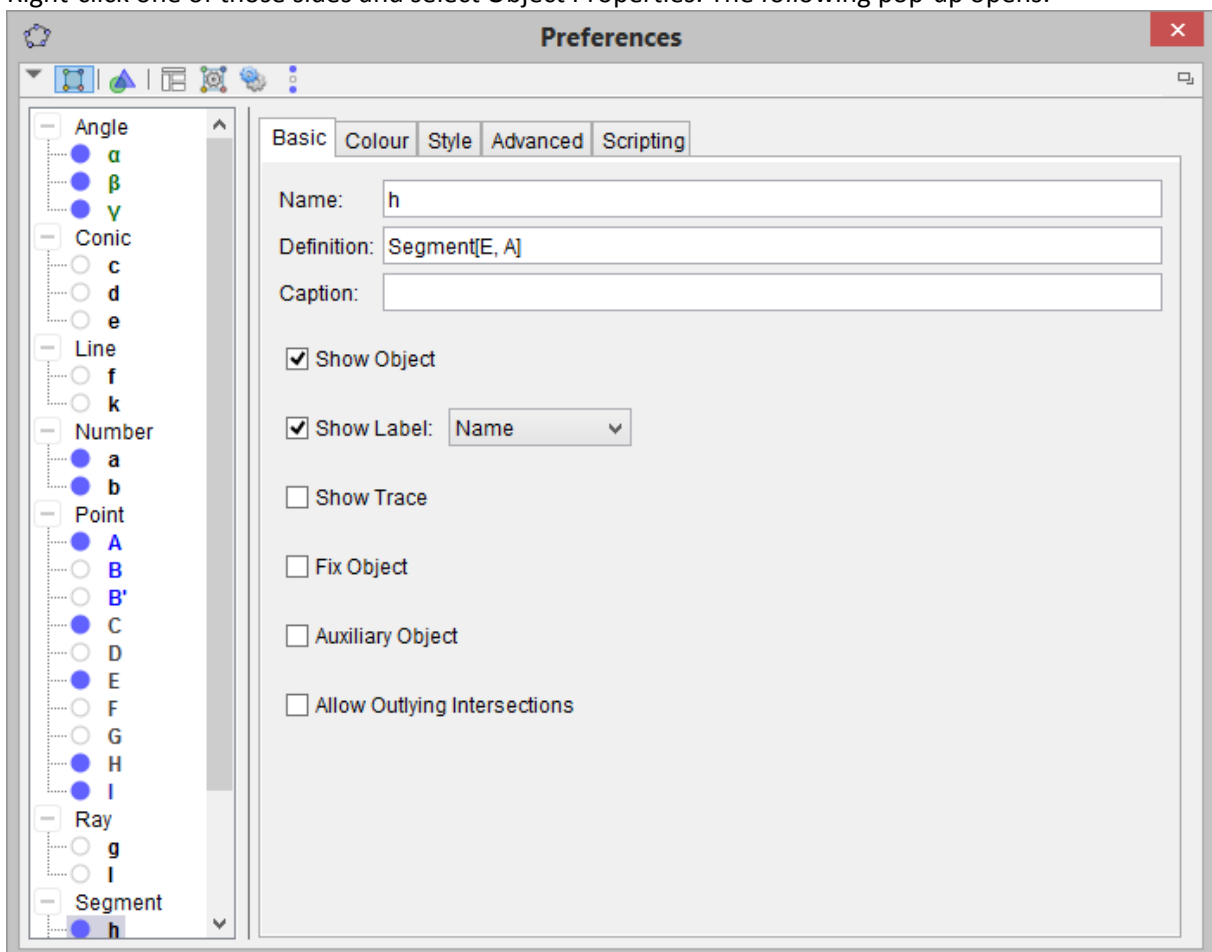
Step 23: Using the function Segment  connect Point I to every Point in our triangle. And hide Point F or G, whichever is still visible right now.

We've now drawn a quadrilateral with two diagonals in it. You can Move  Point I about. What kind of quadrilateral have we drawn? Write this on the same piece of paper from Step 17.

Time for a little cleaning up.

Step 24: If you've correctly figured out what kind of Quadrilateral you've drawn you should know which sides are equally long. We're going to give those a little marker showing that they are the same length.

Right-click one of those sides and select Object Properties. The following pop-up opens:





For all of the SIDES of the quadrilateral uncheck the "Show Label" box. Then click on "Style" and choose a "Decoration". Make sure that the sides with the same decoration are the same length! When you're done manipulating the properties click the red X of the Preferences window.

For both DIAGONALS of the quadrilateral next to the "Show Label" select "Value".

You can also right-click the Angles and check its properties. Here under “Colour” change the colour of the Angles that are the same to Red.

Step 25: Remember those two words you wrote down? Step 17 and 23 if I remember correctly.

Somewhere under the Slider  tool you'll find the Text  tool.

Click somewhere on the Graphics field and enter the two words you had written down, then press “OK”.

The final step: Our quadrilateral is now ready. We now have to save it and send it to our teacher. Save your GeoGebra with the following things in the name:

assignment1-lastname-studentnumber.ggb

Example:

assignment1-Jasperse-12345.ggb

You can now upload it to Magister to the folder “GeoGebra Assignment 1” under “Opdrachten”. If this does not work you can also send it through Magister via email. If you have any trouble, be sure to message your teacher.

Good luck!