

## Geogebra Lab - make a simultaneous equation solver

Paul Robinson, IT Tallaght

### Websites

Geogebra Homepage: <http://www.geogebra.org/cms/>

Click on Download and use the AppletStart Version of Geogebra, or download a stand alone version.

Geogebra Forum: <http://www.geogebra.org/forum/>

Community of Geogebra users, bug reports and feature requests

Geogebra Facebook Group: <http://www.facebook.com/home.php#!/geogebra>

Pretty active, conference news, lots of helpful stuff

Geogebra Wiki: <http://www.geogebra.org/en/wiki/index.php/English>

Collection of re-usable teaching resources

University of Limerick: <http://www.ul.ie/cemtl/resources.htm>

Excellent GeoGebra step by step demos

Math 247: <http://math247.pbworks.com/Learn-and-Use-GeoGebra>

Fantastic Step-by-Step Help on How to Use GeoGebra by Dr Linda Fahlberg-Stojanovska. Includes accessing Geogebra properties and methods using Javascript very cool.

LaTeX online equation editor:

<http://www.numberempire.com/texequationeditor/equationeditor.php>

Indispensable if you want to put mathematics into Moodle and don't know any LaTeX!

Go to the Geogebra Homepage: <http://www.geogebra.org/cms/>, click on Download and use the AppletStart Version of Geogebra. If you double click the screen you will get the GeoGebra *Drawing Pad* in its own window.

At the bottom of the screen is the *Input Line*, and on the left of the screen is the *Algebra View*.



Click on the *Panning Tool*, then on the screen, and you can drag the axes around if you wish. Click the little arrow at the bottom right for other commands.

In the input line type

$$3*x + 2*y = 4$$

press return

$$y = 3*x - 3$$

press return

Note: **always** use lower case x and y.

You will see two straight lines on the drawing pad and their formulas in the algebra view. Geogebra will accept the formula for a straight line in many forms

e.g.  $y = 2x + 1$ ,  $y/2 + x/3 = 5$ ,  $3 = 2(1 - x) + 4(y - x)$

will all be drawn as straight lines. Geogebra will, however, convert them to the form  $ax + by = c$  in the algebra view.

You now have two straight lines on the screen. Jazz them up a bit by right clicking on each line (or its formula), go to *Properties..* and change the colour and line thickness (in *Style*).

We want to solve the two simultaneous equations we have. Each equation has been represented as a straight line and, geometrically speaking, *solve* means to find where the two lines *intersect*.



Click the *Point Tool* then on the point where the two lines intersect. You will know you are at this point as a little window will pop up with Line a, Line b in it. You should get a point called A. Hold the mouse over A and it should tell you that it is the intersection of the two lines.

That is pretty much it, but we can add a bit of text too.



Click on the Insert Text Tool then the drawing pad. In the text box type

$x = x(A)$  and  $y = y(A)$  click on OK

You get the boxes by clicking Object, Empty Box before inputting the text  $x(A)$  and  $y(A)$ . The command  $x(A)$  is the x-coordinate of the point A and  $y(A)$  its y-coordinate. If you right click the text and go to properties you can change the font etc.

**That's it!**

To change the problem right click each equation in the algebra window and edit its equation (in the *Basic* Tab). Remember that multiplication is  $*$  and division is  $/$ .

## Problems

Solve the following simultaneous equations using pen and paper and using your solver.

(i)  $x - 3y = 19$   
 $2x + 5y = -28$

(iii)  $\frac{(x-1)}{3} + \frac{(y+2)}{5} = \frac{2}{15}$   
 $\frac{(1-x)}{6} + \frac{(5+y)}{2} - \frac{5}{6} = 0$

(ii)  $\frac{x}{2} = y + 1$ ,  $x - \frac{y}{3} = 4$

(iv)  $\frac{5}{(x+y)} = \frac{20}{27}$   
 $\frac{4}{(2x-y)} = \frac{16}{33}$

Adapt your solver to solve

(i)  $x + y = 3$   
 $x^2 - y^2 = -3$

(ii)  $4x - y = 7$   
 $xy = 15$