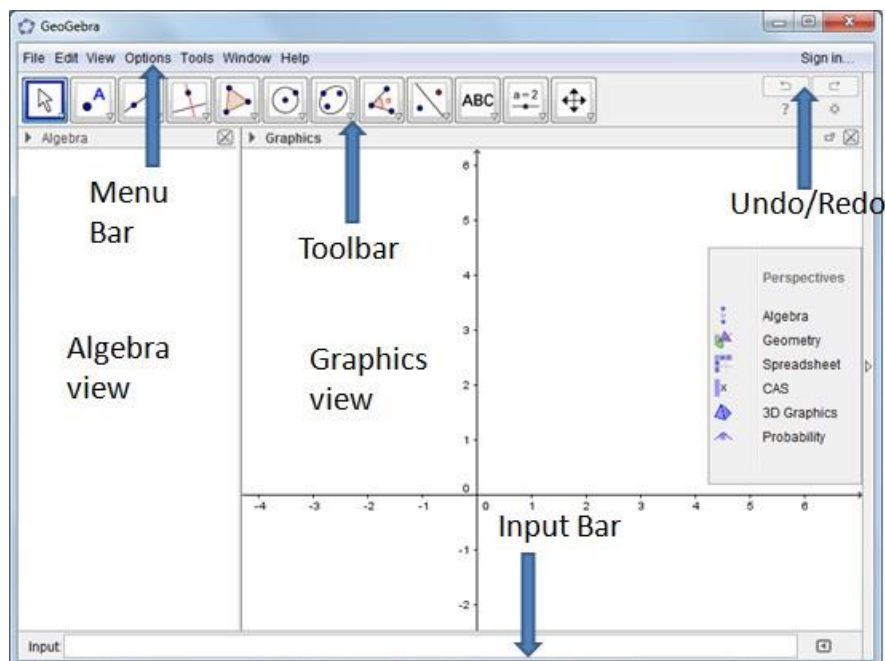# Introduction to GeoGebra for Teachers

GeoGebra 5

Figure 1: Launch Screen for GeoGebra

The button menu along the top (see Figure 2) contains a submenu of actions. By clicking on the down-pointing arrow at the bottom right corner of any of these buttons the submenu is displayed. The following section explains each of these submenus in more detail.
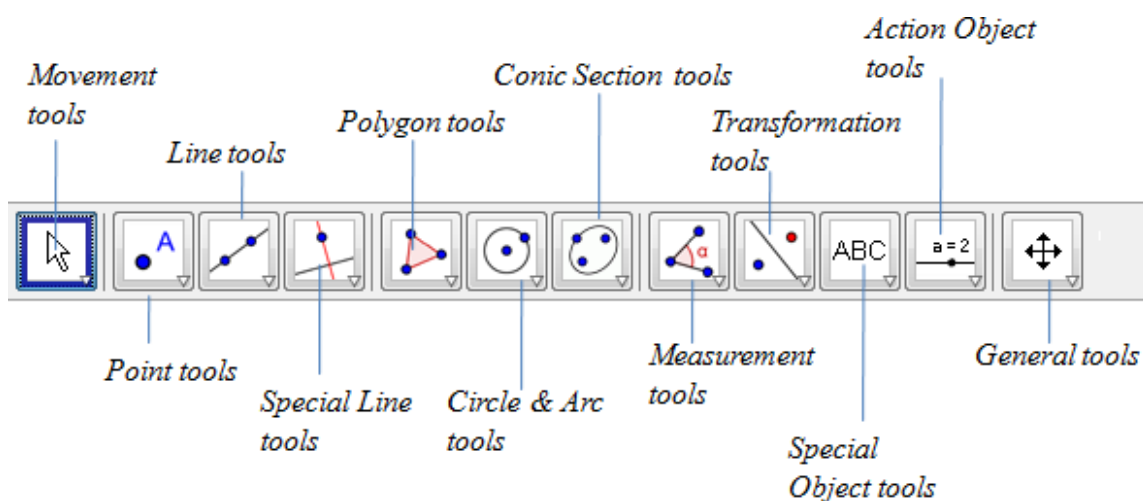

Figure 2: Buttons for GeoGebra

The GeoGebra Toolbar

1st from left: Move

The first button here allows you to select a previously drawn object and move it around the drawing area. The second button in this menu allows you to select a point as a centre of rotation and rotate any object around it. The 3rd button allows you sketch freehand shapes which will be recognised and converted to an exact shape. The 4th button allows you to draw objects using a pen.

2nd from left: New Point

The three buttons allow you to construct different types of points. The first button allows you to put a point anywhere in the drawing area. The second button allows you to select two different curves and find their point of intersection. The third button constructs the midpoint of a line segment.
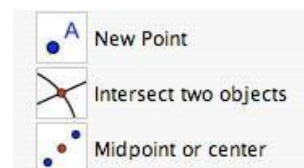
3rd from left: Line through two points

This tool has eight different buttons. These construct different types of lines and polygons. The first button draws an infinite line through two selected points. The second button draws a line segment between two selected points. The third button draws a line segment of a given length from a specific point. The fourth button draws a ray through two points. The fifth button draws a vector between two points. The sixth button allows you to draw a vector parallel to a given vector. The seventh button, the polygon tool, allows you to construct a closed polygon. The last button, the regular polygon tool, allows you to draw a regular polygon.
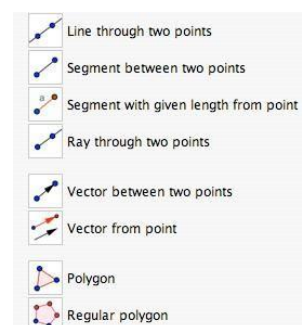

4th from left: Perpendicular line

There are six buttons under the Perpendicular line tool. These allow you to draw specific types of lines. The first button allows you to draw a line perpendicular to a given line. The second button draws a line parallel to a previously constructed line. The third button, the **Line bisector**, is used to bisect a line segment. The fourth button, **Angular bisector**, bisects a previously constructed angle. The fifth button is **Tangents**. This button can draw tangents to a circle, a conic or the graph of a previously defined function. The sixth button is the **Polar or diameter line** button.
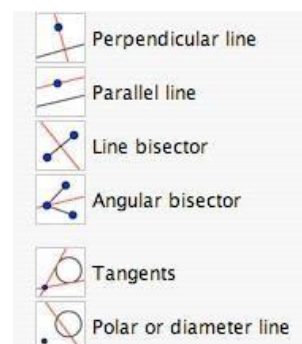
5th from left: Circle with centre through point

The nine buttons in the next menu allow you to construct circles, arcs, sectors and conics. The first button, **Circle with centre through point**, works by either clicking on the point you want to be the centre of the circle or clicking on some blank space to create such a point. Release the mouse button. Move the mouse and you will see a circle in the process of construction. When you click the mouse again the circle is finished. The second button in this menu is **Circle with centre and radius**. Click on the required centre. A menu appears asking you for the radius. Enter the required value and press the Return key. The desired circle is drawn. The third button is called **Circle through three points**. Select this tool and click on three different points. The circle through these points is constructed. The fourth button, **Semicircle through two points**, does exactly what it says.
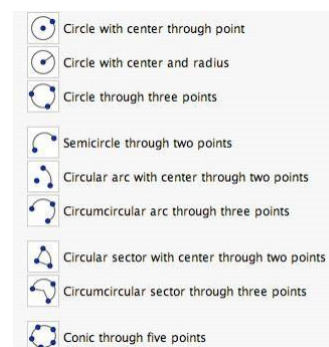

Click with it in two different places to construct the semicircle with that line segment as diameter. The fifth button here is **Circular arc with centre through two points**. Click somewhere with this button to construct the centre of the circle. Click again to create the first point of the arc. If you move the mouse anti-clockwise you will see an arc being constructed. When you click again the arc is completed. The sixth button, **Circumcircular arc through three points**, draws an arc through any three points. To use this button click in three different places. Three points and the arc passing through them are constructed. The seventh and eighth buttons do for sectors what the fifth and sixth

buttons do for arcs. The final button, **Conic through five points**, works by allowing you to select 5 different points on the screen. It then calculates and plots the conic section passing through all 5 points.
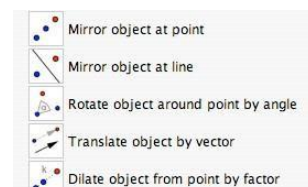
Angle tool

The eight buttons in this menu deal mainly with measurement. The first button, **Angle**, is used to construct and measure the angle between three points. The second but- ton is **Angle with given size**. Select this tool and click to create the vertex of the arm of an angle. The next click gives the point at the angle. At this point a menu appears where you will be asked to select angle size and direction. The third button, **Distance or length**, has several functions. If you use this button and click on two previously constructed points it will give you the distance between them. The function of this button is to measure the length of a line segment. The fourth button is called **Area**. Use this button on a polygon, circle or conic to display the area of the figure. The fifth button, **Slope**, will display the slope of a selected line or line segment.
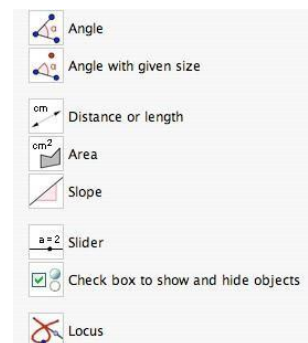
The sixth button, **Slider**, allows us to construct variables which can be changed in Dynamic worksheets. The seventh button, **Check box to show and hide objects**, is another button to control what is displayed on the screen. The final button in this section is called **Locus**. This tool allows you to select a point, B, that depends in some way on a previously created point, A. Using the locus tool on B first and then A will construct the locus of B subject to the given conditions.

Mirror object at point

These five buttons are concerned with geometric transfor- mations. The first button, **Mirror object at point**, per- forms a central symmetry. Select the object that you want to perform the symmetry on, choose the centre of symmetry, the mirror image is then constructed. The button, **Mirror object at line**, works the same way for an axial symmetry. The next button, **Rotate object around point by angle** , needs you to select the object to be rotated and the centre of rotation. A menu will then appear asking for the size of the angle. You can enter a number or the variable name of a previously constructed angle. The default rotation is anticlockwise. **Translate object by vector** performs the translation of an object while **Dilate object from point by factor** performs a dilation.

Insert text

There are three buttons in this menu. The first, **Insert text** allows you to place text anywhere on the page. When you select this tool and click on the drawing pad a menu like the one on the bottom right appears. The button with the degree symbol helps you to enter mathematical symbols while the button with α on it contains the Greek alphabet. These two allow you to enter most things that you will need. The **Insert image** button allows you to import various types of images into your worksheet.
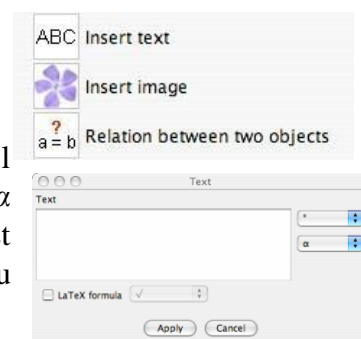
Once the image is imported it is treated as an ordinary object and you can use various tools on it. In particular, all the geometric transformation tools will work. This allows you to prepare an image in your favourite drawing application and then use it in GeoGebra. The **Relation between two objects** button tells you the relation between a limited set of objects. It will let you find out if two objects are equal, if a point lies on a line or a conic, or if a line is tangent or secant to a conic.

Move drawing pad

Most of the buttons under this tool are self explanatory. The **Move drawing pad** button allows you to drag the whole drawing pad wherever you like. The **Zoom in** but- ton zooms in on portions of your drawing. The **Zoom out** button zooms out on portions of your drawing. The **Show/ hide object** is a little more complicated. Use the button to click on the object that you want to show or hide. Nothing appears to happen. Now select any other tool. At this point the change you wanted occurs. If you click on an object with the **Show / hide label** button the label will disappear or appear. The **Copy visual style** button is a very convenient one. Suppose that you have drawn a diagram where you assigned a
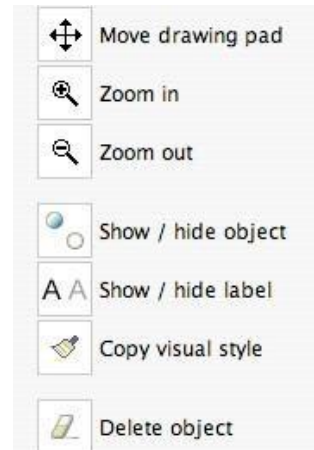
particular colour to an object. Later you may want to use the same colour on another object, maybe a descriptive piece of text. If you use this style to click on the first object it will apply that object's style to the object you click on next. **Delete object** deletes any object you click on when using it. Be very careful before you use this tool. It will delete not only the object you select but also any objects that depended on the selected object during their construction. Unless you are sure that you want to delete an object it is usually a much safer option to hide it.

Algebra Input Commands `Input:`

GeoGebra contains a set of internal commands and functions. These can be entered directly by using the box beside the word **Input**. This is called the **Command** window.

There are other commands available also that you can examine at your leisure in the GeoGebra help file. With these commands you can draw many types of graph that are not possible by just using the Geometry toolbar buttons. For example if you enter sin(x) into the **Command** window and press the **Enter** key you will find that the graph of sin x is drawn on the screen. The command Function[sin(x),0,2 pi] will draw the graph of sin x from 0 to 2π. Note the use of the square brackets and the space between the number 2 and the constant pi. We are now going to look at the ways that we can use direct input, entered into the **Command** window, to perform many different constructions and operations.

Exercise 1

Task 1

Select the 1ˢᵗ toolbar from the left and then select the freehand shape from the dropdown menu.
Use your mouse to draw shapes on the graphics window.

Task2

A

Select the 2ⁿᵈ toolbar from the left and then select a point on the graphics window.
Use your mouse to move this point and note its co-ordinates also change.

Task 3

Use the 3ʳᵈ toolbar from the left and select the line option from the dropdown menu. .
Now select 2 points on the graph to draw the line. Note its equation.
Use your mouse to move one of the points and note the line also changes.

Task 4

Use the 4th toolbar from the left and select perpendicular line option from the dropdown menu. .
Now select the point on the graph and then the line to draw the perpendicular line. Note its equation.

Task 5

Use the 5th toolbar from the left and select polygon.
Select 3 points and then the close the polygon by going from the 3rd point back to the 1st.

Task 6

Use the 6th toolbar from the left to draw a circle

Task 7

Use the 7th toolbar from the left to draw an ellipse

Task 8

Graph the line y=2x+1 by inputting it in the Input: bar at the bottom of the screen and hitting the return key.

Task 9

Graph the line y=x+3 by inputting in the input bar and hitting the return key.
Graph the line y=2x+3 by inputting in the input bar and hitting the return key.

Use the 2ⁿᵈ toolbar from the left and select the intersection from the dropdown menu.
Then select the 2 lines and the intersection point will appear.

Task 10

Graph the line **y = ax + b** by inputting in the input bar and hitting the return key.
When the prompt appears accept create sliders.
Change the sliders a = 2 and observe the change on the graph.

Project Maths GeoGebra Resources

https://www.projectmaths.ie/for-teachers/professional-development/learn-to-use-geogebra

Get started with GeoGebra

To help you get started on using GeoGebra here are some short videos which explain the basics of GeoGebra.
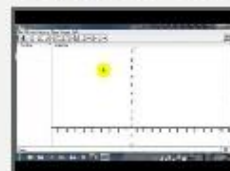
Download GeoGebra

Want to download and install GeoGebra? Simply follow the instructions in this tutori...
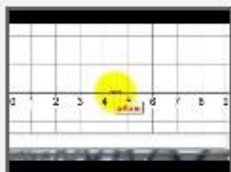
Install GeoGebra

Want to download and install GeoGebra on multiple PCs? Simply follow the instruction...

Set up GeoGebra

This tutorial shows you how to change some basic settings on GeoGebra to make it eas...

Move the graphics view

Moving and scaling the graphics view is one of the most useful things to know In Geo...

Inserting a picture

When linking maths to real-life it ccan be useful to insert a picture into GeoGebra ....

Introduction to geometry
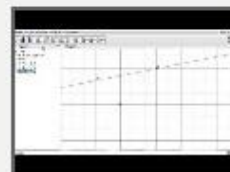
Knowledge of a few basic tools makes it easy to teach Geometry using Geogebra. This ...

Bisect a line segment

Want to construct the perpendicular bisector of a line segment? This tutorial will s...

The equation of a circle
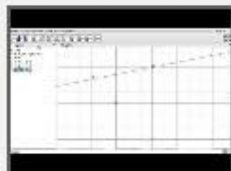
Understanding the equation of a circle is so much easier when you can see the circle...

Introduction to statistics

Use GeoGebra with Census@SChool data to create charts, calculate means, standard dev...

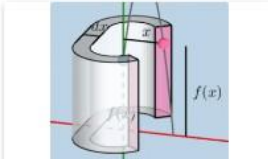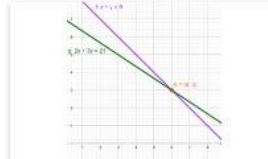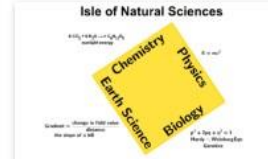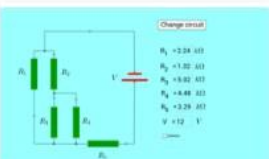# GeoGebra Resources

https://www.geogebra.org/search/science
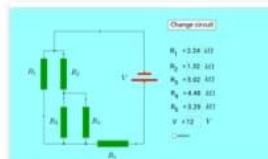
Below is a sample of some resources on GeoGebra site: