Using GeoGebra

In Geometry, you will use a software tool called GeoGebra to build constructions, study geometric relationships, and solve problems. These instructions will help you navigate some of the basic features of the tool that pertain to this course. Not all of the tool's features are covered. If you don't find what you're looking for, go to the [GeoGebra help manual](#) online for more information or click on Help in the GeoGebra menu bar.

User Interface

The main features of the GeoGebra user interface (see the screen capture following this list) include:

- Menu Bar–Select a drop-down menu from the menu bar to gain access to all the tools and functions in GeoGebra, including additional help.

- Tool Bar–Click an icon in the tool bar to choose that particular tool, or click the arrow beneath the icon to select a different tool from that tool group.

Click the arrow beneath the icon to open a tool group.

- Graphics View–After selecting a tool from the menu bar or the tool bar, click in the graphics view to build your geometric construction. In the screen capture below, the coordinate axes and grid in the graphics view have been turned on.

- Algebra View–Look in the algebra view to see the coordinates and equations that support the objects built in the graphics view. In most cases, selecting an object in the algebra view is equivalent to selecting it in the graphics view.

- Input Bar–Enter coordinates or equations in the input bar to build your geometric construction in the graphics view. This is a viable alternative to using the menu bar or the tool bar.

GeoGebra_Activity

Menu Bar

Tool Bar

File Edit View Options Tools Help

Move
Drag or select objects (Esc)

Free Objects
- A = (-5, 4)
- B = (-3, 3)
- C = (2, 3)

Dependent Objects
- a: -x - 2y = -8
- b: 1.2x - 6.6y = -17.4
- c : $(x+5)^2 + (y-4)^2 = 5$

Algebra View

Graphics View
(Axes and Grid On)

Input Bar

Input:

Created with GeoGebra

Maintaining Files

GeoGebra source files are saved with the file extension .ggb. Click File in the menu bar for your file maintenance needs:

- New–To create a new .ggb file, click File→New.

- Open–To open a .ggb file from a saved location, click File→Open. From your computer's directory, choose the file from the location you saved it to.

- Save–To save a .ggb file, click File→Save or click File→Save As if you want to change the file name. Choose a location for the file on your computer, enter a file name, and click Save.

- Export–To export a screen capture of a construction from GeoGebra, click File→Export→Graphics View to Clipboard. Click the desired location for the screen capture in a separate document, and press Ctrl+V to paste the screen capture.

Deleting Objects

If you place an unwanted object in the graphics view, you have several ways to delete it:

- Click the object in the graphics view or the algebra view. Press Delete on your keyboard.

- Right-click the object in the graphics view or the algebra view, and choose Delete from the pop-up menu.

- In the menu bar, click Tools→ General Tools→Delete Object, or click the General Tools button on the toolbar, and then click Delete Object. Then click the unwanted object in the graphics view or the algebra view.

- Press Ctrl+Z on your keyboard to go back one step.

- Click the Undo button ⤺ in the upper right corner of the tool bar to go back one step. Or click Edit→Undo in the menu bar.

Changing Views

To change the views that appear in the user interface, click View in the menu bar:

- Axes–Click View→Axes to show and hide the *x*- and *y*-axes in the graphics view.

- Grid–Click View→Grid to show and hide the grid lines in the graphics view. When the grid is showing, it's a useful device for precisely locating points.

- Algebra–Click View→Algebra to show and hide the algebra margin on the left side of the screen.

General Tools

Click the rightmost button in the tool bar to access the general tools.

- Move Graphics View (shown)–Click and drag the graphics view to move it in any direction. This tool is helpful if you can't see some parts of your construction.

- Zoom In–Click in the graphics view or use your mouse wheel to zoom in.

- Zoom Out–Click in the graphics view or use your mouse wheel to zoom out.

- Show/Hide Object–Click an object in the graphics view to show or hide it. Then click a different tool for the change to take effect. Your object is not deleted, it's just hidden. Use this tool if the graphics view gets cluttered. You can also toggle the radio buttons in the algebra view to show and hide objects.

- Show/Hide Label–Click a label in the graphics view to show or hide it. Your label is not deleted, it's just hidden. Use this tool if the graphics view gets cluttered.

- Delete Object–Click an object in the graphics view or the algebra view to delete it.

Movement Tools

Move (shown)–Click and drag an object, or label in the graphics view to move it. The Move tool is one of the most widely used tools because it can also act as a selecting tool to highlight an object before manipulating it. Some objects are fixed and cannot be moved. To move a fixed object, go to Object Properties under the Edit menu to change its properties.

Point Tools

- New Point (shown)–Click the graphics view to place a point. The location of the point is approximate, not exact. For a more precise location, you can enter the coordinates of a point (x, y) in the input bar and press enter. Or use the grid for more precise placement.

- Point on Object–Click an object in the graphics view to place a point on it. The location of the point is approximate, not exact. For a more precise location, you can enter the coordinates of a point (x, y) in the input bar and press enter.

- Intersect Two Objects–Click the intersection of two objects, or click each object individually, to place a point precisely at the intersection of the objects. You can do this in the graphics view or the algebra view.

- Midpoint or Center–Click a line segment in the graphics view or the algebra view to precisely locate its midpoint.

Line Tools

- Line through Two Points (shown)–Click two points to draw a line through them.

- Segment between Two Points–Click two points to draw a line segment between them.

- Segment with Given Length from Point–Click a point to set the endpoint of a line segment. Enter a value for the length of the segment. The tool draws the segment horizontally to the left if the value is negative or horizontally to the right if the value is positive.

- Ray through Two Points–Click two points to draw a ray from the first point through the second point.

- Vector between Two Points–Click two points to draw a vector from the first point to the second point. This tool is useful during transformations when translating an object a given distance by a vector.

Special Line Tools

- Perpendicular Line (shown)–Click a point and then a line or a line segment. This tool draws a line through the point perpendicular to the line or line segment.

- Parallel Line–Click a point and then a line or a line segment. This tool draws a line through the point parallel to the line or line segment.

- Perpendicular Bisector–Click a line segment to draw its perpendicular bisector.

- Angle Bisector–Click three points to draw the angle bisector defined by the points. The second point chosen is the vertex. Or click two lines or line segments to draw the angle bisector. This tool automatically draws a line perpendicular to the angle bisector as well.

- Tangents–Click a point and then an arc or a circle. This tool draws two tangent lines to the arc or circle through the point.

Polygon Tools

- Polygon (shown)–Click any number of points to define the vertices of a polygon. Click again on the point you started with to close the polygon and establish its properties.

- Regular Polygon–Click two points to define one side of a regular polygon. Then enter the number of vertices for your polygon to complete the drawing of the shape.

Circle and Arc Tools

Circle and arc tools are useful because they behave like a traditional compass when creating geometric constructions.

- Circle with Center through Point (shown)–Click a point in the graphics view to define the center of a circle. Then drag your mouse to set the approximate radius of the circle.

- Circle with Center and Radius–Click a point to define the center of a circle. Then enter a value for the exact radius of the circle.

- Circle through Three Points–Click three points to draw a circle passing through the points. (The center of the circle is not one of the points.)

Conic Section Tools

Parabola (shown)–Click a point and then a line. This tool draws a parabola using the point as the focus and the line as the directrix of the parabola.

Measurement Tools

- Angle (shown)–Click three points to display the measure in degrees of the angle defined by the points. The second point chosen is the vertex. Alternatively, click two

lines or line segments to measure the angle between them. Select lines and line segments in counterclockwise order to avoid an unexpected reflex angle measurement.

- Angle with Given Size–This tool is an angle maker. Click two points to define the endpoint and vertex, respectively, for one leg of the angle. Then enter a value in degrees for the angle measure, and choose the direction (clockwise or counterclockwise) that the angle will open with respect to the first leg. The tool will establish the third point for the angle.

- Distance or Length–Click two points to display the distance between the points in units. The distance will be labeled as a directed line segment. You can also click a line segment to display its length in units.

- Area–Click a polygon to display its area. This tool works only on established polygons, not collections of vertices or points.

- Slope–Click a line or line segment to display its slope. The tool displays horizontal slopes as 0. Vertical slopes are undefined and do not get displayed.

Transformation Tools

- Reflect Object about Line (shown)–Click an object and then a line (or line segment) of reflection. This tool reflects the object about the line (or line segment).

- Rotate Object around Point by Angle–Click an object and then a point of rotation. The tool will prompt you for an angle measurement and direction. Enter a value for the rotation angle and choose the direction, clockwise or counterclockwise.

- Translate Object by Vector–Before using this tool, you must draw a vector using the Line tool called Vector between Two Points. Click an object and then your defined vector. The tool will translate the object according to the length and direction of the vector you've chosen.

- Dilate Object from Point by Factor–Click an object and then a point that represents the center of dilation. Enter the scale factor of the dilation when prompted. Most dilations in this course will have the center of dilation at the origin, $(x, y) = (0, 0)$.

Special Object Tools

Insert Text (shown)–To describe and customize your geometric constructions, you can insert text or symbols in the graphics view. With this tool enabled, click anywhere in the graphics view and enter your text in the Edit box. You can enter text, special symbols, or properties from objects you've created. Review the text and symbols in the Preview window before accepting them.

Customization

GeoGebra offers a variety of features for customizing your geometric constructions. You aren't likely to use all of them, but you might find these features beneficial as you work through the course.

Equations
GeoGebra displays equations for objects such as lines and circles in the algebra view. You can change the form of the equation if you right-click the equation and choose Equation… in the pop-up menu. For example, you can change from the slope of a line in slope-intercept form to its general form.

Input Bar
The input bar is an alternative and effective way to define objects. By entering values in the input bar (window), you can be sure that you're locating objects precisely in the graphics view. For example, entering the value (9, -2) will plot a point precisely at that location. Entering the line $y = -3x + 7$ will plot the line definitively. To enter an exponential curve, use a caret followed by the proper exponent. For example, enter x^2 for x^2. Experiment with different equations to see the results.

Labels
You can move labels for most objects using the Move tool (leftmost button in the toolbar). Moving labels off construction lines and away from other labels is important for maintaining a clean file that you and others can more easily understand.

Object Properties
Sometimes you will want to stylize your geometric construction by changing the colors, line types, and labels associated with the object. To change object properties, right-click an object in either the graphics view or the algebra view. Then select Object Properties from the pop-up menu and choose a relevant tab:

- Basic—Change the name of your object or write a caption. Changing the name of an object, such as a lettered point, can help organize and make sense of your work. If you want a caption to appear, select Show Label→Caption. If you might want only a numerical value to appear with your object, select Show Label→Value.

- Color—To change the color of an object, click the Color tab. Choose a hue, and then click Close.

- Style—Change the line thickness, line style, or opacity of your object. Opacity is the degree to which you can see through a particular object.