

1. Introduction to GeoGebra (by Rachel Fruin)
Play around with the toolbar to learn about the tools.

The screenshot displays the GeoGebra software interface. At the top is a main toolbar with icons for navigation, point creation, line drawing, and text entry. Below this, the title "Introduction to GeoGebra" is centered. The main workspace is divided into four tool palettes:

- Point Tool:** Includes "New Point", "Intersect Two Objects", and "Midpoint or Center".
- Segment/Line Tool:** Includes "Line through Two Points", "Segment between Two Points", "Segment with Given Length from Point", "Ray through Two Points", "Vector between Two Points", and "Vector from Point".
- Line Relationship Tool:** Includes "Perpendicular Line", "Parallel Line", "Perpendicular Bisector", and "Angle Bisector".
- Measurement Tool:** Includes "Angle", "Angle with Given Size", "Distance or Length", "Area", and "Slope".

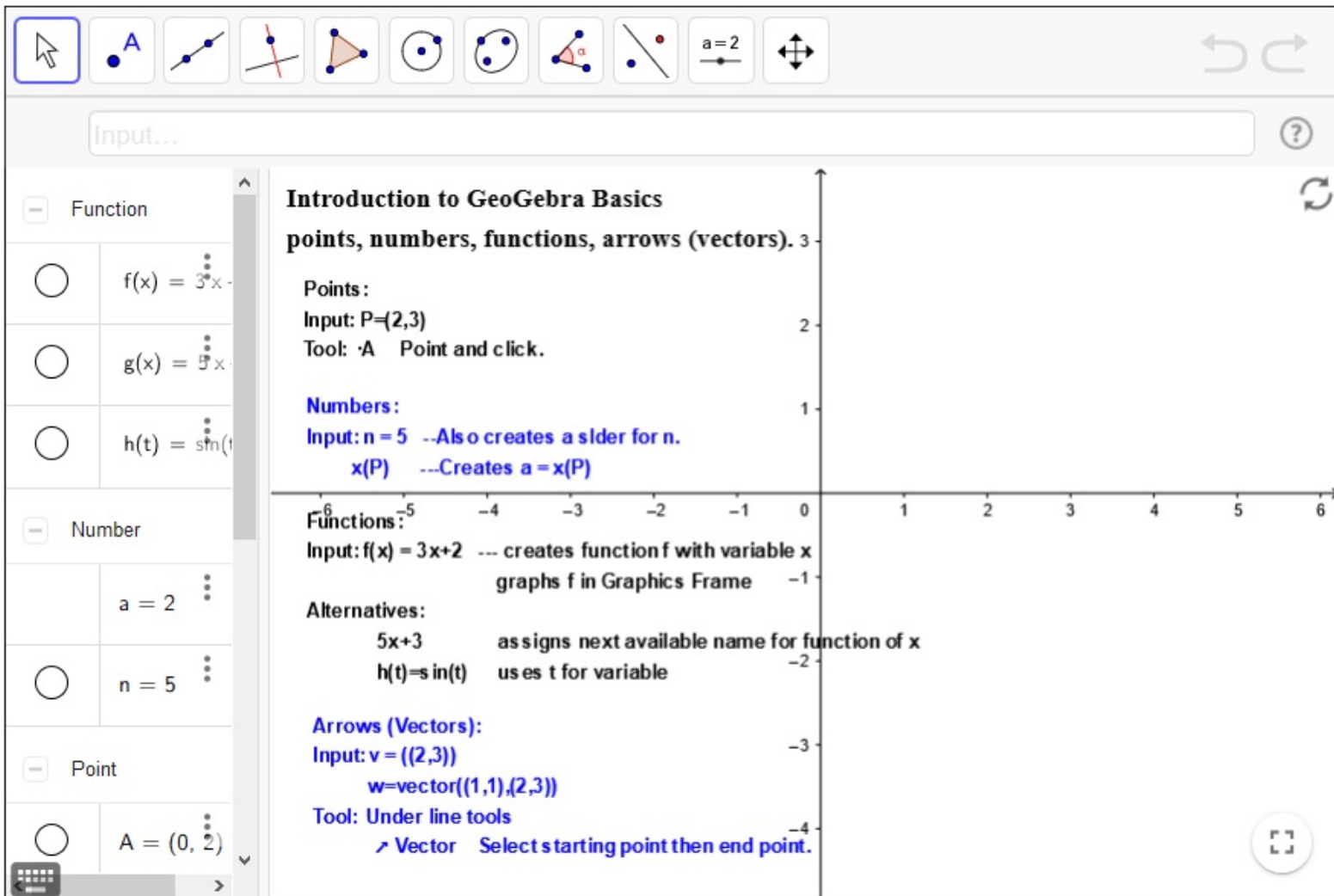
Each tool palette has a small triangle in its bottom right corner, which is the focus of the instruction below. A blue instruction text is located below the tool palettes, and a small circular icon is in the bottom right corner of the workspace.

Familiarize yourself with the tools by clicking on the triangle in the bottom right corner of each tool.

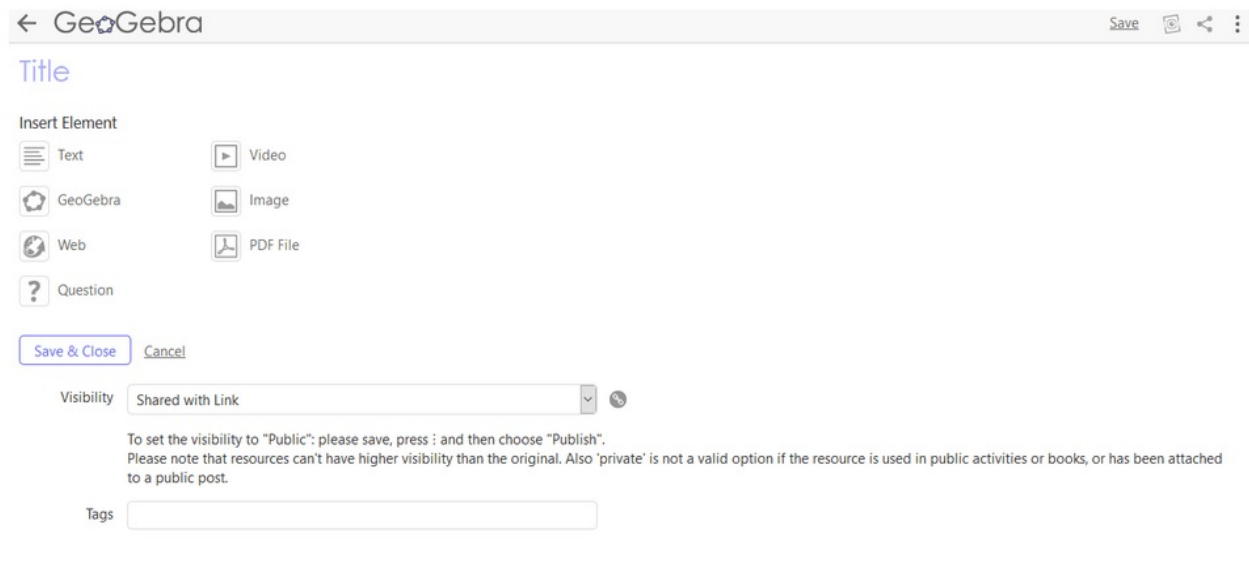
2. Beginning GG: Basic Tools* available at opening of GG

Views:

- a. Toolbar [Tools/Commands/Functions and Operators]
 - i. Algebra View *
 - ii. Graphics View * [Actually two graphic frames]
 - iii. Spreadsheet View
 - iv. CAS View
 - v. 3D_Graphics View
 - vi. Probability Calculator
- b. Other Components:
 - i. Menubar*
 - ii. Input Bar *



3. Fresh Start: what starting an activity looks like initially.



4. Simple Dynamic Mapping Diagrams

Building simple dynamic mapping diagrams.

One input, output, arrow.

Create Parallel Axis in Graphics 2:

Action

Input $I_a=2$ Click on Graphics 2...
 Input $l: x = I_a$ Click on Graphics 2...
 In Graphics: Use [point tool](#) to create free point

Response

in Algebra Number $I_a = 2$
 in Algebra line $l: x=2$ l is vertical line in Graphics 2
 in Algebra $A= (...,...)$, in Graphics point labelled "A".

Create Point in Graphics paired with points/arrow in Graphics 2

Action


In Graphics: Use [point tool](#) to create free point
 Input $X_A=(0,x(A))$ Click on Graphics 2...
 Input $Y_A=(I_a,y(A))$ Click on Graphics 2...
 Input $v_A=Vector[X_A,Y_A]$ Click on Graphics 2...

Response

in Algebra $A= (...,...)$, in Graphics point labelled "A"
 In Algebra $X_A=(0,...)$, $x(A)$ is "x" coordinate of A,
 X_A is point on vertical axis in Graphics 2.
 In Algebra $Y_A=(2,...)$, $y(A)$ is "y" coordinate of A,
 Y_A is point on line l in Graphics 2.
 In Algebra $v_A=(2,...)$, as column vector,
 v_A is vector from X_A to Y_A in Graphics 2.

Create Points/arrow in Graphics 2 paired with point in Graphics

Action

In Graphics 2: Use [point tool](#) to create point on Y axis
 In Graphics 2: Use [point tool](#) to create point on line l
 In Graphics 2: Use vector tool  to create vector from B to C
 Input $P_{BC}=(y(B),y(C))$. Click on Graphics

Response

in Algebra $B= (0,...)$, in Graphics 2 point labelled "B"
 in Algebra $C= (2,...)$, in Graphics 2 point labelled "C"
 In Algebra $u=(2,...)$, as column vector,
 u is vector from B to C in Graphics 2.
 In Algebra $P_{BC} =((y(B),y(C))$. in Graphics point labelled "P_{BC}"

5. A Mapping Diagram for linear functions

A mapping diagram for linear functions of the form $y = f(x) = mx + b$

Create Linear Function and Its Graph : $y = f(x) = mx + b$

Action	Response
Input m=2 Click on Graphics 2...	in Algebra Number m= 2
Input b=3 Click on Graphics 2...	in Algebra Number b= 3
Input f(x)=m*x+b Click on Graphics...	in Algebra f(x)=mx+b, in Graphics graph of function $f(x) = 2x + 3$

Create Mapping Diagram for Linear Function : $y = f(x) = mx + b$

Action	Response
In Graphics 2: Use <u>point tool</u> to create point on Y axis	in Algebra A= (0,...), in Graphics 2 point labelled "A" on Y axis.
Input F_a=(l_a,f(y(A))) Click on Graphics 2...	in Algebra Point F_a=(l_a,f(y(A))), in Graphics 2 point labelled "F_a" on line l.
In Graphics 2: Use <u>vector tool</u> to create a vector from A to F_a	in Algebra column vector v=(2,...), in Graphics 2 vector/arrow from A to F_a
Input: P=(y(A),y(F_a)). Click on Graphics.	in Algebra Point P=(y(A),y(F_a)), in Graphics point on graph of f labelled "p"

6. Sequences and Zip

Start in the basic mapping diagram below by entering inputs:

t_0=-2
t_n=2
n=5
dt=(b-a)/n

Sequence [<Expression> , <Variable i> , <Start Value a> , <End Value b> , <Increment>]

Zip [<Expression> , <Var1> , <List1> , ...]

Examples:

Input	Result
t_i=Sequence[t, t, t_0, t_n, dt]	Alg: Creates list of numbers from t_0 to t_n with increment dt.
x_i=Zip[(0, t), t, t_i]	Alg: Creates list of points on source-axis using list t_i, points on MD.
y_i=Zip[(l_a, f(t)), t, t_i]	Alg: Creates list of points on target-axis using list t_i, points on MD.
v_i=Zip[Vector[A, B], A, x_i, B, y_i]	Alg: Creates list of MD vectors from list x_i to list y_i, arrows on MD.
P_i=Zip[(A, f(A)), A, x_i]	Alg: Creates list of points on graph of f, points on graph.

7. Control Tools

Check Box Tool: Hide Show

Creates check box: a Boolean Value attached to objects. [Advanced: condition to Show Object.]

Input Box:

Creates an input box linked to any existing object.

Examples:

Action

Result

Select Input Box Tool . Click in Graphics 2 to create Input box. Enter Caption "f(x) = " . Select object f to change to function f .

Creates input box in Graphics 2 for entering expression for f(x)

Select Check Box Tool . Click in Graphics 2 to create Check box. Enter Caption "Hide/Show MD Arrow " . Select object to connect object to check box.

Creates boolean value in Algebra and check box in Graphics 2 for showing or hiding arrow in MD.

8. Asking Questions

Add a question to an activity.

In creating an activity-

Click on +ADD ELEMENT , then select ? Question and complete form-

?
Question

Heading (optional)

A	Question
<i>f_x</i>	

Open question
Multiple choice

A
f_x
✖

Add Answer

Done

Cancel

Save & Close Cancel

9. Composition

$$g(x) = 2(x - 1)^2 + 3$$

Steps for g:

1. Linear: Subtract 1.
2. Square result.
3. Linear: Multiply by 2 then add 3.

Outline of Steps to Create Composition

1. In the linear template, in Algebra change $f(x) = 2x + 1$ to $g_2(x) = x^2$.
2. Input functions $g_1(x) = x - 1$ and $g_3(x) = 2x + 3$.
3. Input numbers $l_b = -2$ and $l_c = 4$, then create vertical lines, $l_0: x = l_b$ and $l_3: x = l_c$.
4. Create basic list: $t_i = \text{sequence}(-1, 3)$.
5. Create directly lists $x_i = (l_b, t_i)$, $g_1x_i = (0, g_1(t_i))$, $g_2g_1x_i = (l_a, g_2(g_1(t_i)))$, and $g_{xi} = (l_c, g_3(g_2(g_1(t_i))))$.
6. **Use Zip** to create lists $v_{1i} = \text{Zip}[\text{Vector}(A, B), A, x_i, B, g_1x_i]$, $v_{2i} = \text{Zip}[\text{Vector}(A, B), A, g_1x_i, B, g_2g_1x_i]$ and $v_{3i} = \text{Zip}[\text{Vector}(A, B), A, g_2g_1x_i, B, g_{xi}]$.

10. Learning by Deconstruction: Composition

- a. Example: Mapping Diagram Composition with Adjustable Arrows

On-line version:

<https://www.geogebra.org/m/cvxynwxa>

- b. Example: Mapping Diagram Solve Equations

On-line version:

<https://www.geogebra.org/m/kpmpg2sfj>

- View Algebra
 - Auxiliary Objects
 - Sort by Object Type/Construction order
 - View Construction Protocol
-

How to Create a New GeoGebra Book

Author: [GeoGebra Docu Team](#)

Open the GeoGebra Book Editor

1. [Log in](#) to your GeoGebra Profile Page.
Note: If you do not have a GeoGebra account, please [register](#).
2. Click on + **NEW BOOK** in order to open the *Book Editor*.

Create a Title Page

The *Title Page* of the *Book Editor* allows you to input some basic information and metadata about your GeoGebra Book.

Note: The metadata will help other users of the GeoGebra Community to search for your resources and thus, benefit from your effort and expertise.

1. **Title:** Fill in the *Title* of your GeoGebra Book.
2. **Language:** Specify the main *Language* of your GeoGebra Book in order to help other users from the international GeoGebra Community to locate resources in their preferred language.
3. **Description:** Add an optional *Description* for your GeoGebra Book, which will make it easier for other users to decide whether this resource is what they were looking for (optional).
4. **Target Group (Age):** Specify the age of the user *Target Group* intended to work with this GeoGebra Book.
5. **Tags:** Add *Tags* (key words) which allow other users to find your GeoGebra Book.

6. **Visibility:** Decide about the *Visibility* of your Book and specify, which users will be able to access your Book. You may choose between the following options:
 - *Public:* Other users can find and view this Book.
 - *Shared with Link:* Only users who have the direct link to your Book can view it. Please note that it won't appear in the search results of other users.
 - *Private:* Other users cannot view your Book, which won't appear in their search results either.

When you are done entering this information about your new Book, just click [Save](#) and start adding content. You may edit the metadata at any time on tab *Title Page* in the *Book Editor*.

Note: By creating a GeoGebra Book you agree to publish your work under the [Creative Commons: Attribution Share Alike](#) license.

Add Content to your Book

Add Chapter

Add Activity

After saving your Title Page, the *Book Editor* opens automatically with tab *Content* being active by default. You may now...

- add existing Activities
- create new Activities
- structure your Book by inserting chapters

Add Chapter

Set up the main structure of your GeoGebra Book by creating different chapters (optional). You may choose between the following options:

New Chapter: You can specify a *Name* and enter an optional *Description* for the chapter in the appearing dialog window. Click [Save](#) when you are done.

Existing Chapter: You may either copy a chapter of one of your own Books or search for a public GeoGebra Book of another user to import one of its chapters into your new Book.

1. In the appearing dialog window, search for the Book you want to copy a chapter from.
2. Once you found the desired Book, click on [View Content](#) in order to display its chapter overview.
3. Select the chapter(s) you want to copy to your Book.
4. Click on [Import](#) in order to add the selected chapter(s) to your new GeoGebra Book.