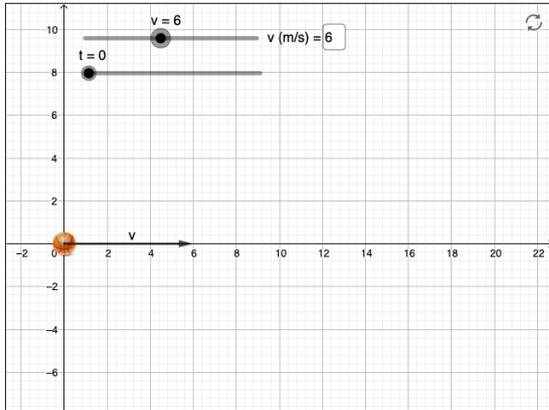


Creating a simple Physics interactive using GeoGebra

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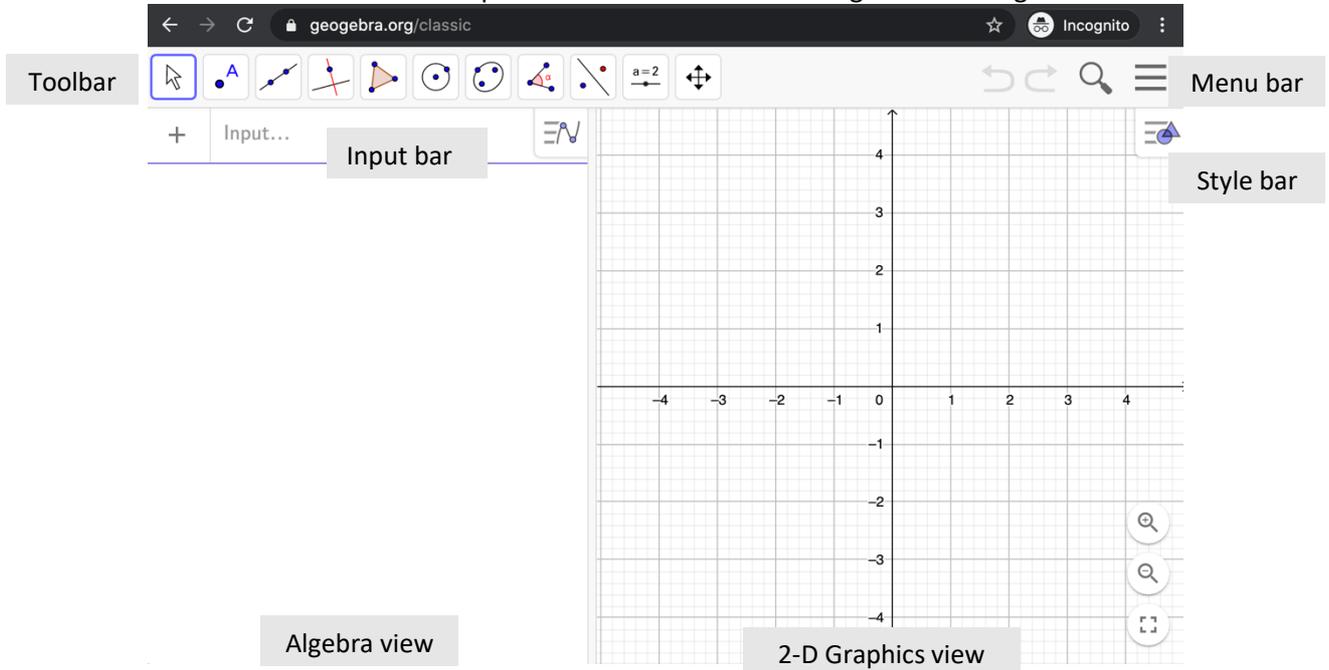
By the end of this series of activities, you will be able to create an applet that is exactly like this:

<https://www.geogebra.org/m/nqf7xecd>



Getting Started

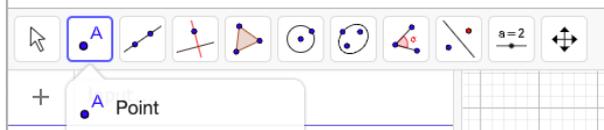
1. Go to <https://www.geogebra.org/classic>
2. Log in to GeoGebra and save the applet (before anything gets lost!)
You will see two panels or views: the Algebra view with the Input bar and the 2-D Graphics view with the grids.
3. We will refer to the various parts of the user interface using the following terms:



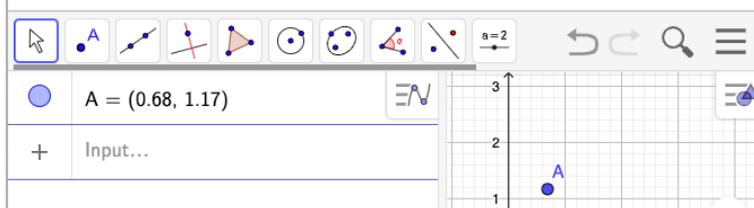
Part 1: Point, Line, Segment and Vector

It takes two points to define a line (infinite length), segment (finite length) or vector (with direction).

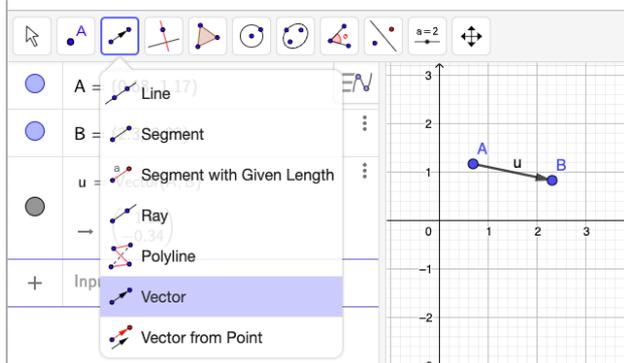
1. Create the first point by selecting the point icon from the toolbar.



2. Click anywhere on the 2-D Graphics view.
The point will be named "A" by default. You can see the x and y-coordinates of the point in the Algebra view. To move the point around, click on the arrow icon (left-most in the toolbar) before dragging the point.



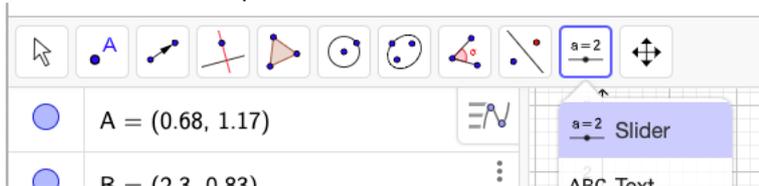
3. Now try creating a second point. *It will be named "B" by default.*
4. Type in "Vector(A,B)" into the Input bar or use the Vector option in the toolbar to select the start and end points.



Part 2: Slider and Animation

You can allow users to move a point either by dragging it or by using a slider to control the x or y value.

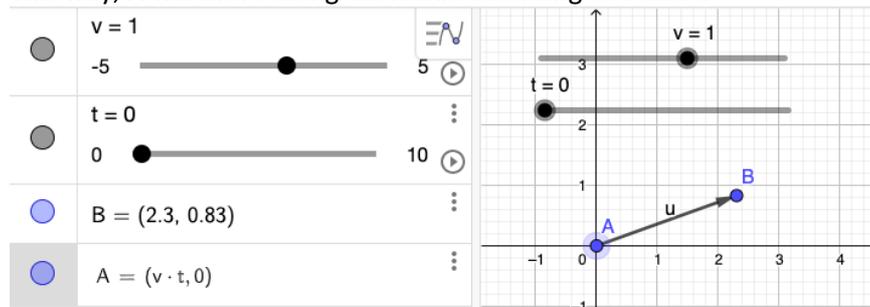
1. Click on the Slider option from the toolbar.



2. Click on the position in the 2-D Graphics view where you want to slider to appear.
3. The settings box for sliders will appear. The name of the slider will be "a" by default.

Try changing the time to “t” (to represent time) and the minimum value to “0”, the maximum value to “10” with increment “0.1”. Click OK. *You can experiment with changing them later.*

- Now try creating a new slider and name it “v” for velocity.
- Now we want to define the x-position of point A as a displacement of an object given by $v \times t$. To do so, click on the point A in the Algebra view, and edit the coordinates to “ $A=(v \cdot t, 0)$ ”. This way, A will move along the x-axis according to v and t.



- Now, suppose we want the vector to vary in length depending on the magnitude of v, we can define the x-value of B in terms of the x-value of A such as by keying in “ $B=(x(A)+v, 0)$ ”.



- To label the vector as “v”, click on the settings at the right-hand side of the vector in the Algebra view.



- In the settings, key in “v” under Caption and select from the dropdown menu *Show Label* the option for “Caption”. No two elements can have the same name so you need to display a caption, which need not be unique, instead.

Name:

Definition:

Caption:

Show Object

Show trace

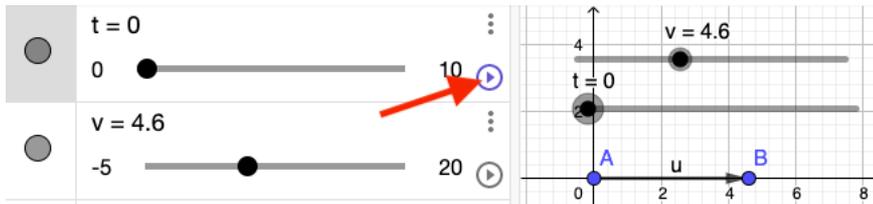
Show Label:
 Name
 Name & Value
 Value
 Caption
 Caption & Value

Fix Object

Auxiliary Object

- Now vary the two sliders and see how your vector changes.

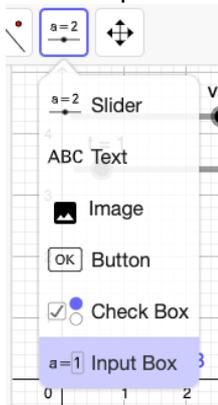
- You can also click on the play button on the right-hand side of a slider in the Algebra view to see the points animate based on the variable of the slider.



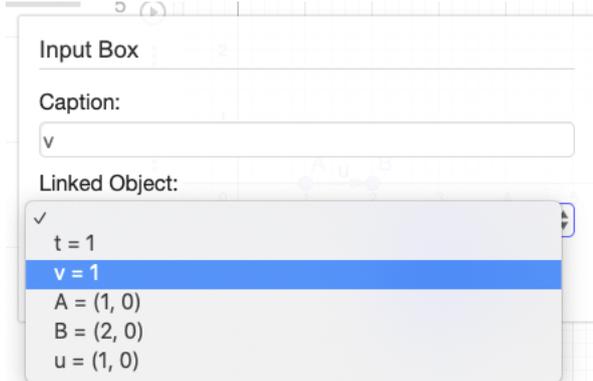
Part 3: Input Box

You can allow users to key in values to change a variable.

- Select "Input Box" from the toolbar.



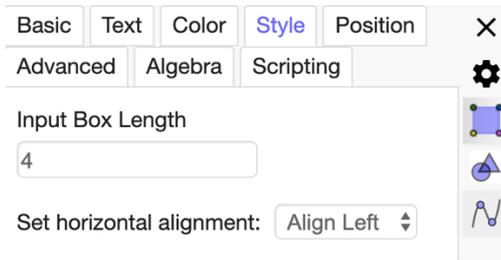
- Select the position where you want it to appear by clicking in the 2-D Graphics view.
- Select the "Linked Object" as " v " so that students can opt to key in a value for " v " apart from using the slider.



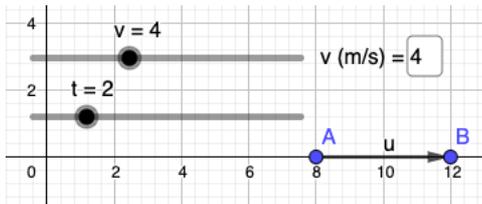
- Now, if the input box is too long, you can click on the settings



5. Select the tab for “Style” and key in the number of digits allowed.



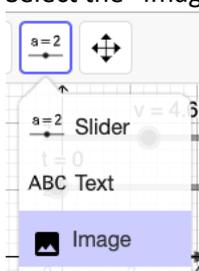
6. You can also change the caption of the Input Box under settings for “Basic” if you like.



Part 4: Animating an Image.

You can animate an image using one or more points.

1. You can use any png or jpg file for animation. PNG files with transparent backgrounds are preferred. [You can download a free-to-use sample from here.](#)
2. Select the “Image” option from the toolbar.

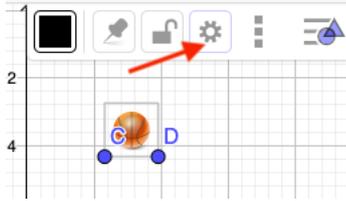


3. Browse for the file for upload and click OK.

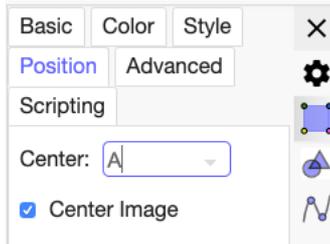


4. The image will be inserted with two points by default. These two points can be used to change the size and orientation of the object.

- For the purpose of our applet, we just need the basketball to move with A. Hence, select the image and click on the settings icon.



- Select the “Position” tab.
- Tick the check box for “Center Image” and select point A.

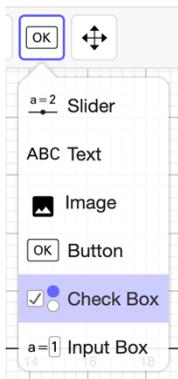


- You can hide the points A and B by clicking on their blue circles in the Algebra view.

Part 5: Checkbox and Boolean

You can create boolean values (true or false) in GeoGebra to control animation or visibility of objects, among other possibilities.

- Select the “Check Box” from the toolbar.



- Select the position where you want it to appear by clicking in the 2-D Graphics view.
- Now we will try to use the checkbox to start and stop the animation. So under “Caption”, key in “Play” or any text you like.
- You will be prompted to select elements to show or hide using the checkbox. This may be useful for future use but we will skip this step for now.
- Notice that after inserting the checkbox, there is an associated boolean value in the Algebra view.

6. Select the settings of the boolean value using the dropdown menu on the right.



7. Under the "Scripting" tab, you can key in the following GeoGebra Script under "On Update":
- "StartAnimation(t,a)" – this starts and stops the animation for the slider "t" using the boolean "a" (true for start and false for stop).

