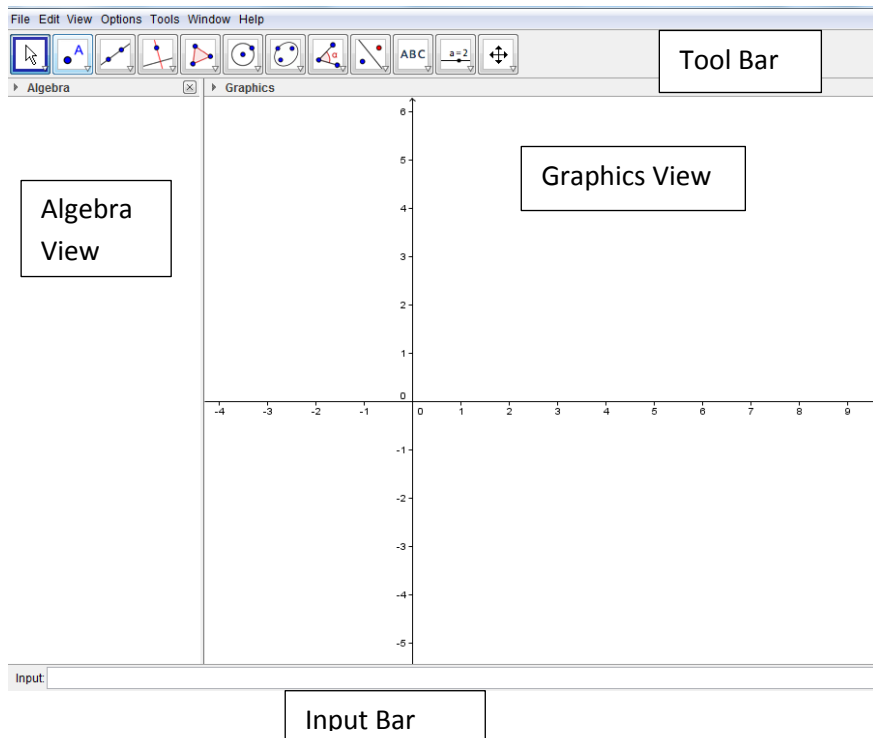


How to use a Slider and Latex Text to Demonstrate the Trigonometry Ratios

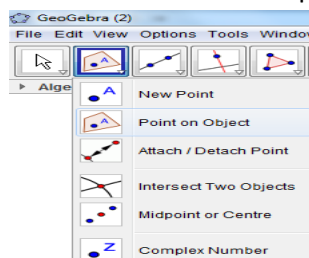
This tutorial is based on GeoGebra version 4.2.




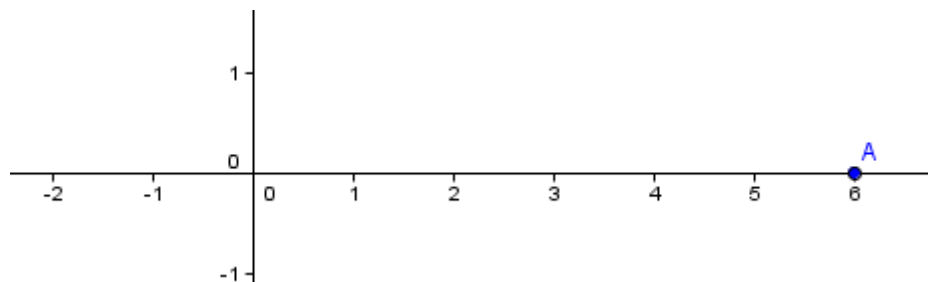
Section 1: How to Draw a Right-Angled Triangle


1. Open GeoGebra.
2. Go to Options and choose Font Size and pick a suitable font size.

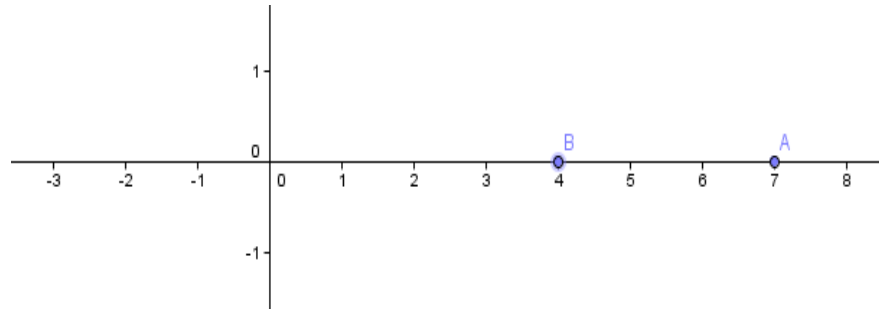
3. Select the x axis.



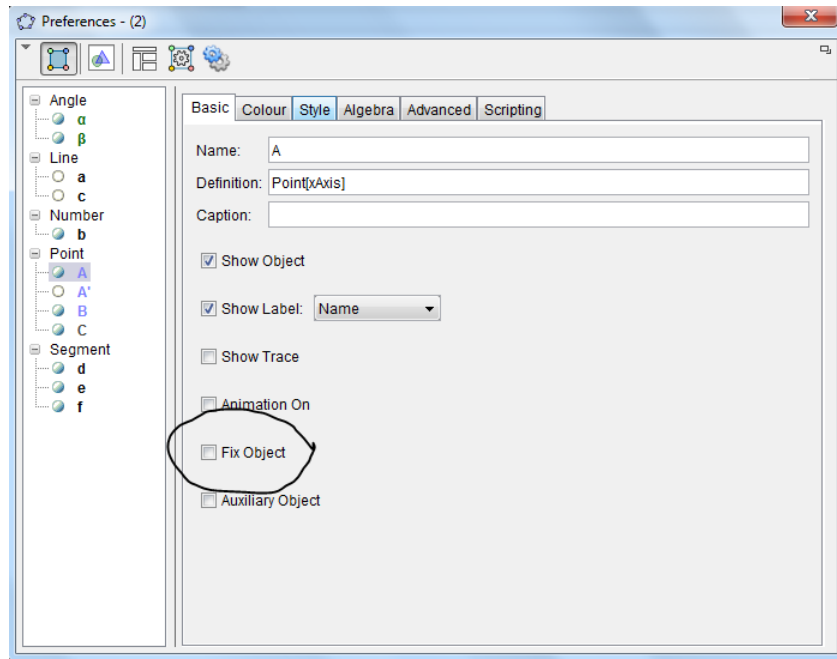
Point on Object tool  and click somewhere on the x axis. This creates a new point called A on the x axis.




4. Select the Point on Object tool  and click on the x axis three units to the left of A to create a point called B.

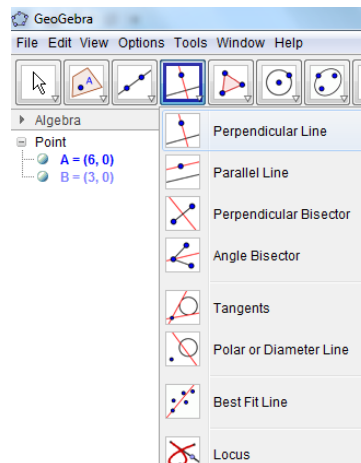



5. Right click the point A and choose Object Properties. A new dialogue box appears.

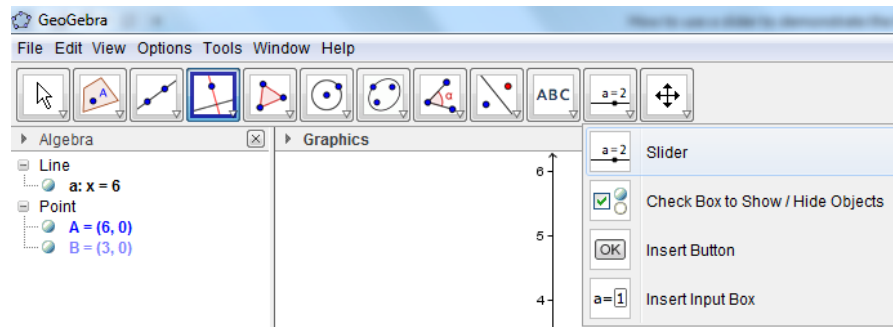


6. With the Basic tab open click on the box beside Fix Object. Click the X at the top of the dialogue box.

7. Select the Perpendicular Line tool . Click on point A and on the x axis. This creates a line through A perpendicular to the x axis.

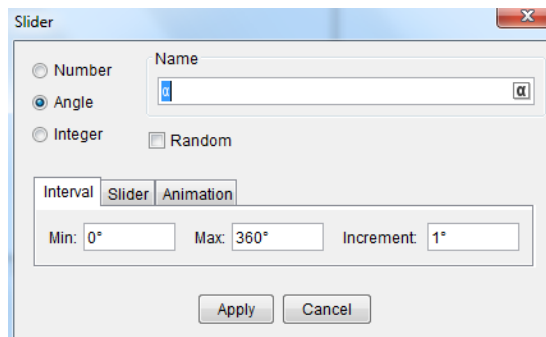


8. Select the Slider tool  and click on the Graphics View.

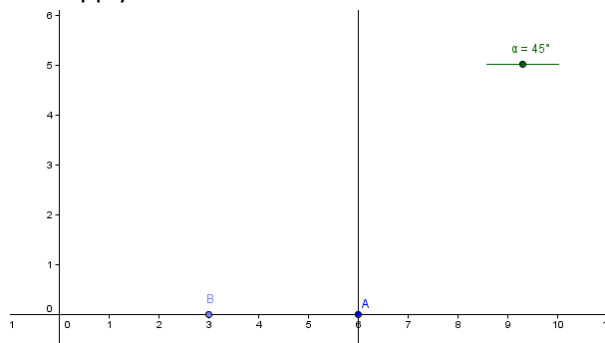


9. A new dialogue box appears on the screen.

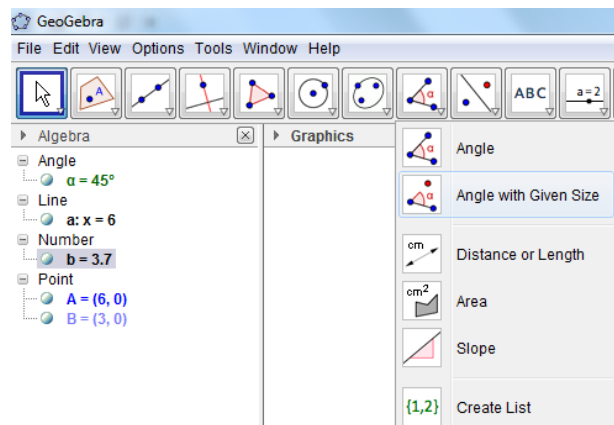
10. Click the circle beside Angle. The dialogue box changes.



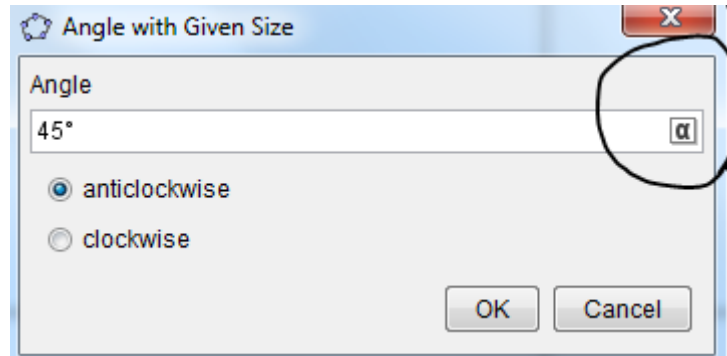
11. Set Min to 0° and Max to 90° and Increment to 1° . Make sure to keep the degree sign after each measurement. Click Apply. This creates a slider called α .



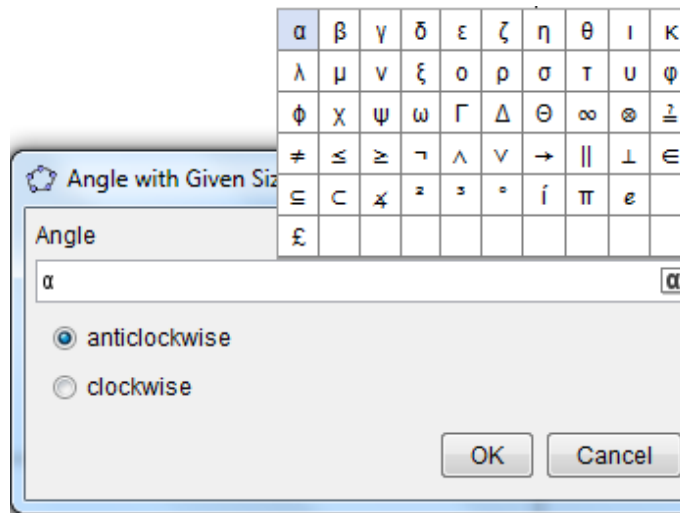
12. Select the Angle with Given Size tool .




13. Click on the point A followed by the point B. A new dialogue box appears.




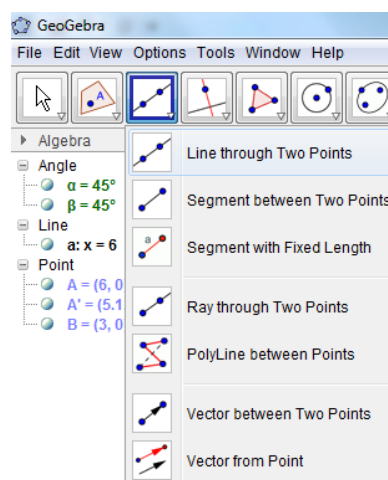
14. Highlight the 45° and press Backspace on your keyboard. Click on the α symbol on the right of this dialogue box and choose α .



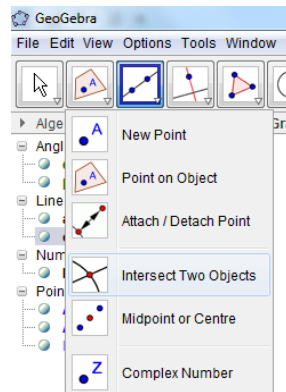
15. Click OK. This creates an angle called β , the size of which depends on the slider α .
 Note: The labels for the vertex B and the angle β may be on top of each other these can be

moved using the Move tool .

16. Select the Line through Two Points Tool . Click on B and A'.




17. Select the Intersect Two Objects tool . Click on lines a and b.

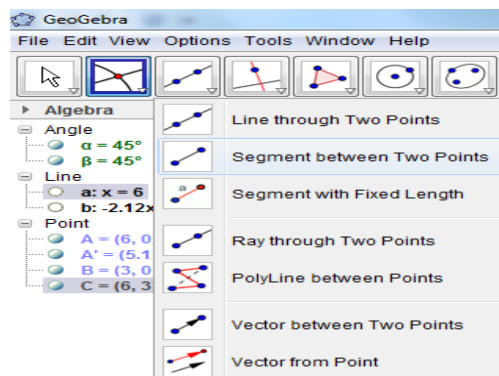


Section B: How to Hide and Rename Objects

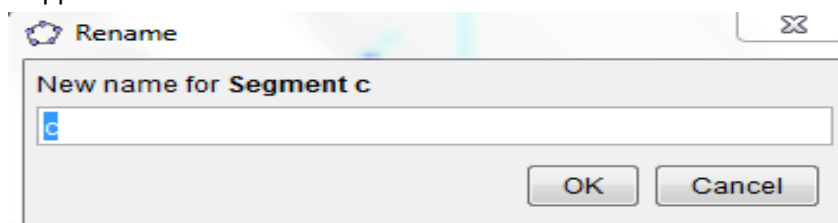
Note: This is a continuation of the previous section.

1. Right click line a in either the Graphics View or Algebra View and unclick Show Object.
 Note: Alternatively one can click on the blue circle beside an object in the Algebra View to hide and unhide the object,
2. Right click line b in either the Graphics View or Algebra View and unclick Show Object.

3. Select the Segment between Two Points tool . Click on A and C.

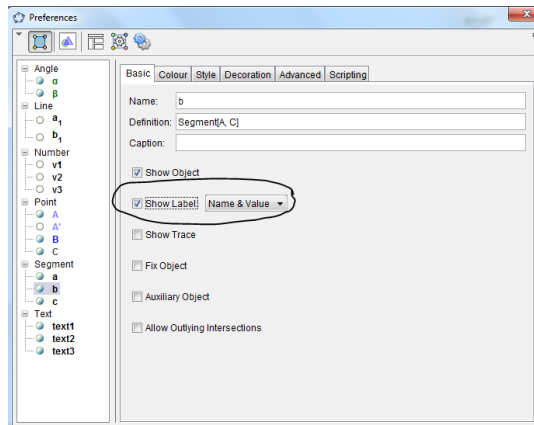


4. Right click the new segment created currently called c and choose Rename and a new dialogue box appears.



5. Highlight c in this dialogue box and press Backspace on your keyboard. Type b as this segment is opposite the vertex B. Click OK.

- Right click the segment again and choose Object Properties. With the Basic tab open click the box beside Show Label and following the drop down menu choose Name and Value. Click the X at the top of the dialogue box. This shows name and value of the object.




An alternative method of renaming an object is click on the arrow at the top of the Graphics View.





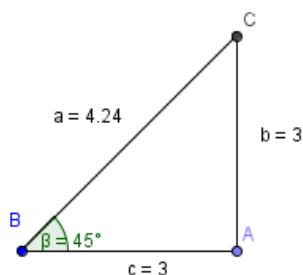
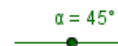
A new Toggle bar appears at the top of the Graphics View.



Click on the object to be renamed and on the drop down menu beside the Set label style

button  and choose Name and Value.

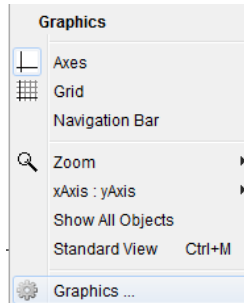
- Select the Segment between Two Points tool . Click on B and A.
- If this segment is not already called c, rename it so that it is called c as it is opposite the vertex C.
- Select the Segment between Two Points tool . Click on B and C.
- Rename this segment so that it is called a as it is opposite the vertex A.
- Change the labelling of a and c so that they show the Name and Value.
- Right click on the point A' and unclick Show Object.



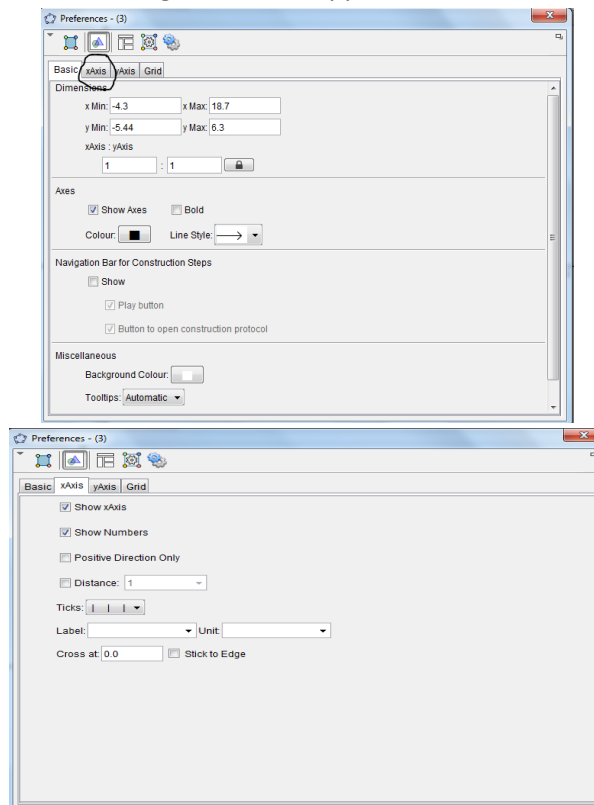
Section C: How to hide the x Axis and y Axis

Note: This is a continuation of the previous section.

1. With no objects selected in the Algebra View, right click on the Graphics View and choose Graphics.



2. Click on the x Axis in the new dialogue box that appears.




3. Unclick Show x Axis.
4. Click on the y Axis tab at the top of this dialogue box. Unclick Show y Axis.
5. Click the X at the top right hand side of the dialogue box.
6. In the input bar type $v_1=b/a$ and press Enter on the keyboard.

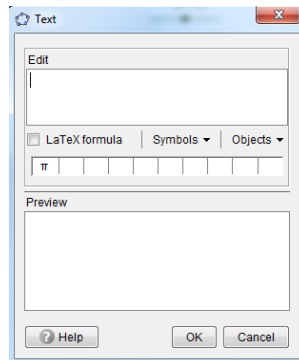
Section D: How to Insert a Text box including Latex Text

Note: This is a continuation of the previous section.

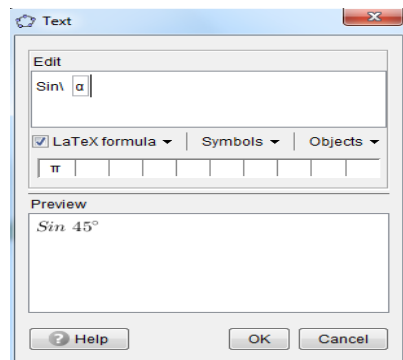
The aim of this section is to display text like this $\sin 45^\circ = \frac{3}{4.24} = 0.71$ in the Graphics View.

To do this we will insert the following $\sin \alpha = \frac{b}{a} = v1$ into a textbox.

1. Select the Insert Text tool  and click on the Graphics View where you require the text to appear. A new dialogue box appears.

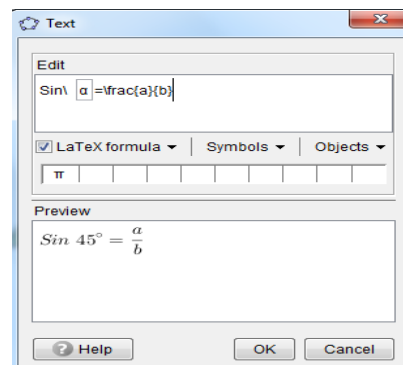


2. Type $\sin \alpha$, follow the down arrow beside Objects and choose α .
Note: The space after the \backslash puts a space between the word Sin and the next part of the text, when the box beside the LaTeX formula is clicked.



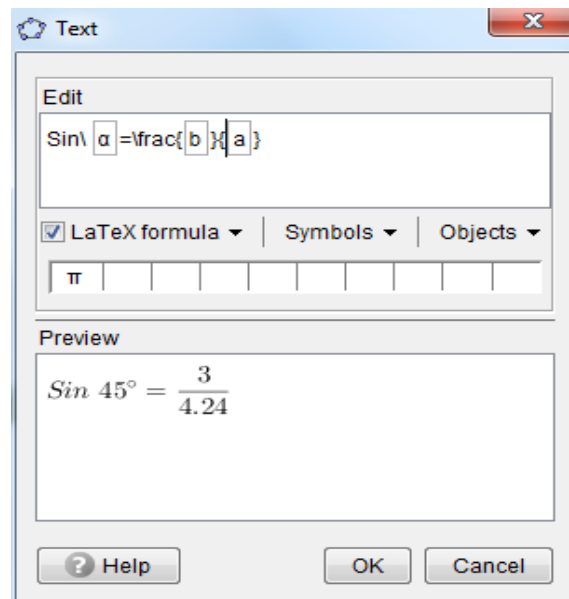
3. Type =
4. Click the checkbox beside LaTeX formula. Follow the down arrow beside LaTeX formula and

click on Roots and Fractions and choose $\frac{a}{b}$.



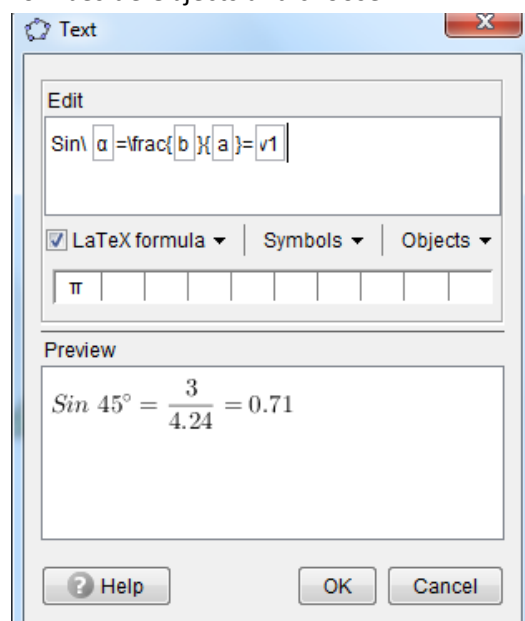
- Highlight the contents of the first {} brackets and press Backspace on your keyboard. Go to Objects, follow the drop down arrow and with the help of the slider bar if necessary, choose b.
- Highlight the contents of the second {} brackets and press Backspace on your keyboard. Go to Objects, follow the drop down arrow and with the help of the slider bar if necessary, choose a.

Note: If you have place points A and B at different locations on the x axis you will get different numerical values for a and b.



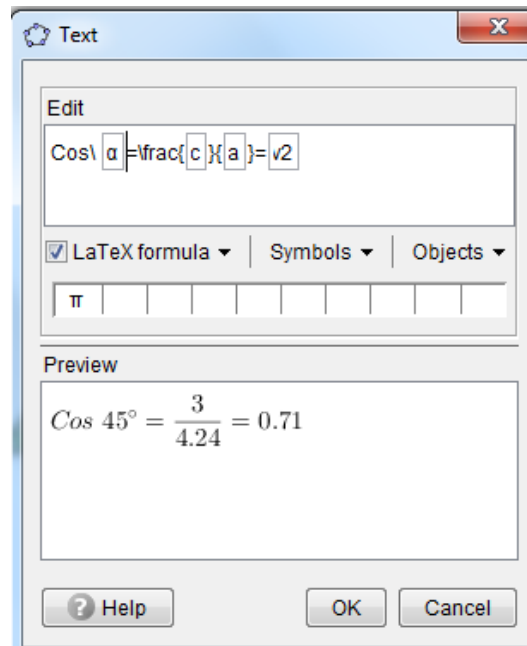
Note: If you just type in a and b in these brackets and do not go to Objects etc. you will get the letters a and b in the fraction $\frac{a}{b}$ in the text box and not the actual values for a and b in the fraction.

- Type = and follow the arrow beside Objects and choose v1.

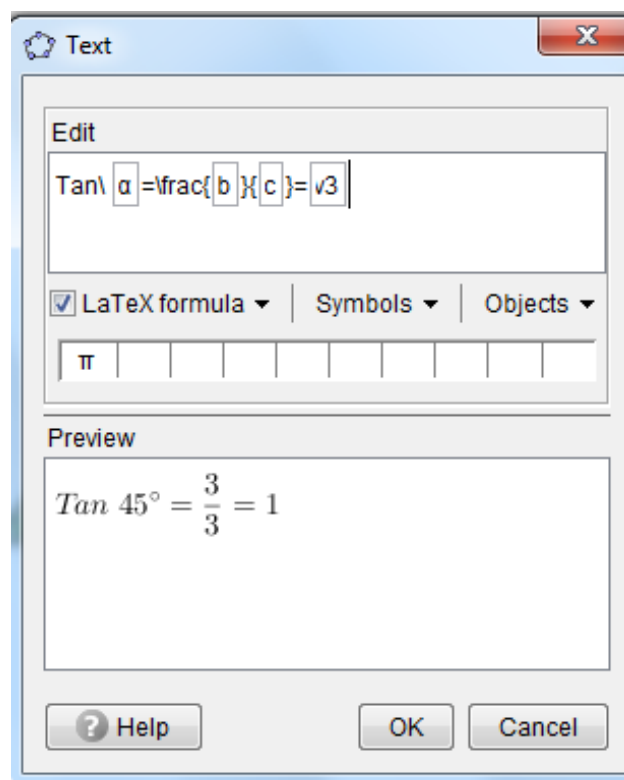


- Press OK.

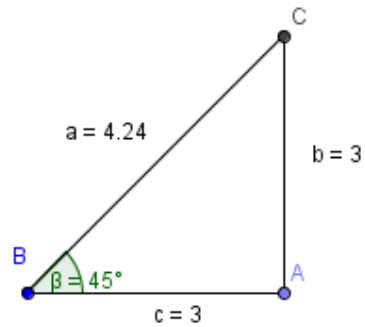
9. In the input bar type $v_2=c/a$ and press Enter on the keyboard.
10. Repeat steps 1 – 10 in this section of the tutorial, but replace Sin with Cos, b with c and v1 with v2.



11. In the input bar type $v_3=b/c$ and press Enter on the keyboard.
12. Repeat steps 1 – 10 in this section of the tutorial, but replace Sin with Tan, a with c and v1 with v3.



13. Move the point B and notice the angle and the ratios stay the same. Given the angle CAB is a right angle, if another angle in the triangle stays the same, then all angles stay the same. The changes in the lengths of the line segments do not affect the trigonometric ratios.



$$\alpha = 45^\circ$$

$$\sin 45^\circ = \frac{3}{4.24} = 0.71$$

$$\cos 45^\circ = \frac{3}{4.24} = 0.71$$

$$\tan 45^\circ = \frac{3}{3} = 1$$

14. Move the slider and see that it is the same for all the other angles.