GeoGebra – Lesson 5

More about Inputs/Free Objects
and Text and Latex Objects

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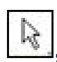
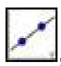
Key Concepts from GeoGebra

- Already discussed: , , , , 

- Advanced Inputs
- Text Objects with Text and Latex

Key Concepts from Mathematics

- The units for an angle are "degrees" or "radians".
- There are 360° or 2π radians in a circle.
- This means that $180° = \pi\ radians$.

  Usually we don't write "radians" so we have: $180° = \pi$ or $\frac{\pi}{180°} = 1 = \frac{180°}{\pi}$.
- To convert an angle from degrees to radians:

  $75° = 75° \cdot 1 = 75° \cdot \frac{\pi}{180°} = \frac{75 \cdot \pi}{180} \approx 1.31$.
- To convert an angle from radians to degrees:

  $4.2 = 4.2 \cdot 1 = 4.2 \cdot \frac{180°}{\pi} = (\frac{4.2 \cdot 180}{\pi})° = 240,64°$.

Script-o-matic

1. View: Algebra window and View: Input field.
2. Circle with slider radius:
   a. Draw a slider in upper left hand corner for the radius from 2-6, increment: 0.25. Rename it r.
   b. Draw a point A(0,3).
   c. Draw a circle with a center at A and radius r – its name is c.
3. Circle angle with slider degree measure:
   a. Draw a slider underneath previous slider for the angle from 0°-355°, increment: 5°. Rename it α.
   b. Click on the move tool and move this slider to 45°.
   c. Draw a point B at (r,3).
      i. In the Input field type: B=(r,3)
   d. Draw an angle from B to A with given size α - its name is β. (Point C will appear on circle.) Widen the shading of the angle to 50 and deselect show name/value (since we will want to show this value in radians not angles).
4. Draw line segments from A to B and from A to C – their names are a and b. Hide the label of b and change the label of a to be 'show value' – this is the radius.
5. Draw an arc with center A and points B and C – it's name is d. Thicken this line, make it red, and check 'show value'. (Notice that the value is the arc-length.)
6. Input (the temporarily incorrect formula): αr=α. This value will be put in free objects with a fixed value based on the current value of α.
   a. This is important: We want αr to be a dependent object – that is, dependent on the value of α, so we right-click and select "redefine". Enter the correct formula: αr=α·3.1416/180/° so that αr is now the radian value of α and is now correctly a dependent object. Notice that we need to "divide out" the degrees!
7. Now click on ABC , click somewhere blank and then enter αr. It should give a text box with the value of αr. Click on the select tool and then move this text box into the shade of the angle.
8. Connecting object to points:
   a. Now suppose we want to move the circle. Try it – that is, click and drag point A. Ahh! Our new text box stays put – which we do not want. Undo the circle move. Right-click on the text box. Because

there are 2 objects where we clicked, we will get a selection box. Select "Text T1" and then Properties. Deselect "Absolute position on screen" and then click on the arrow in "Starting point" and select A. Click on Apply. The text box will move close to A.

b. Click and drag it back into the shade of the angle. Now move the circle (click and drag point A), the text box will stay in its relative position.

9. Interesting! Move the sliders to r=4 and α=45°. You may see 3.14 for the arc –length or you may see π. Move the circle about a bit and this will change. Apparently it depends on the "decimal points" of A. (I like to see π so I move A until π appears.) Now hide A if you don't want your user to move the circle.

10. Dynamic text explanations:
    a. Finally, let's add some dynamic text explanations. Underneath the slider for the radius, open a text box. Type in – including all the double quotes: "Then α in radians is: " + α + "•π/180°=" + αr
    b. To get the dot • copy and paste it from here
    c. Or to get a real fraction line, we select Latex formula and type (only the spaces are optional): "Then \,\, α \,\, in \,\, radians \,\, is: \,\, \frac{π\,•\," + α + " } {180°} \, = \," + αr
    d. Underneath the slider for the angle open another text box. Type in – including all the double quotes: "The arc-length is: α•r =" + αr + "•" + r + "=" + d

11. Move all your objects where you want them. Test the sliders to see how the objects will look for the different radii and angles. Hide the points.

12. Don't forget, we need to make the sliders unmovable so that our user can only move the point! Right-click on each of the sliders, select "Properties" and select "fixed" (bottom right). Now the sliders cannot move – if you want to reposition them, right-click -> properties -> deselect 'fixed'.

13. Save and then export your file... ☺