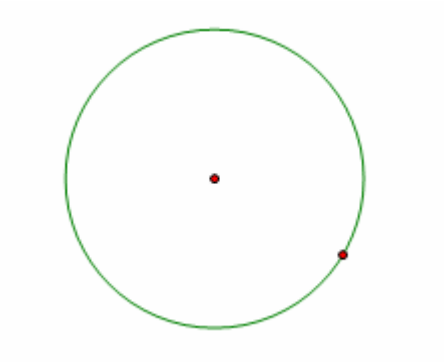
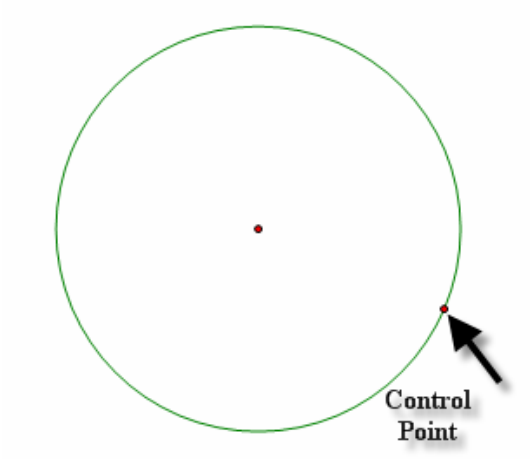
Dome Floor Dilemma

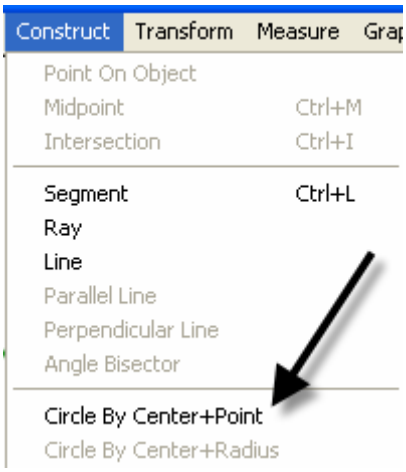
Sector Construction

1. Circle Construction
   a) Use the **Compass** tool to construct a circle.

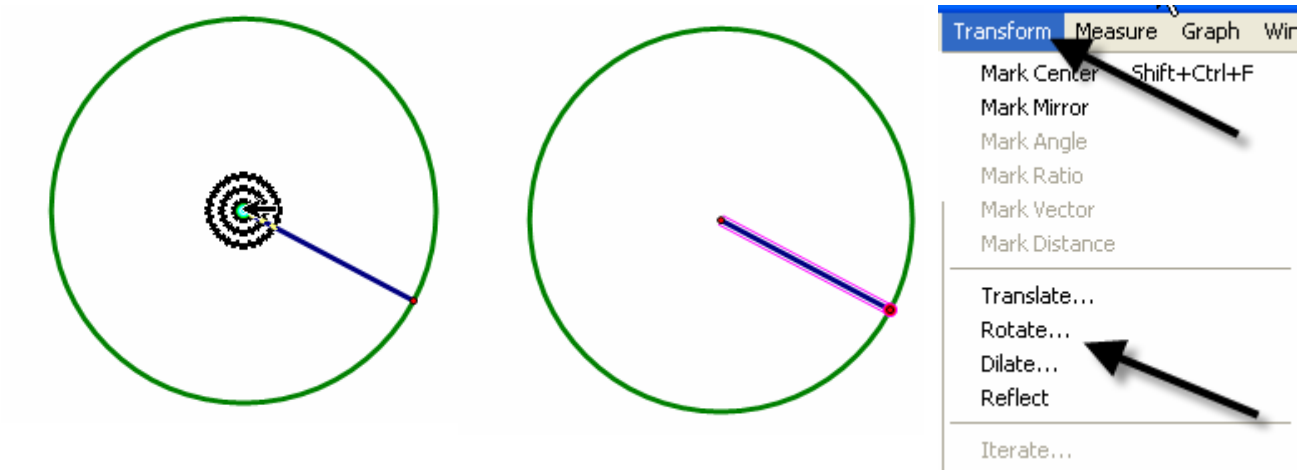


   b) Use the **Segment** tool or the **Construct** menu to construct a radius of the circle. Connect the radius from the center to the "control" point on the circle. To use the **Construct** menu, first select the center and the point on the circle, then use **Construc**t with the **Circle By Center+Point** option.

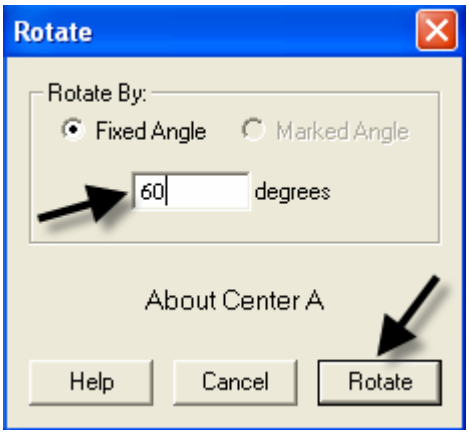


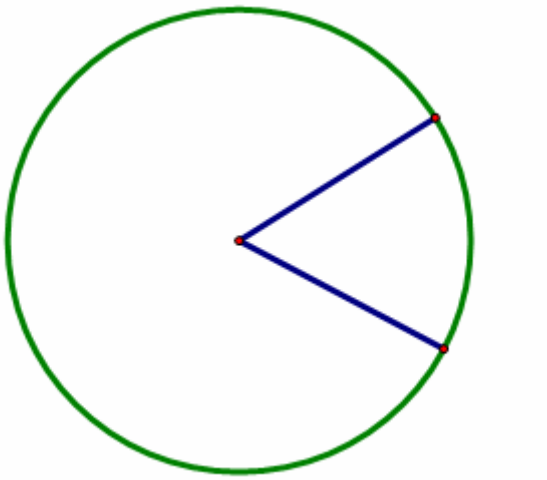


2. Rotate Radius
   a) To rotate the radius and its endpoint that lies on the circle, first mark the point of rotation by double clicking on the center of the circle. You will see a quick flash of concentric circles as the "marking" takes place, then highlight the radius and the endpoint that lies on the circle. Use the **Transform** menu and choose the **Rotation** option.

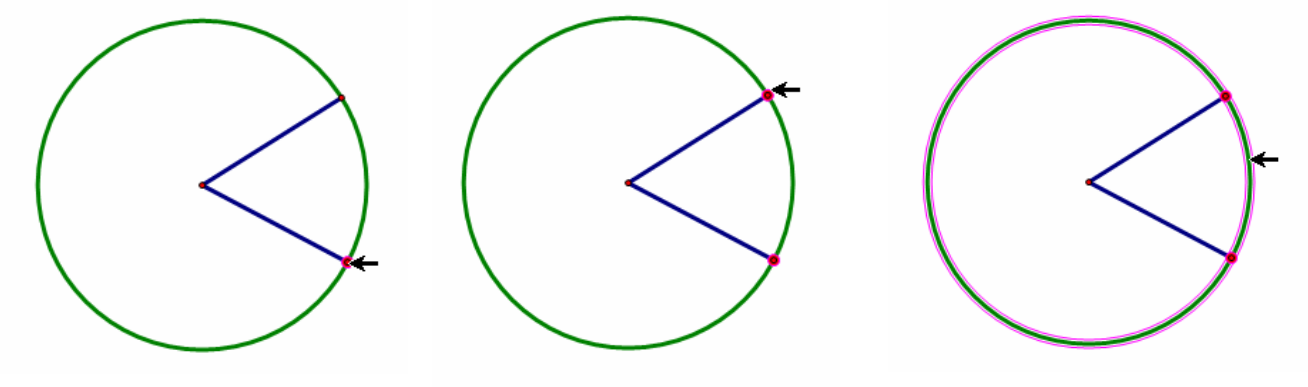


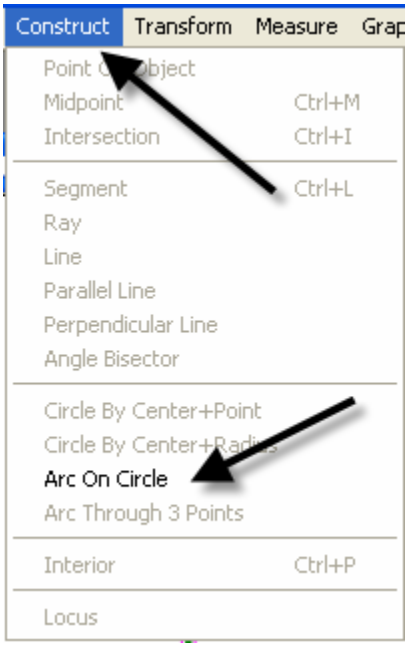
   b) A box will pop up that allows the desired degrees of rotation to be entered. For this construction, enter 60^{o}, then click on **Rotate**.

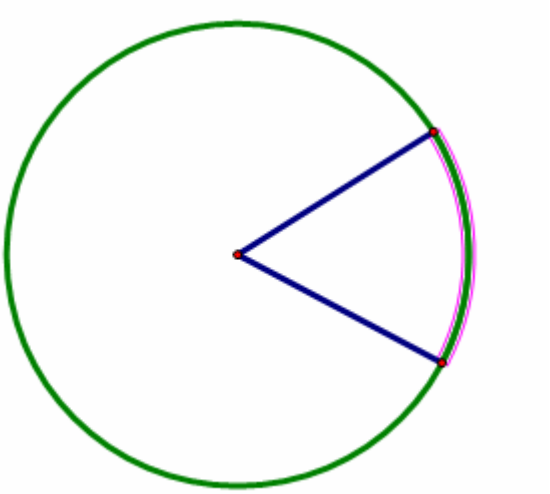




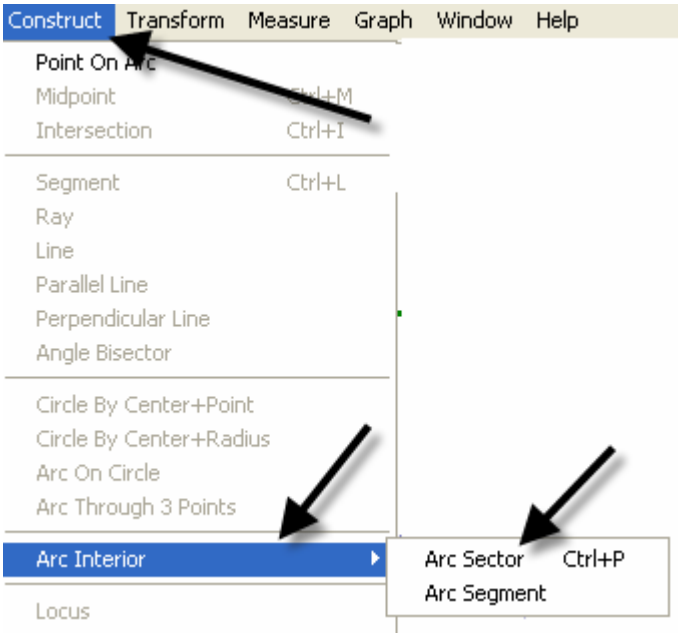
3. Construct Intercepted Arc
   To construct the intercepted arc of the sector, select the endpoints of the radii in a counter clockwise direction. Then select the circle and use the **Construct** menu to construct **Arc on Circle**.

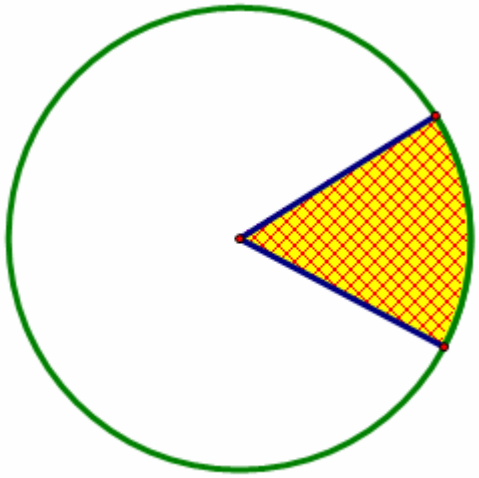




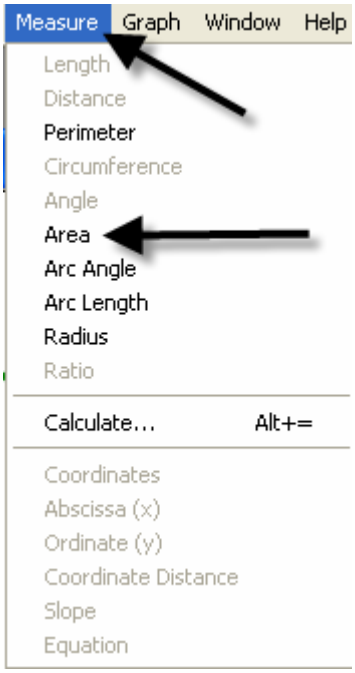


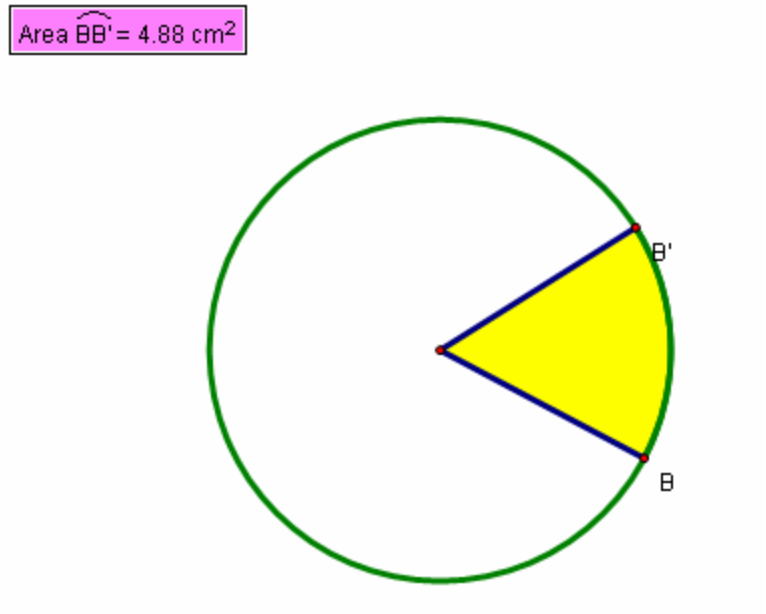
4. Construct Arc Sector
   While the newly constructed arc is still highlighted, create the arc sector interior by using the **Construct** menu with the options, **Arc Interior** then **Arc Sector**.



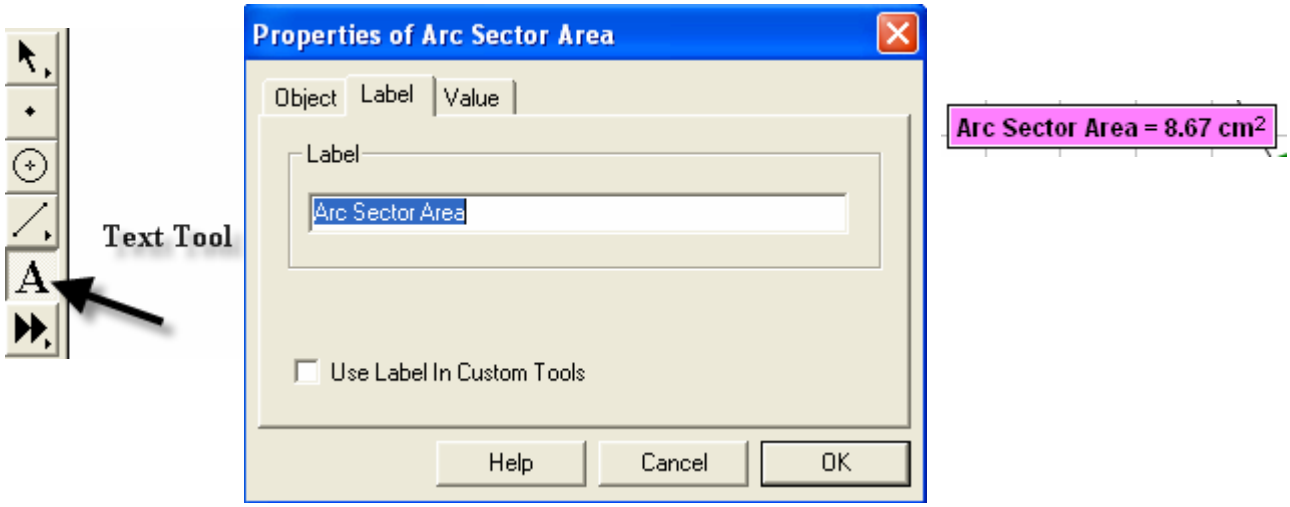


5. Measure Area and Length
   a) To measure the area of the sector, highlight the sector by clicking in it, then use **Measure** from the menu bar with the **Area** option. A highlighted labeled box will appear. Be sure to un-highlight the box by clicking in any white space on the sketch.

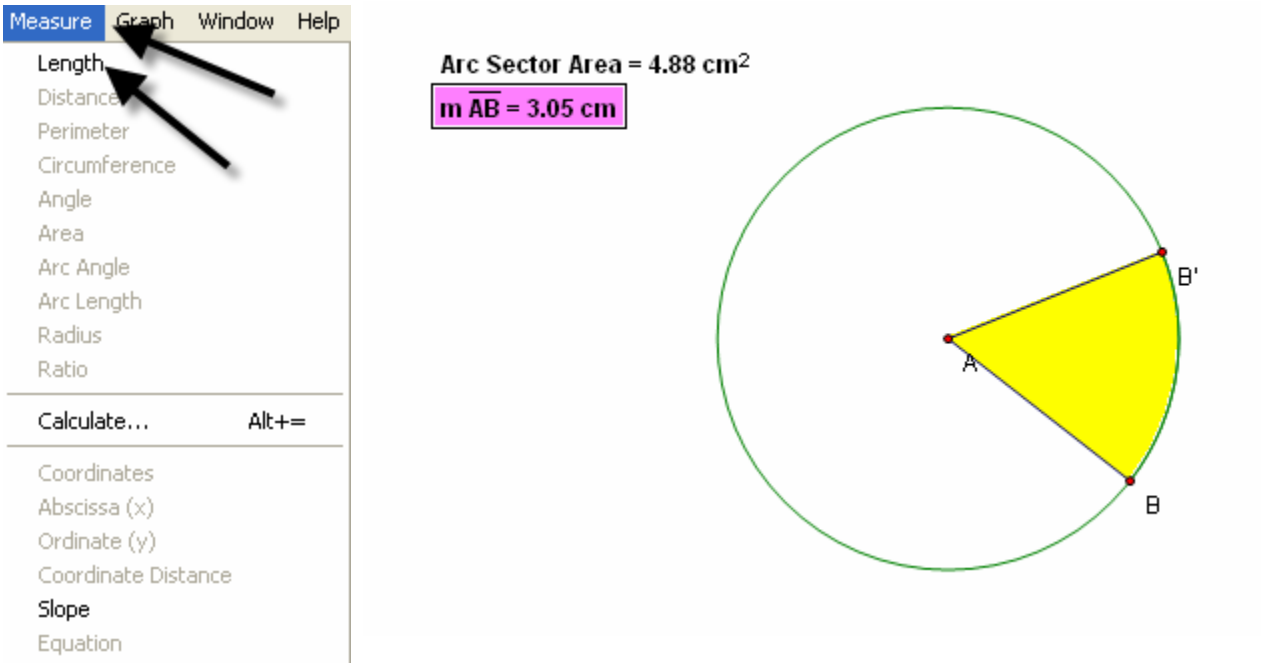




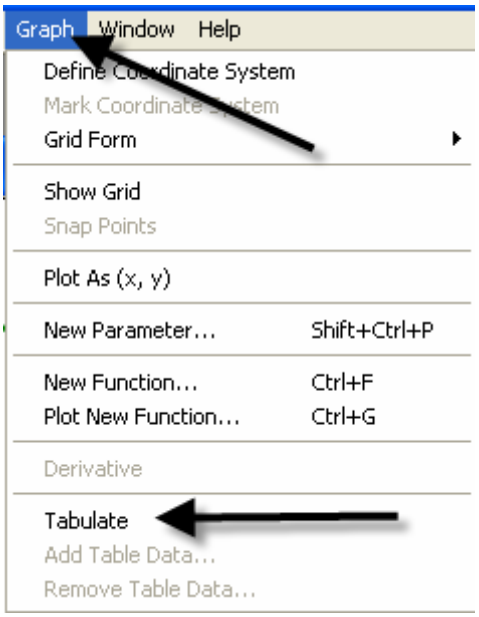
b) Change the label of the Area to read **Arc Sector Area** by first selecting the Text tool, then double clicking on the Area label and typing in the new label in the pop-up window.

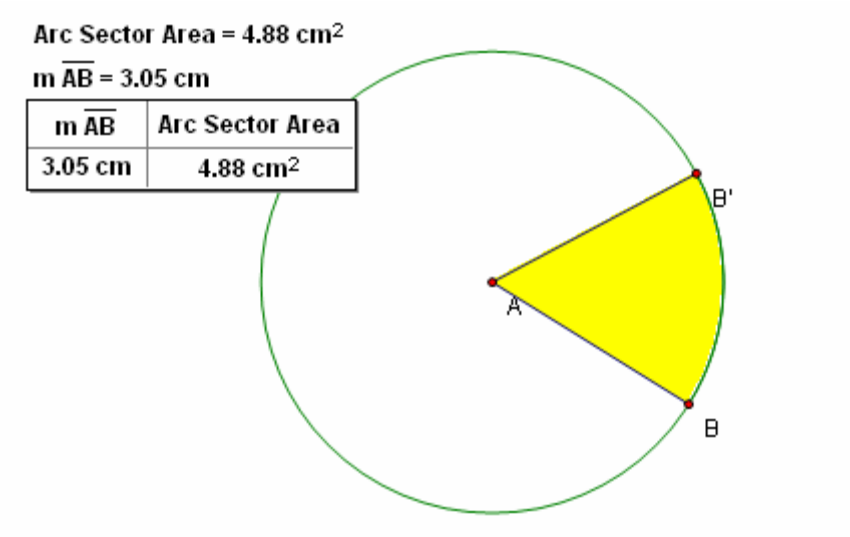


c) To measure the length of the radius, first highlight any radii, then use the Measure menu with the Length option. Again a labeled highlighted box will appear.

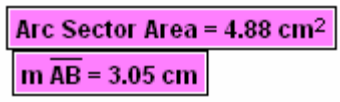


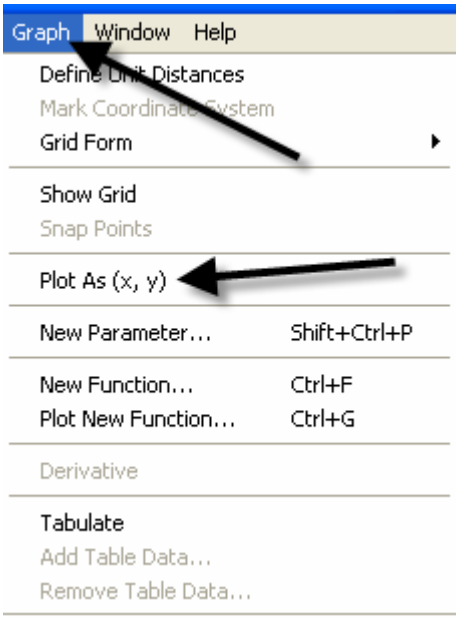
6. Create a Table
   To create a table to explore the relationship between the length of the radius and the area of the sector, highlight their measures respectively. Then use **Graph** from the menu bar with the **Tabulate** option. A labeled highlighted table will pop up on the sketch.



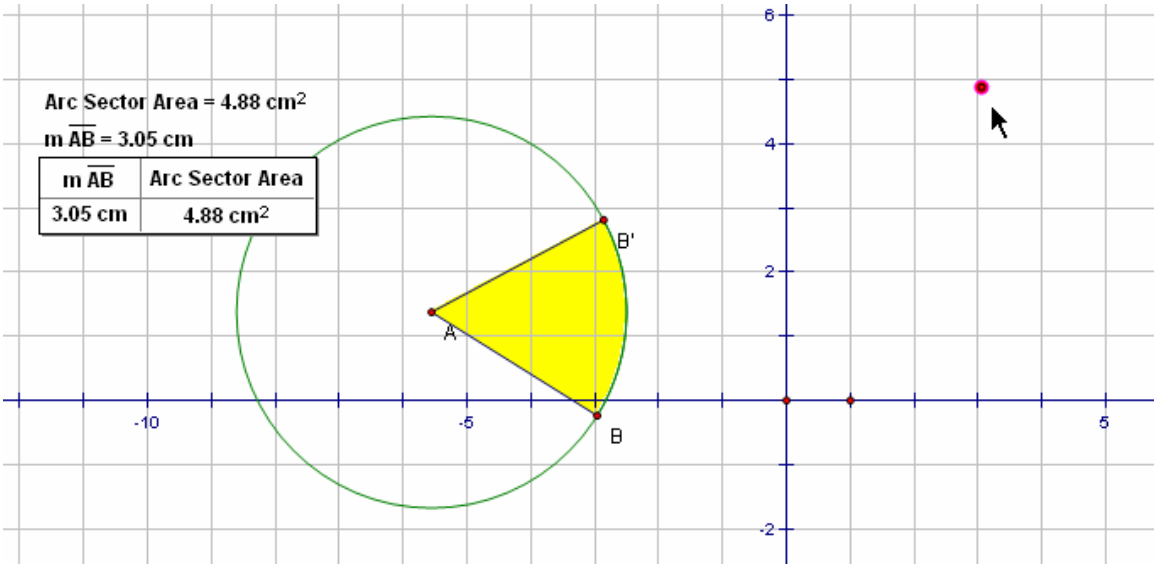


7. Plot Point
   a) To plot the point represented in the table, again highlight the measure values in the respective order: length of radius then area of sector. Use **Graph** from the menu bar with the **Plot as (x,y)** option.

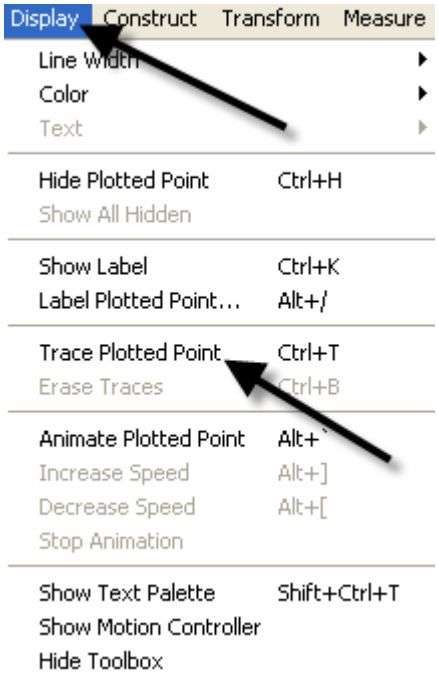




   b) The coordinate grid appears with the highlighted point on the grid.

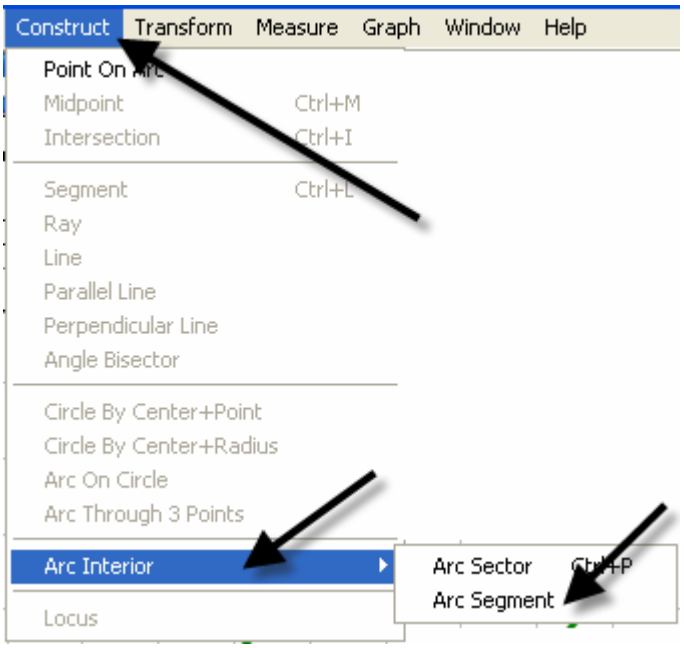


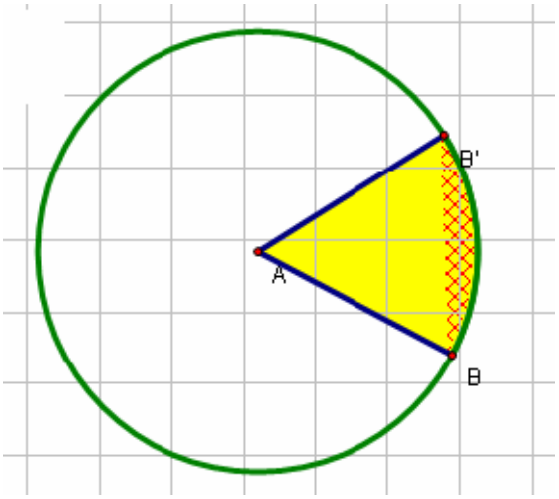
c) To turn on the trace option, highlight the plotted point and use **Display** from the menu bar with the **Trace Plotted Point** option. This will allow any new points added to the table to be plotted automatically.



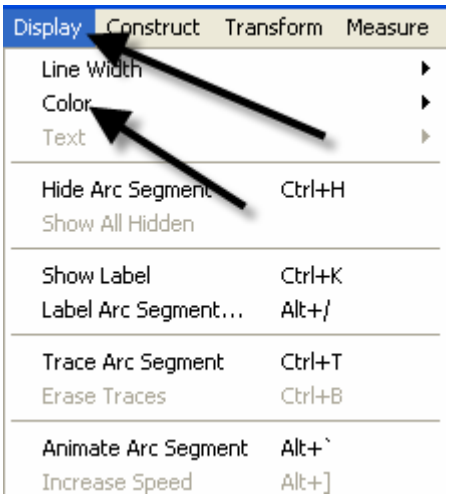
The Arc Segment Construction

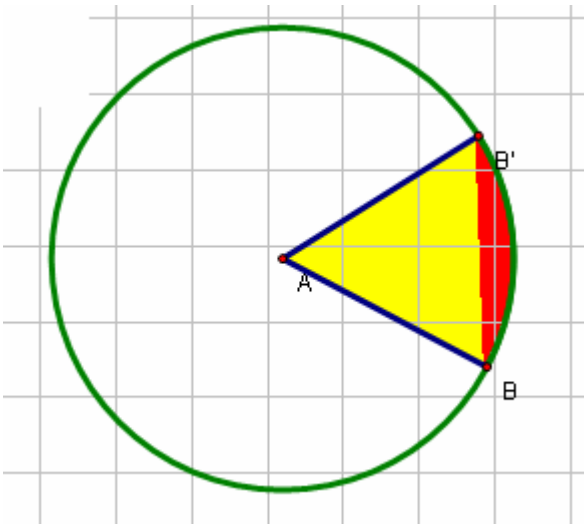
1. Construct Arc Segment
   To construct the arc segment, first select the arc by double clicking on the arc. Then use **Construct** from the menu bar with the **Arc Interior,** then **Arc Segment** options.



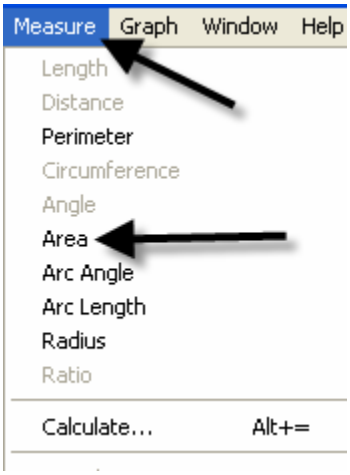


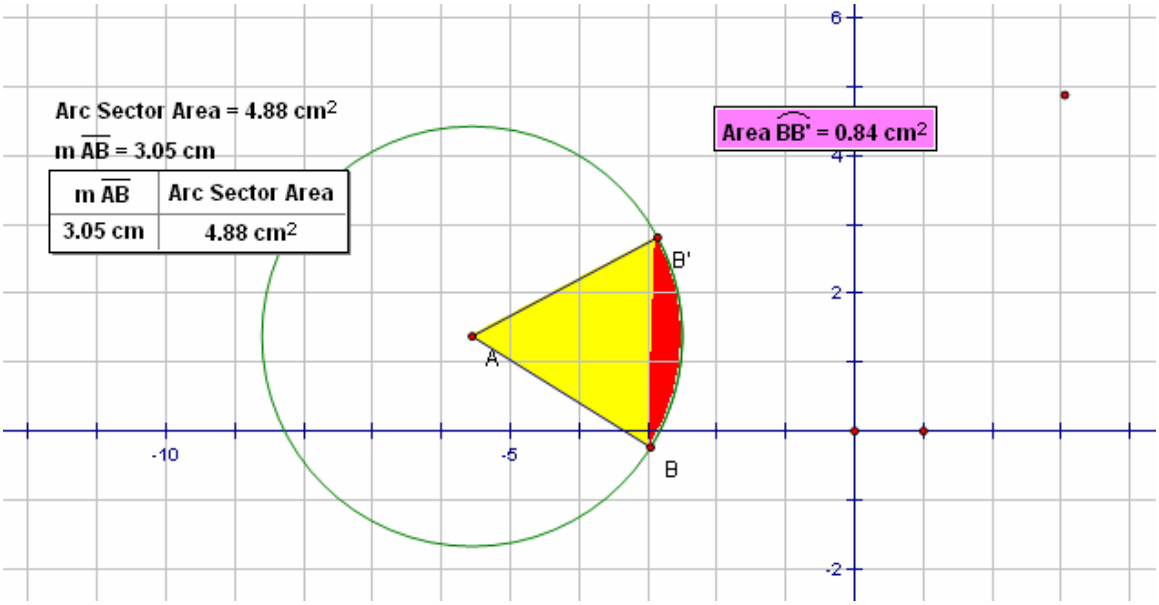
2. Change the color of the segment by using Display with the Color option.



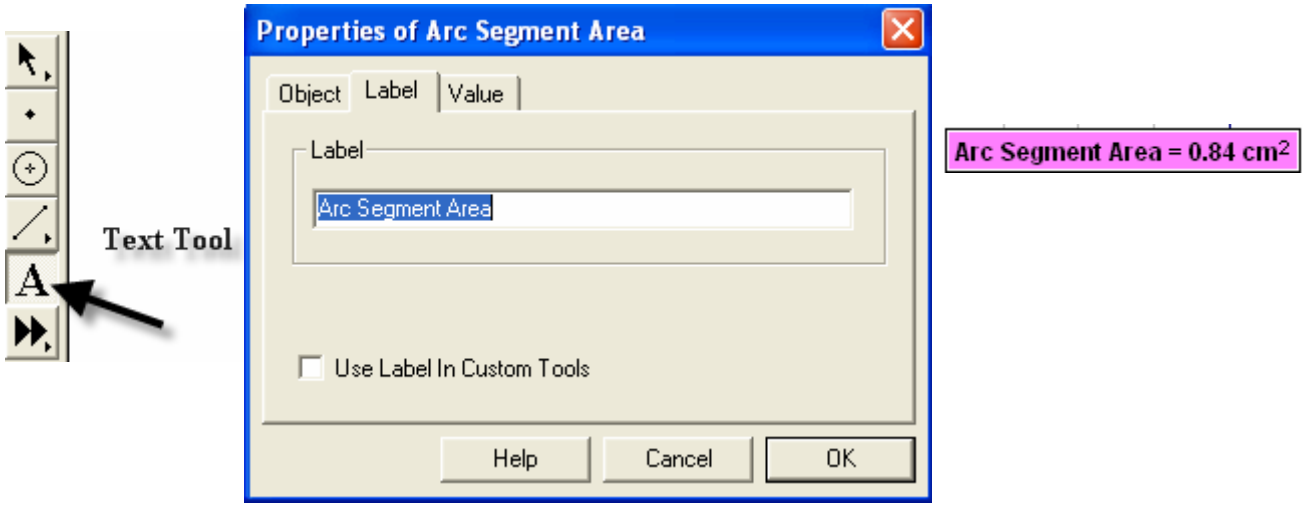


3. Measure Arc Segment Area
   a) To measure the area of the arc segment, highlight it by clicking in the interior of the arc sector, then use **Measure** from the menu bar with the **Area** option. With the measurement still highlighted, you may move it to a new location on the sketch for easier viewing. Remember to click in any blank space to deselect the measurement.

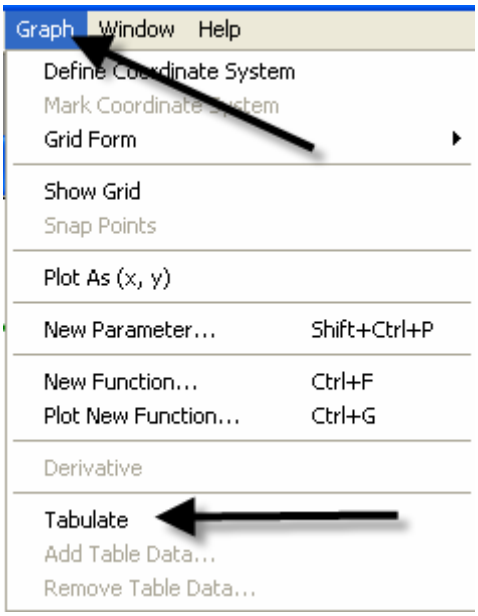


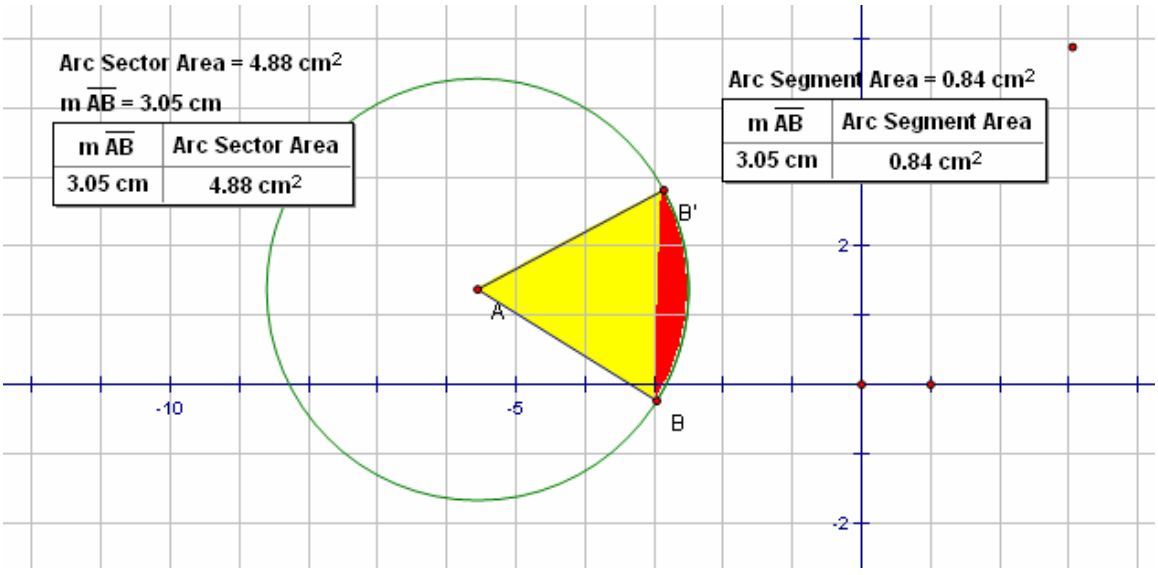


b) Change the label of the Area to read **Arc Segment Area** by first selecting the Text tool, then double clicking on the Area label and typing in the new label in the pop-up window.

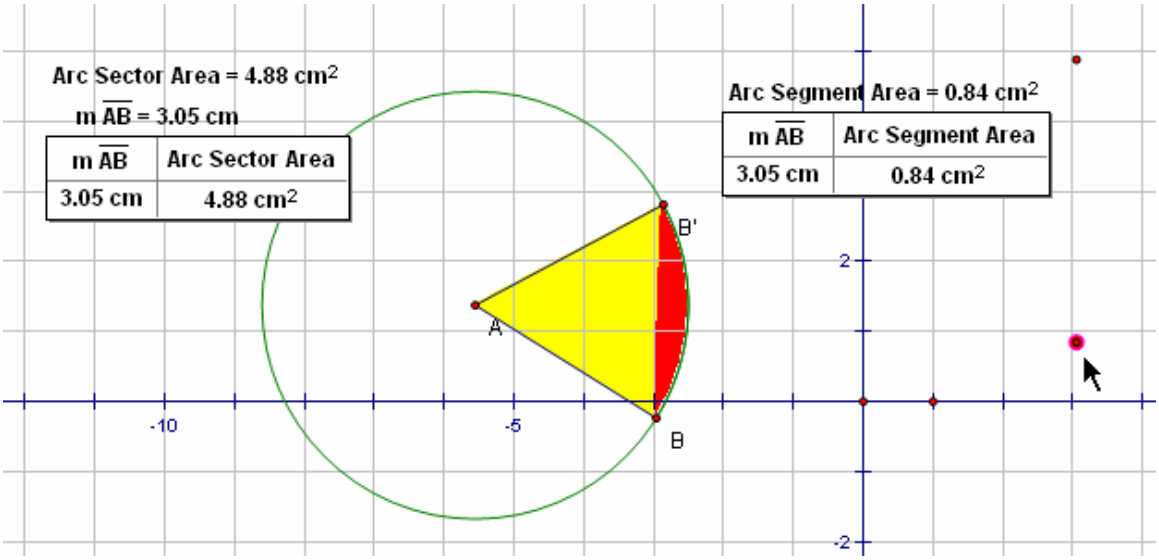


4. Create Table
   To create a table to explore the relationship between the length of the radius and the arc segment area, highlight their measures respectively. Then use Graph from the menu bar with the Tabulate option. A labeled highlighted table will pop up on the sketch.

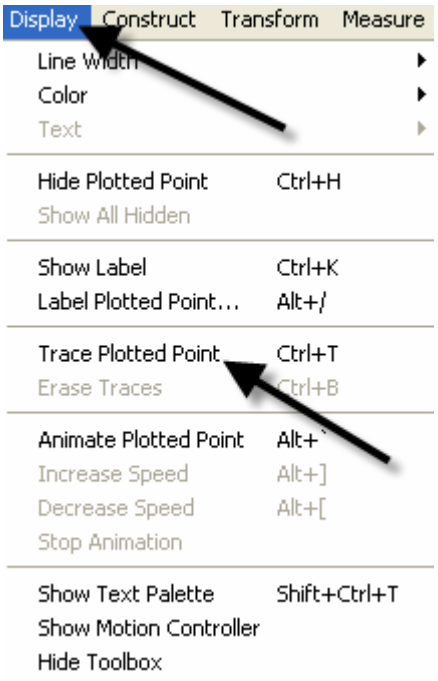




5. Plot and Trace Point
   a) To plot the point represented in the table, highlight the measure values in the respective order: length of radius, then area of the arc segment. Use **Graph** from the menu bar with the **Plot as (x, y)** option.



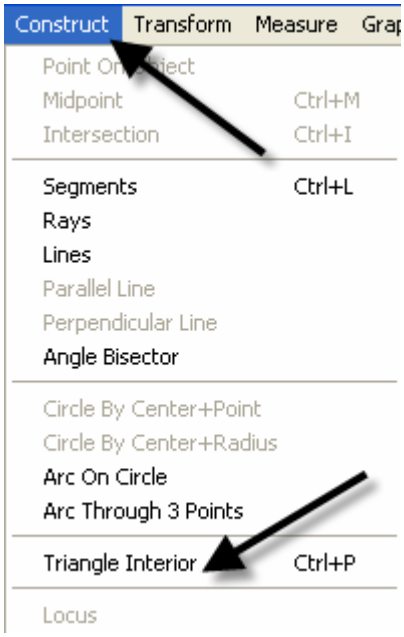
b) To turn on the trace option, highlight the plotted point and use Display from the menu bar with the Trace Plotted Point option. This will allow any new points added to the table to be plotted automatically.

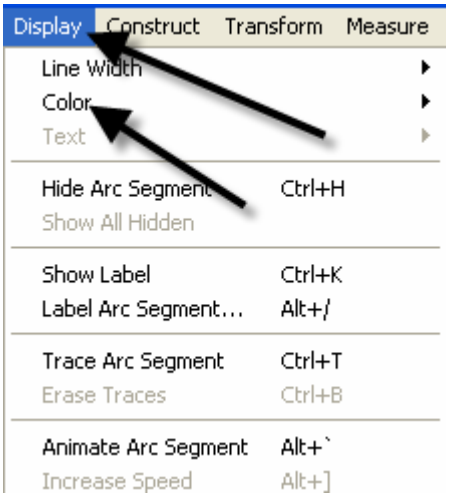


The Triangle Construction

1. Construct Triangle Interior

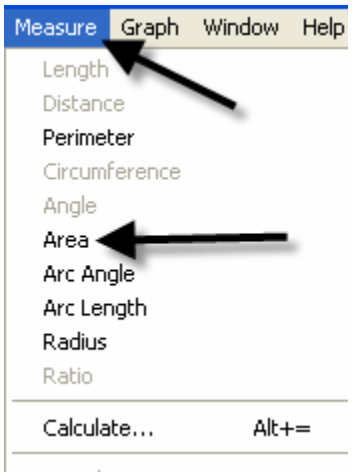
   To construct the triangle interior, first select the vertices of the triangle, then use **Construct** from the menu bar with the **Construct Triangle Interior** option. The color will change to the last color selected, so use **Display** from the menu bar with the **Color** option to make the triangle a different color than the arc segment.

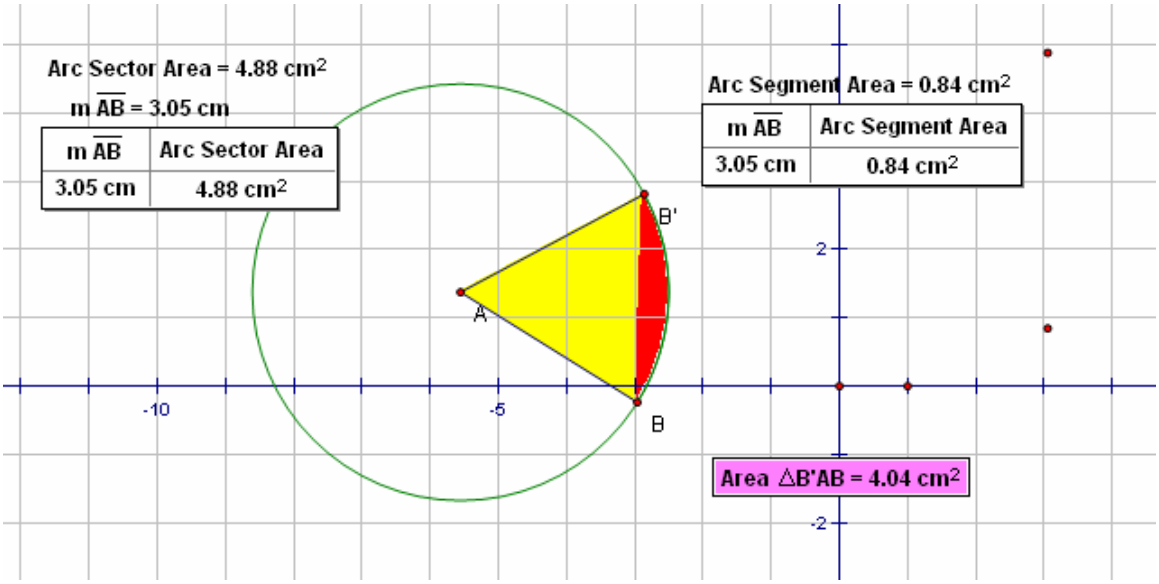




2. Measure Triangle Area

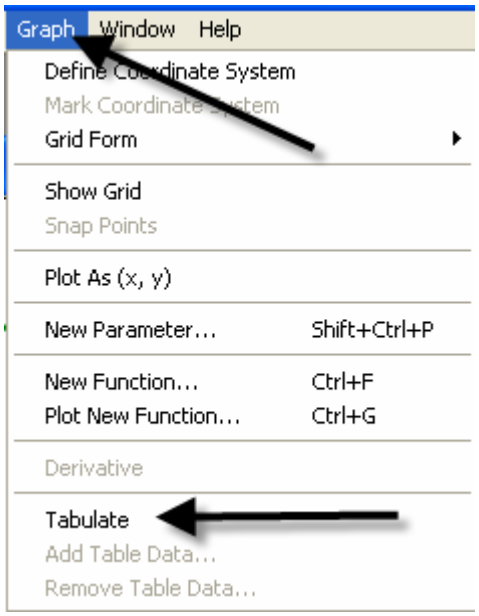
   To measure the area of the triangle, click the triangle interior (may require double clicking to keep from selecting the entire sector) and use **Measure** from the menu bar with the **Area** option. With the measurement still highlighted, you may move it to a new location for easier viewing.

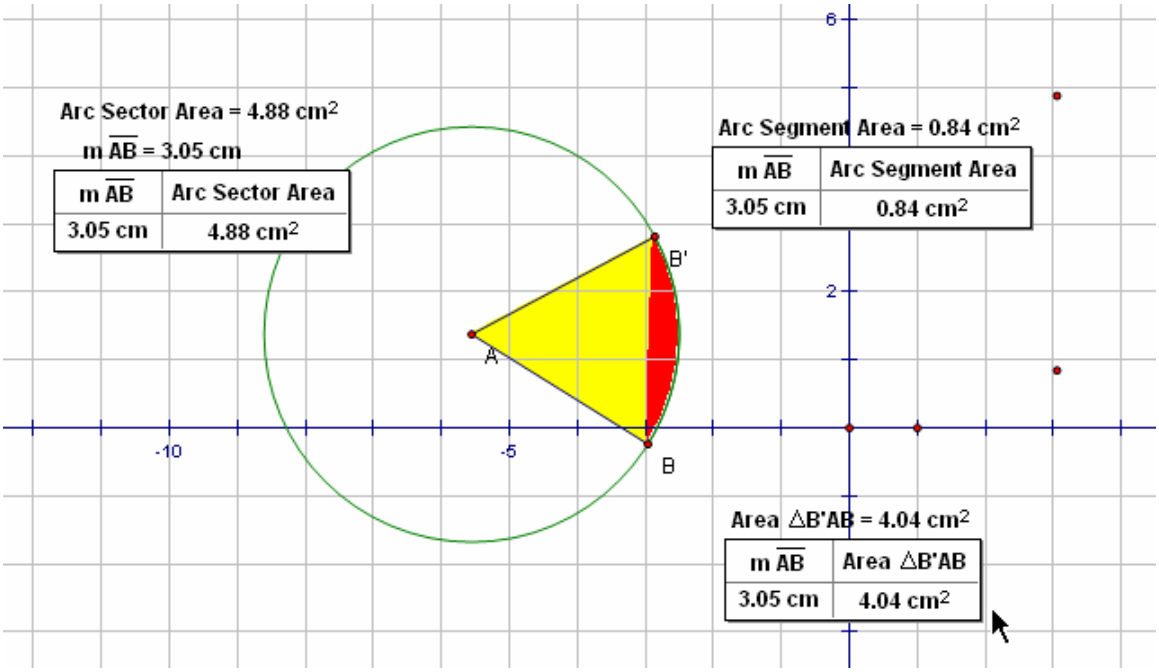




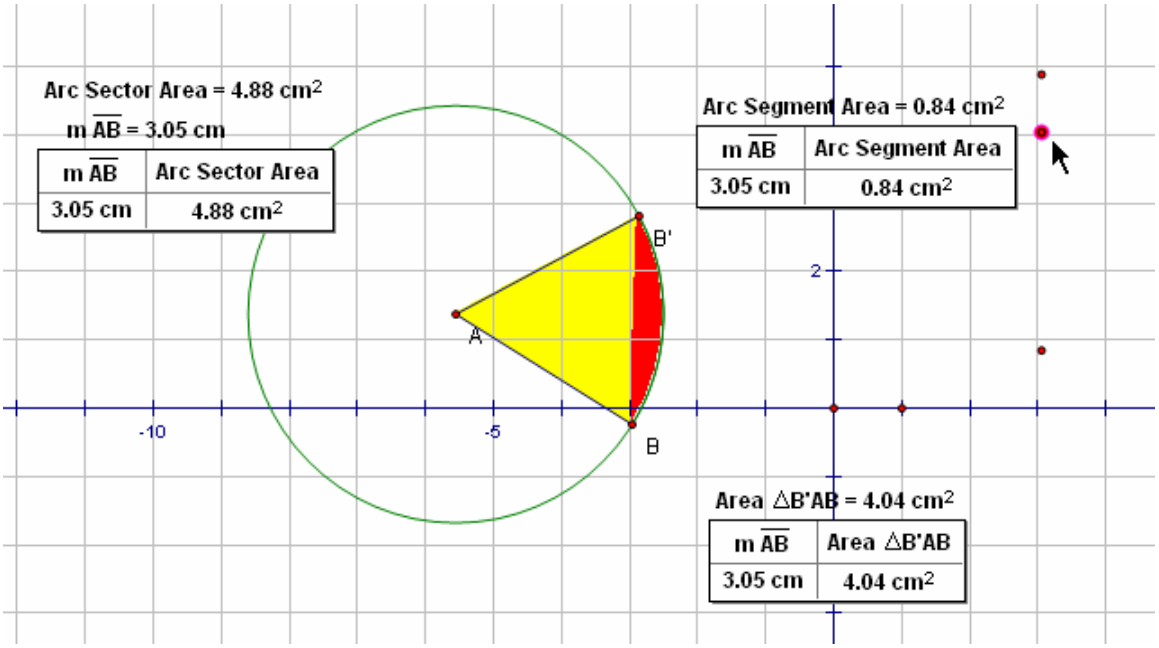
3. Create Table

   To create the table to explore the relationship between the length of the radius and the area of the triangle, highlight both measures respectfully. Use **Graph** from the menu bar with the **Tabulate** option.

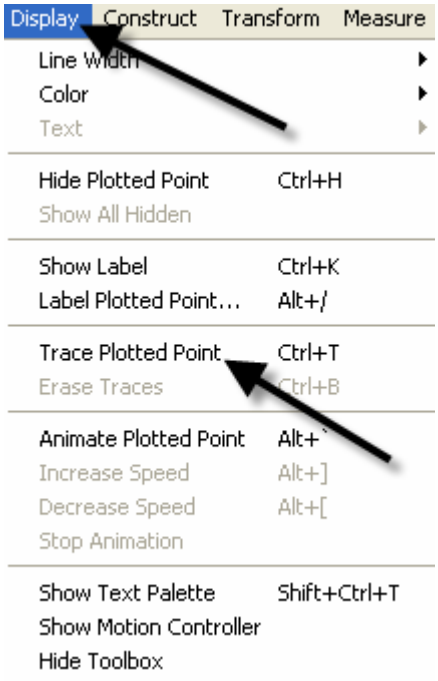




4. Plot and Trace Point
   a) To plot the point in the table, highlight the measures again: length of the radius and area of the triangle. Use **Graph** from the menu bar with the **Plot as (x, y)** option.



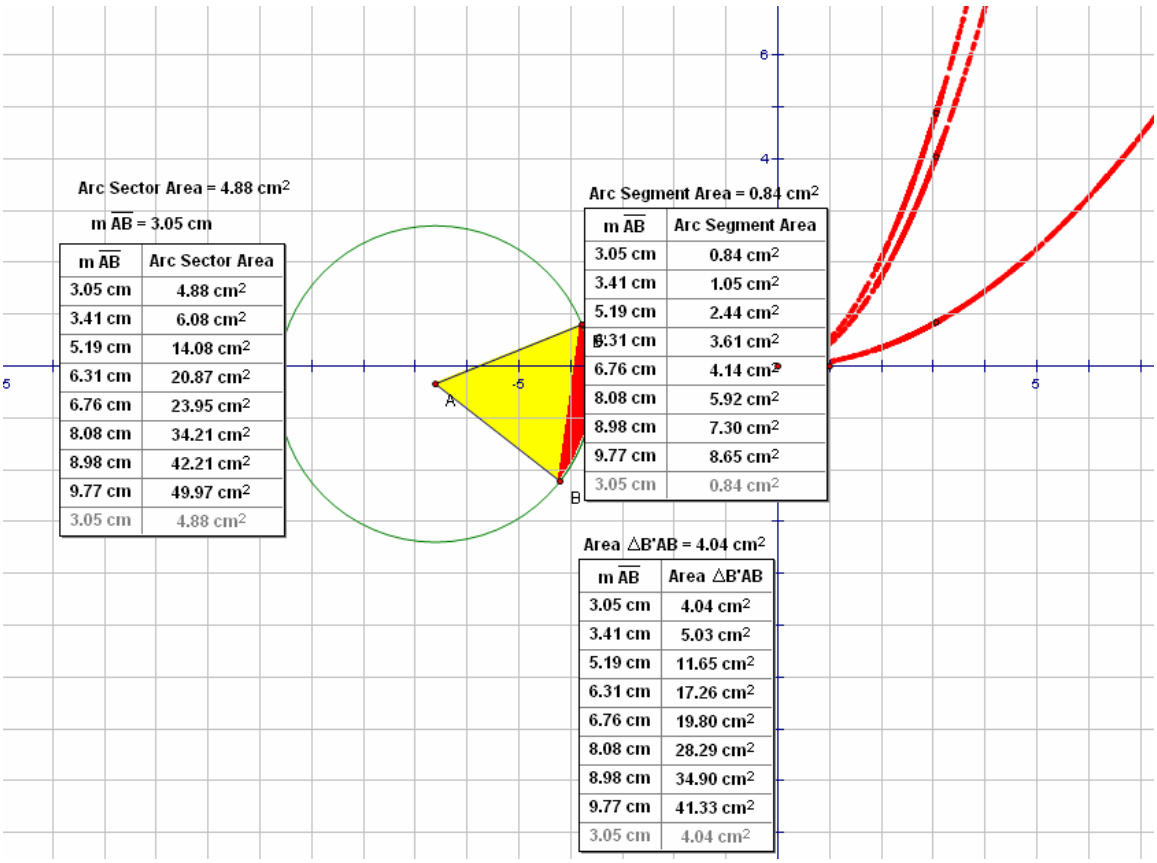
b) To trace the plotted point, highlight the plotted point and use **Display** from the menu bar with the **Trace Plotted Point** option. This will allow any new points added to the table to be plotted automatically.



Dome Floor Dilemma—Function Rule Verification

Function Rule Verification—Geometer's Sketchpad.

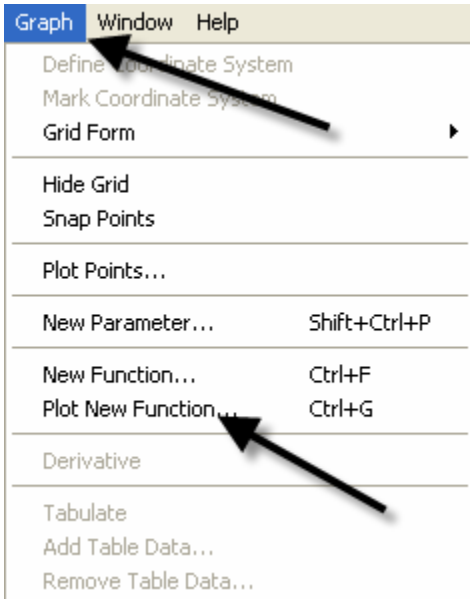
1. Using the existing sketch from the Dome Floor Dilemma Exploration, use **Graph** with the **Plot New Function** option.



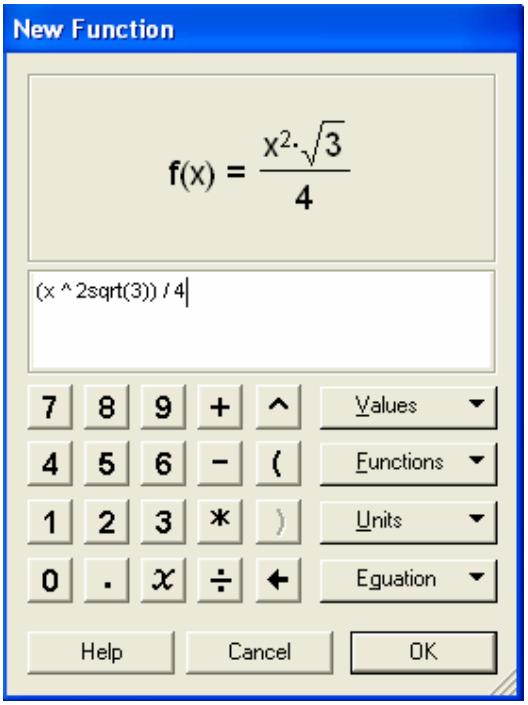
m AB	Arc Sector Area
3.05 cm	4.88 cm²
3.41 cm	6.08 cm²
5.19 cm	14.08 cm²
6.31 cm	20.87 cm²
6.76 cm	23.95 cm²
8.08 cm	34.21 cm²
8.98 cm	42.21 cm²
9.77 cm	49.97 cm²
3.05 cm	4.88 cm²

m AB	Arc Segment Area
3.05 cm	0.84 cm²
3.41 cm	1.05 cm²
5.19 cm	2.44 cm²
6.31 cm	3.61 cm²
6.76 cm	4.14 cm²
8.08 cm	5.92 cm²
8.98 cm	7.30 cm²
9.77 cm	8.65 cm²
3.05 cm	0.84 cm²

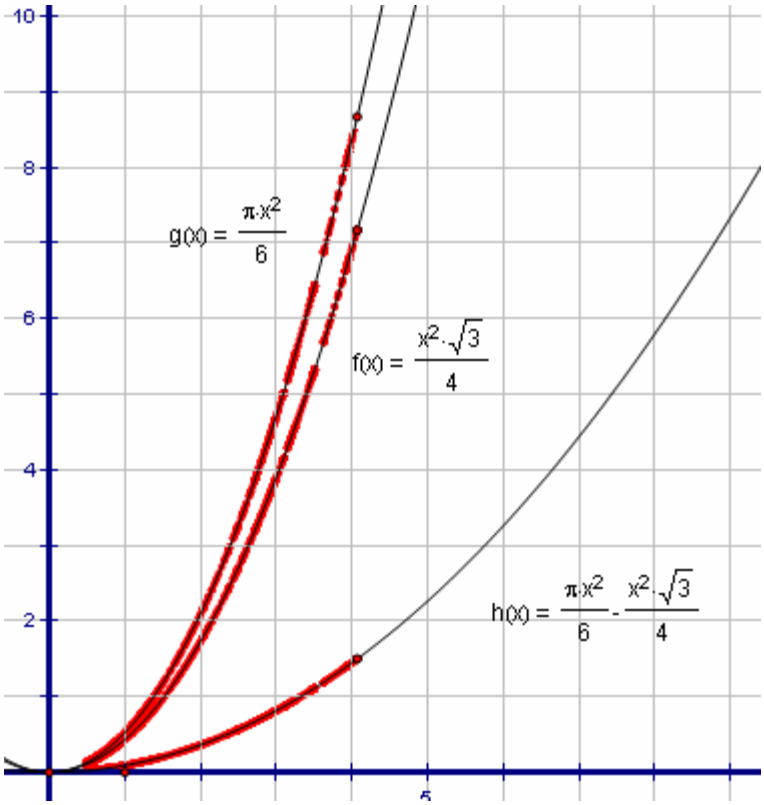
m AB	Area ΔB'AB
3.05 cm	4.04 cm²
3.41 cm	5.03 cm²
5.19 cm	11.65 cm²
6.31 cm	17.26 cm²
6.76 cm	19.80 cm²
8.08 cm	28.29 cm²
8.98 cm	34.90 cm²
9.77 cm	41.33 cm²
3.05 cm	4.04 cm²



A **New Function** box will pop up, allowing the function rule to be entered. Then click on the **OK** button.



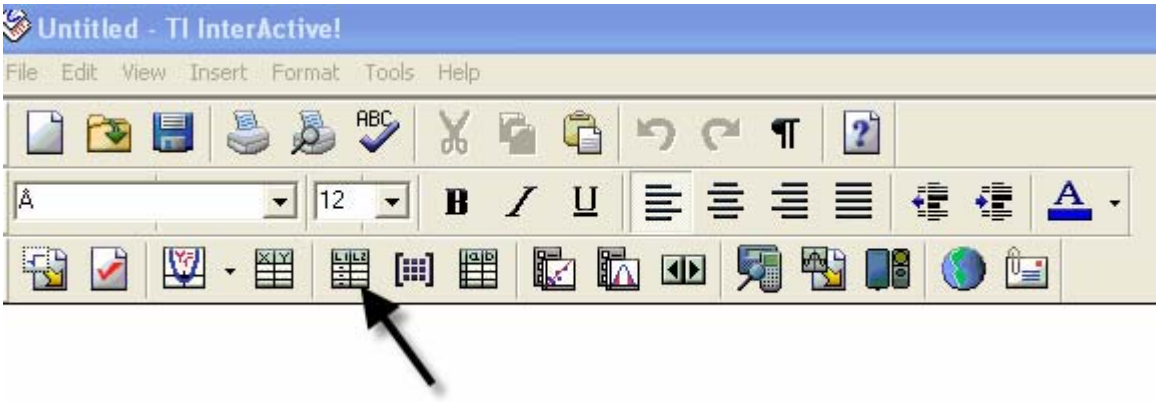
The function will then graph on the coordinate grid. If it is right, it will graph directly on top of its corresponding points, thus verifying the rule. Repeat this process for all function rules.

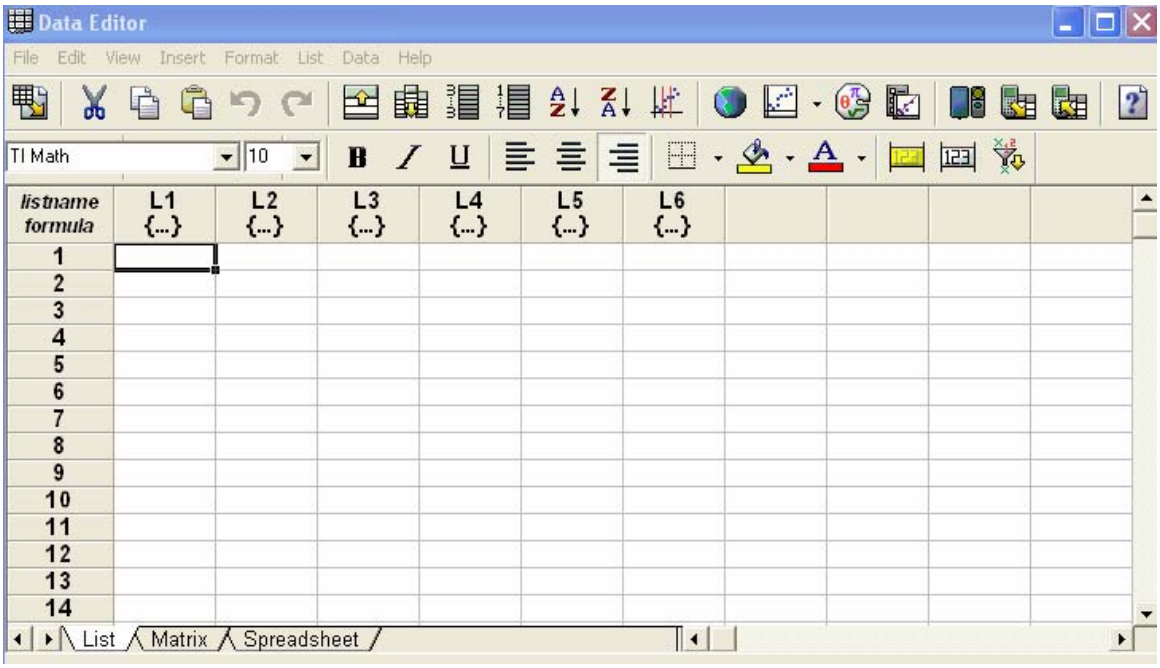


Function Rule Verification—TI-Interactive.

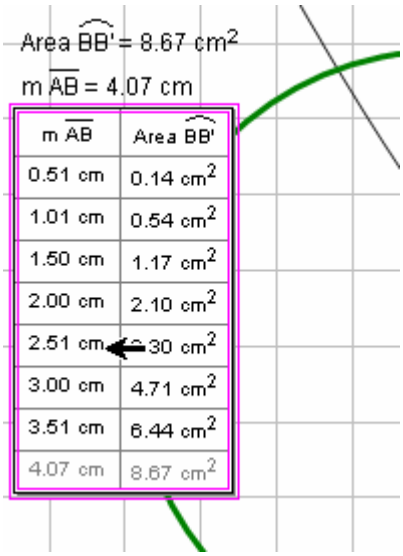
1. With your sketch in Geometer's Sketchpad still open, open TI-Interactive by pressing on the TI-Interactive icon.

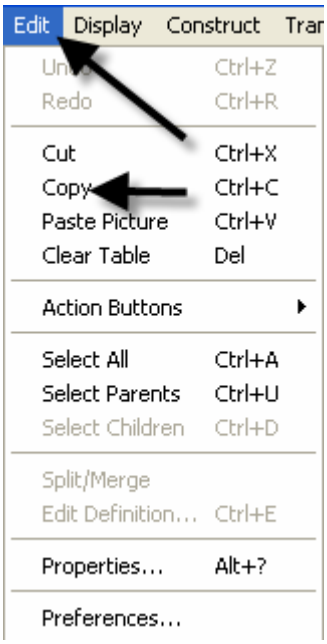
2. Click on the **List Icon** to get the **Data Editor** screen.



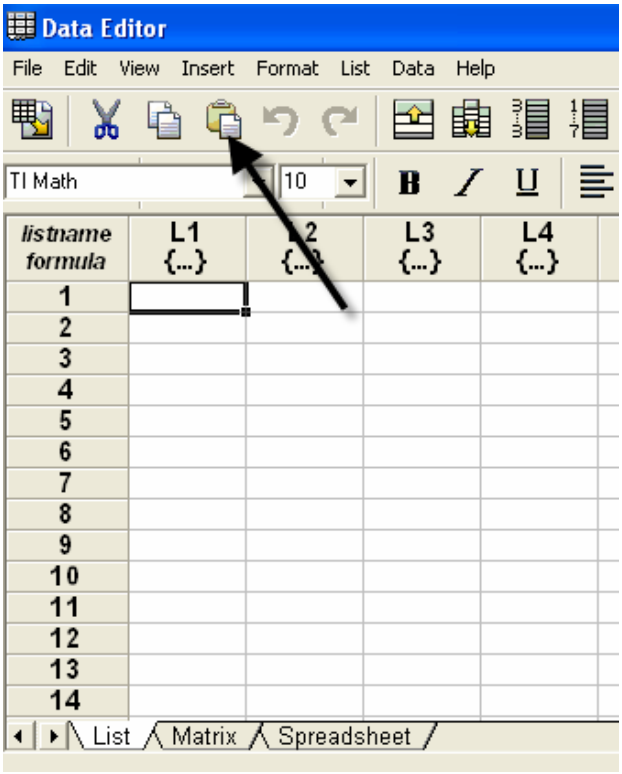


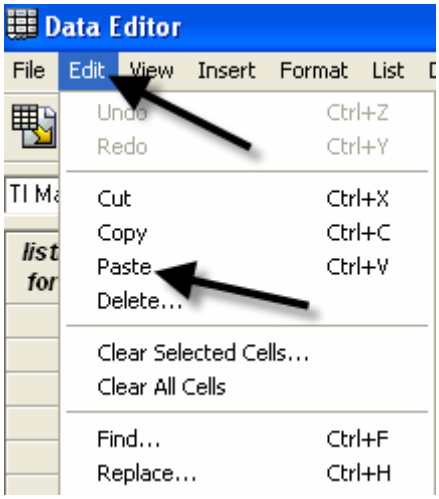
3. Select one of the tables from your sketch in **Geometer's Sketchpad** by clicking on it. Use **Edit** from the menu bar with the **Copy** option.



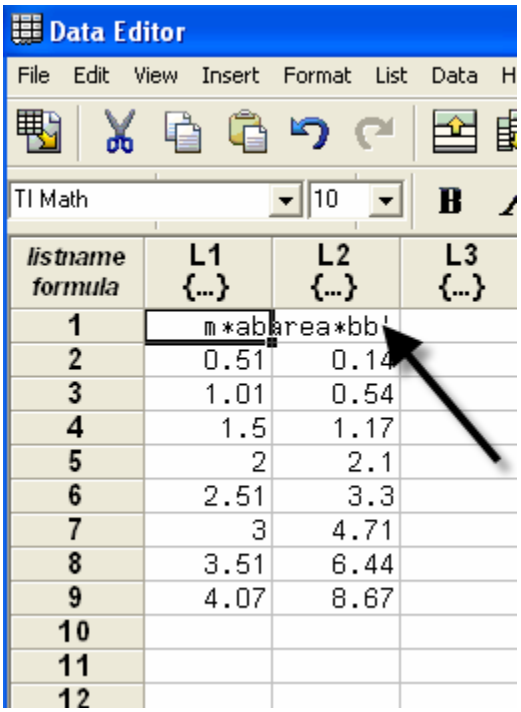


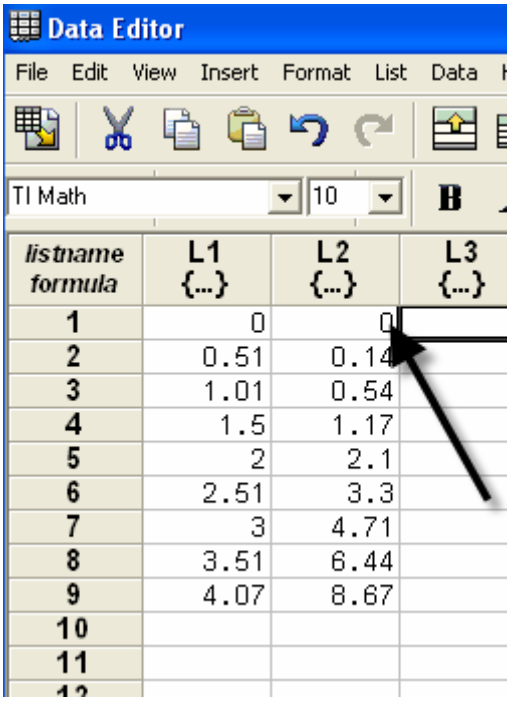
4. Return to the **Data Editor** and click on the **Paste** icon or use **Edit** from the menu bar with the **Paste** option**.**



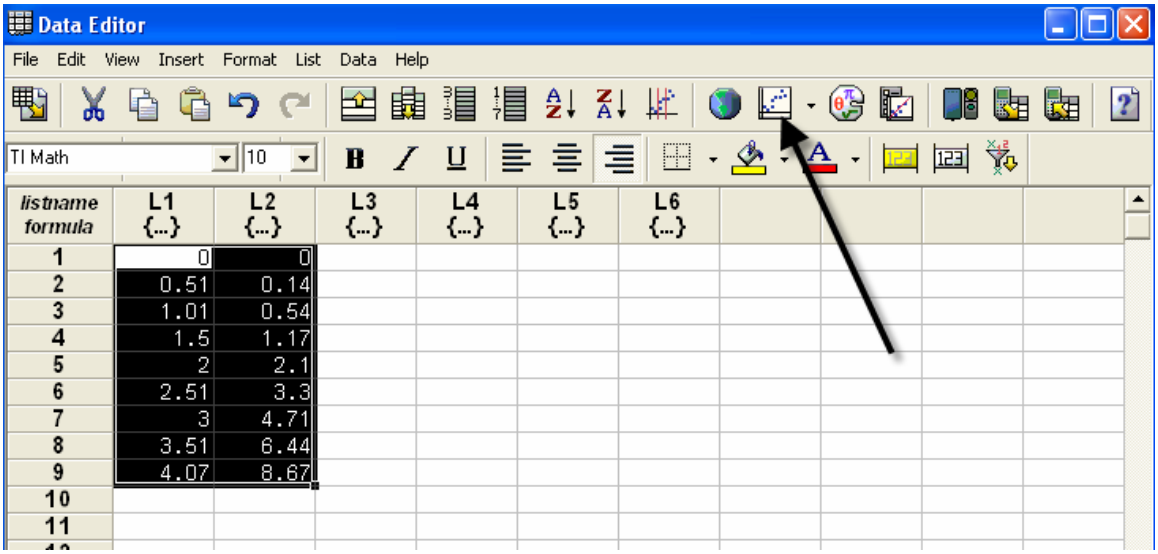


5. Notice that the table headings also transfer. Delete the non-numerical data; and if you like, enter the point of origin in its place.

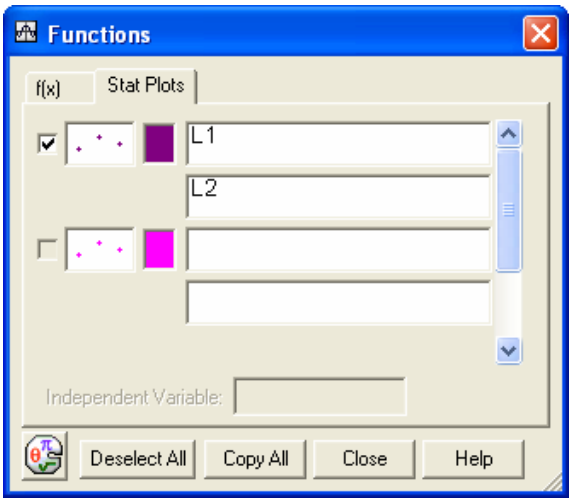


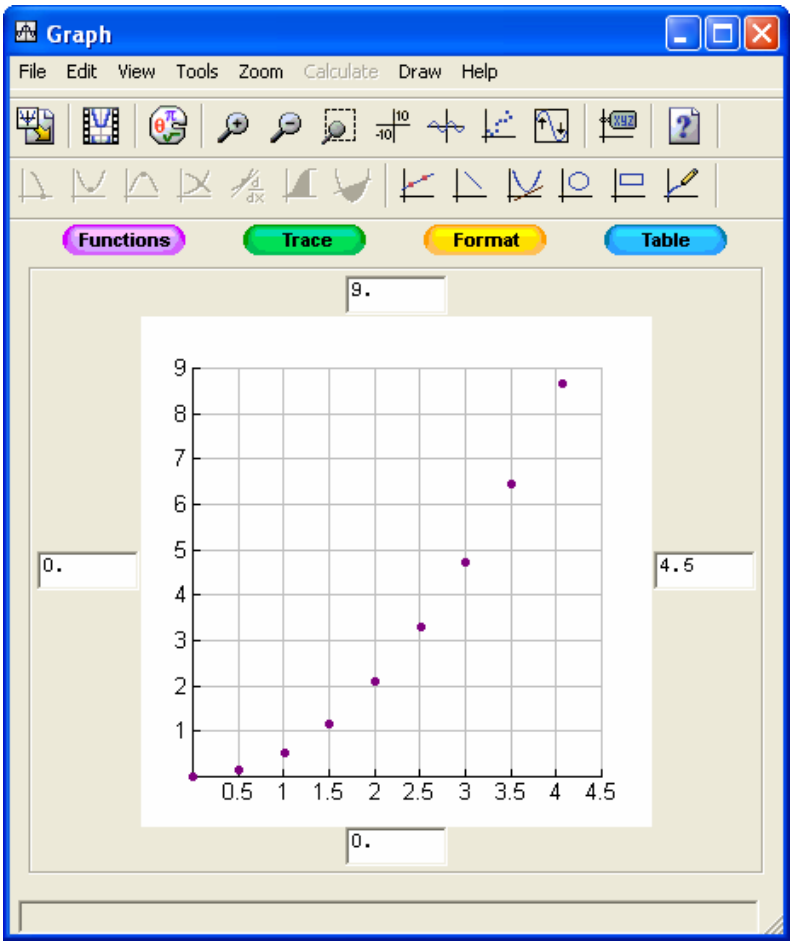


6. Highlight the data you want to graph and click the **Scatter Plot** icon.

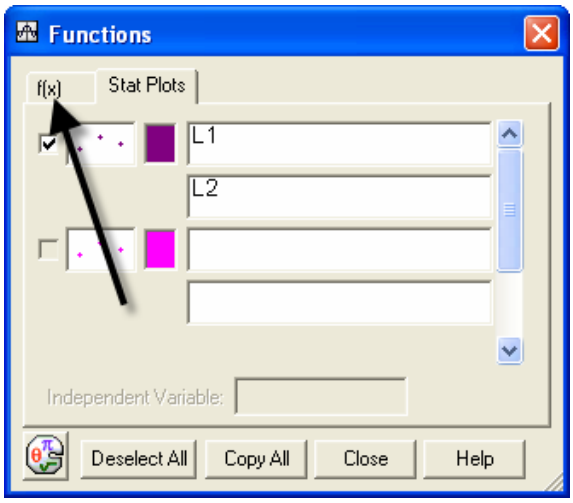


The **Functions** window and the **Graph** window will pop up with **L1** and **L2** listed in the **Stat Plots** windows and the points plotted on the **Graph**.

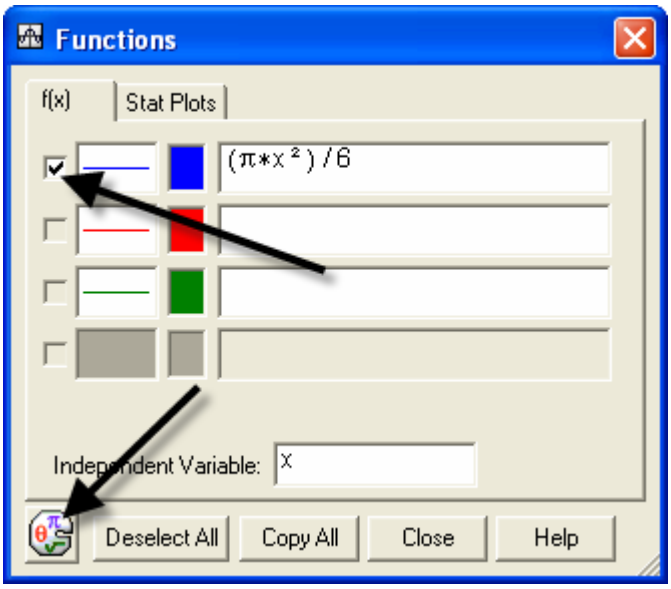


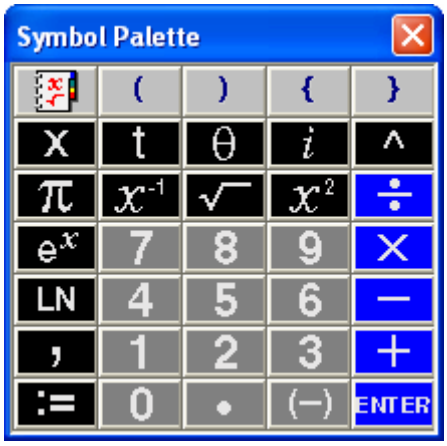


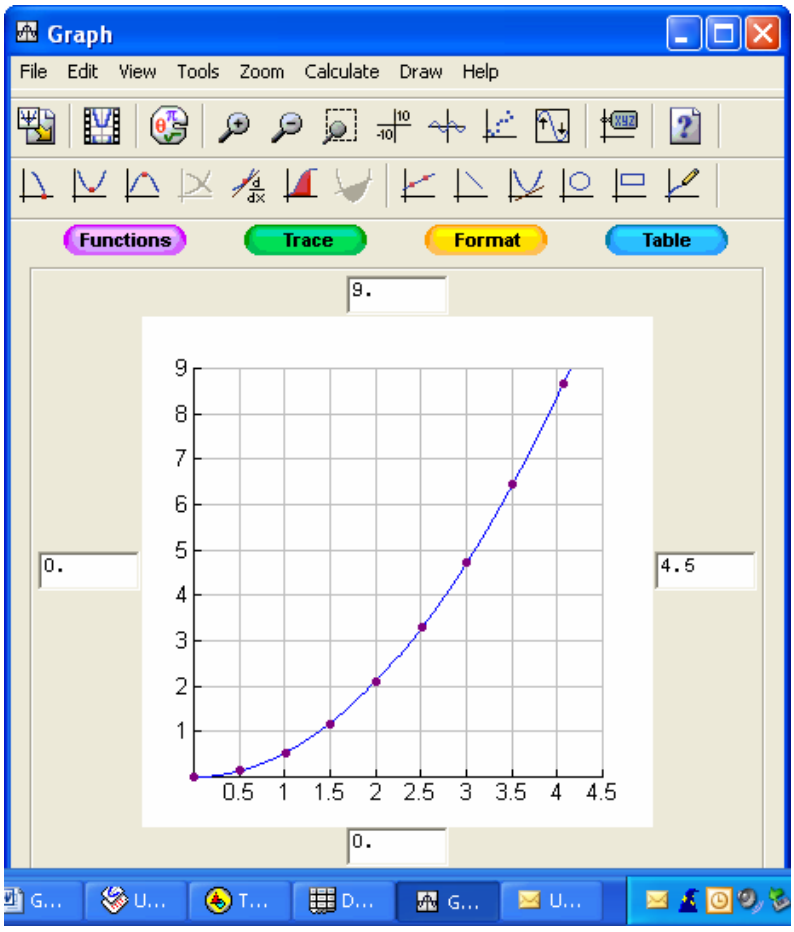
7. To enter the function for verification, click on the **f(x)** tab.



8. To enter the function, press the Symbol Pallet icon . This lets the Symbol Palette pop up. Enter the function and check the box to graph the function.

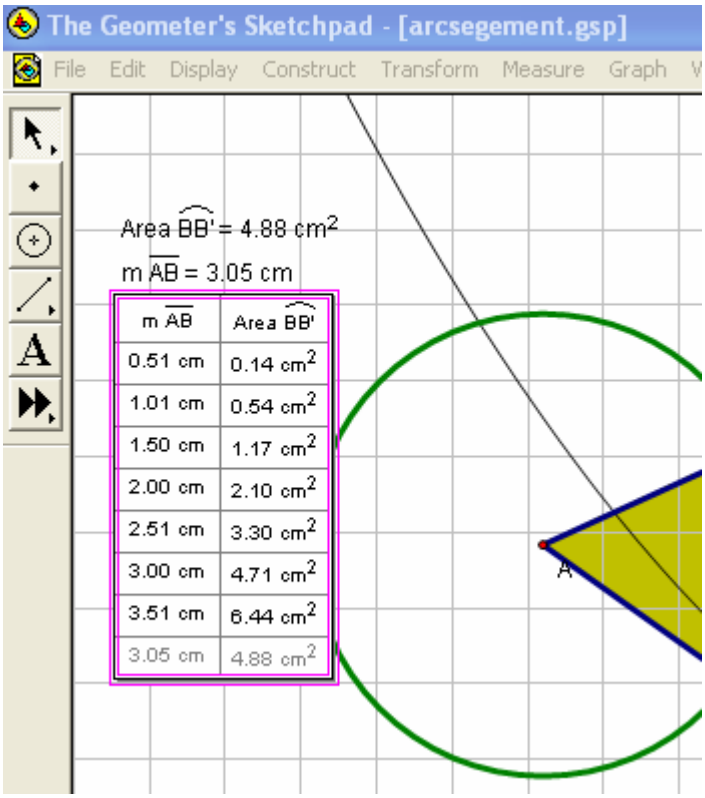


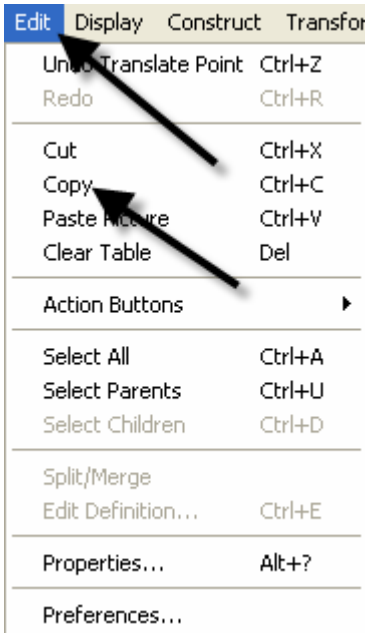




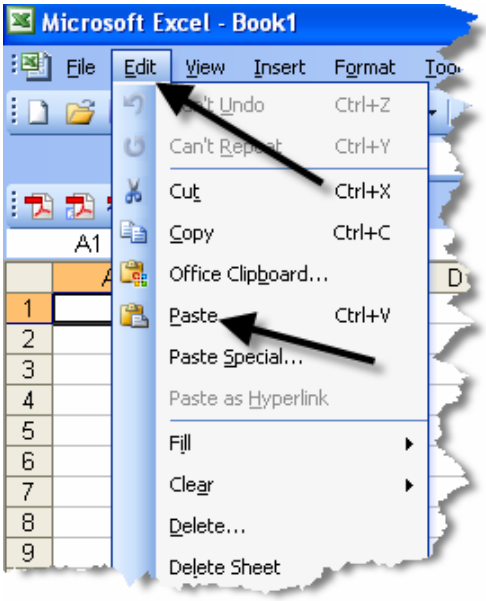
Function Rule Verification—Spreadsheet

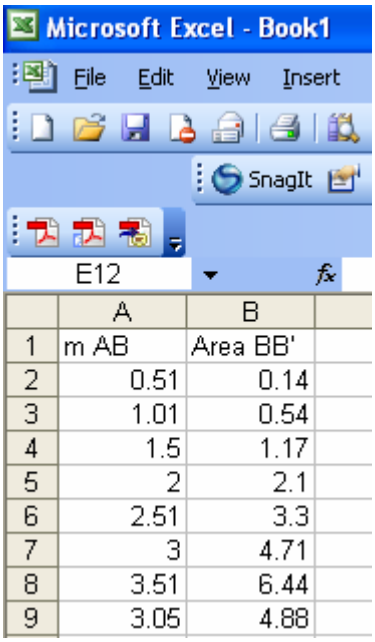
1. Copy the table from **Geometer's Sketchpad** by first selecting it, then use **Edit** from the menu bar with the **Copy** option.





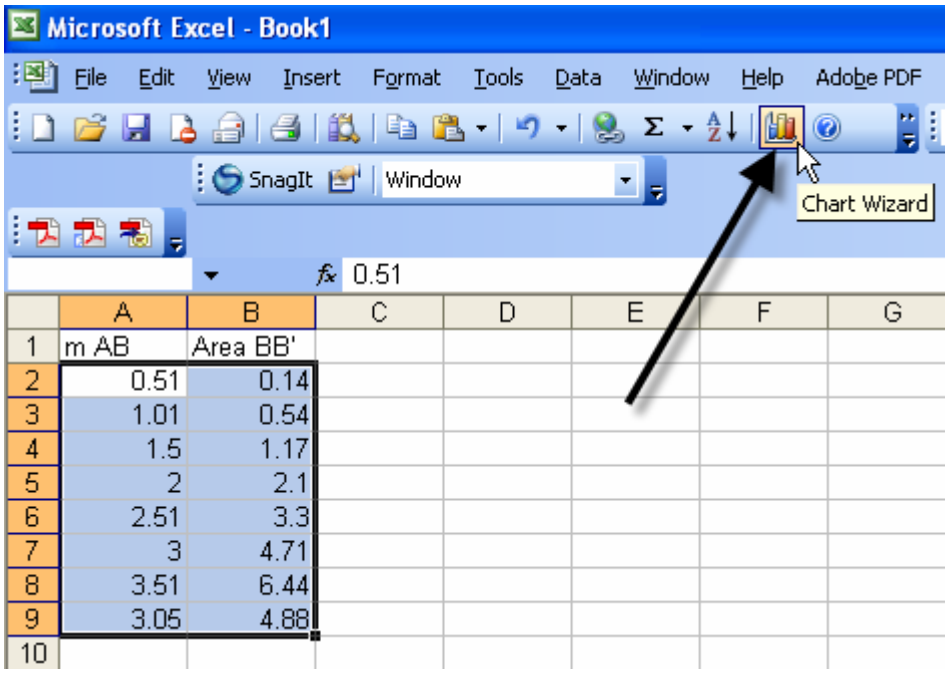
2. Open a blank Spreadsheet and paste into the spreadsheet by using the **Edit** from the menu bar with the **Paste** option.

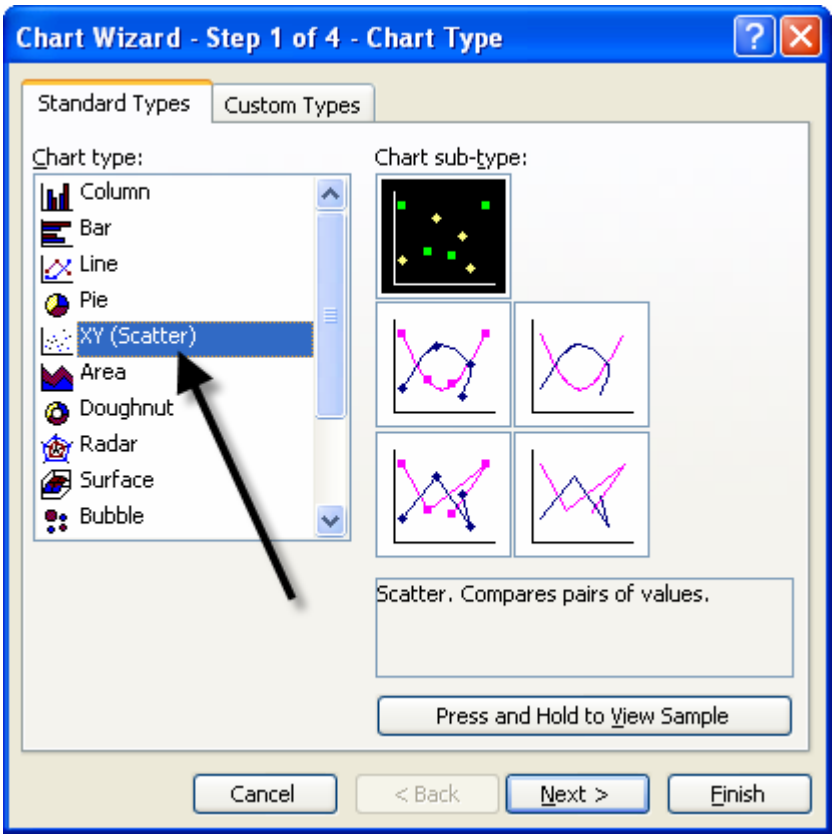




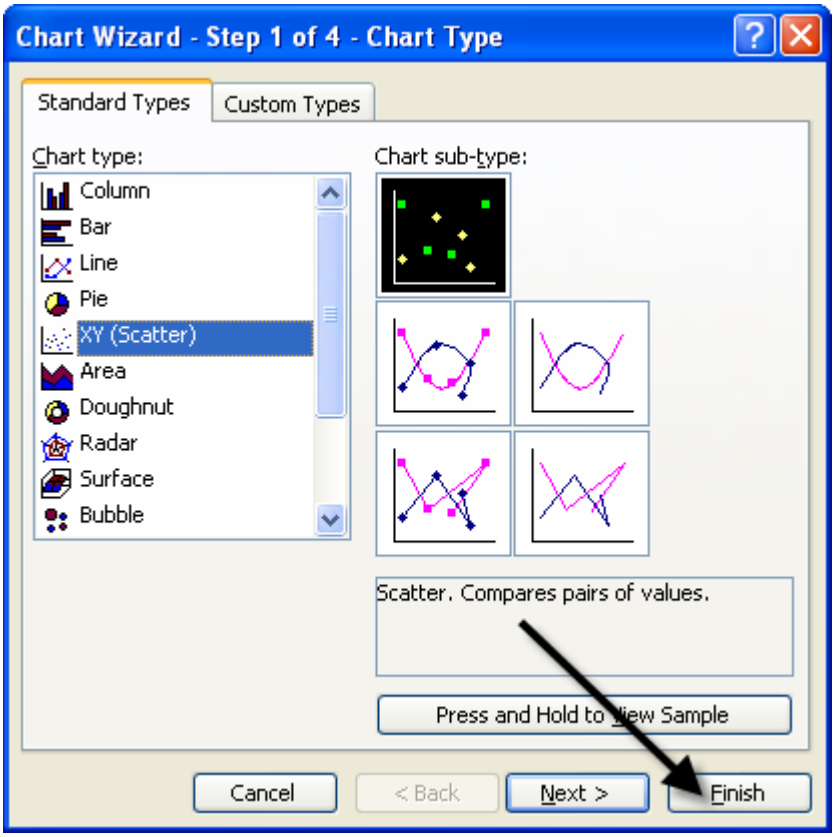
	A	B
1	m AB	Area BB'
2	0.51	0.14
3	1.01	0.54
4	1.5	1.17
5	2	2.1
6	2.51	3.3
7	3	4.71
8	3.51	6.44
9	3.05	4.88

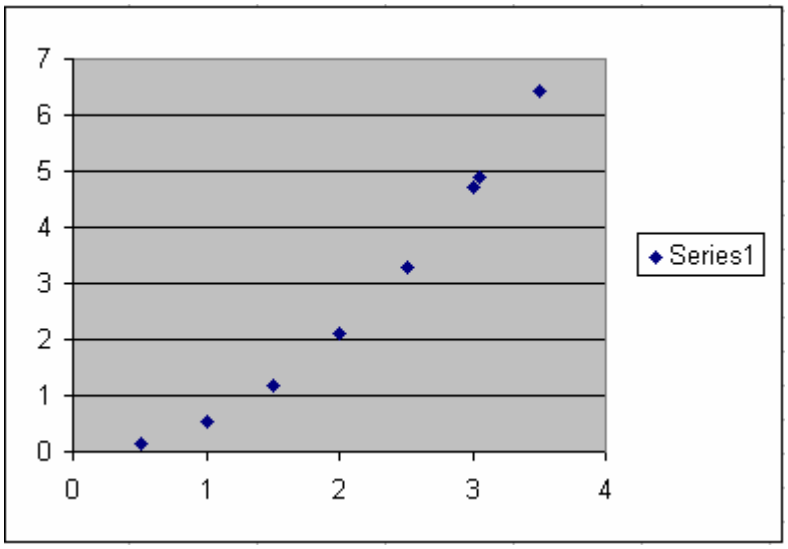
3. Highlight the data you want to graph, then click on the **Chart Wizard** icon. The Chart Wizard box will pop up on the screen. Select **XY (Scatter)**.



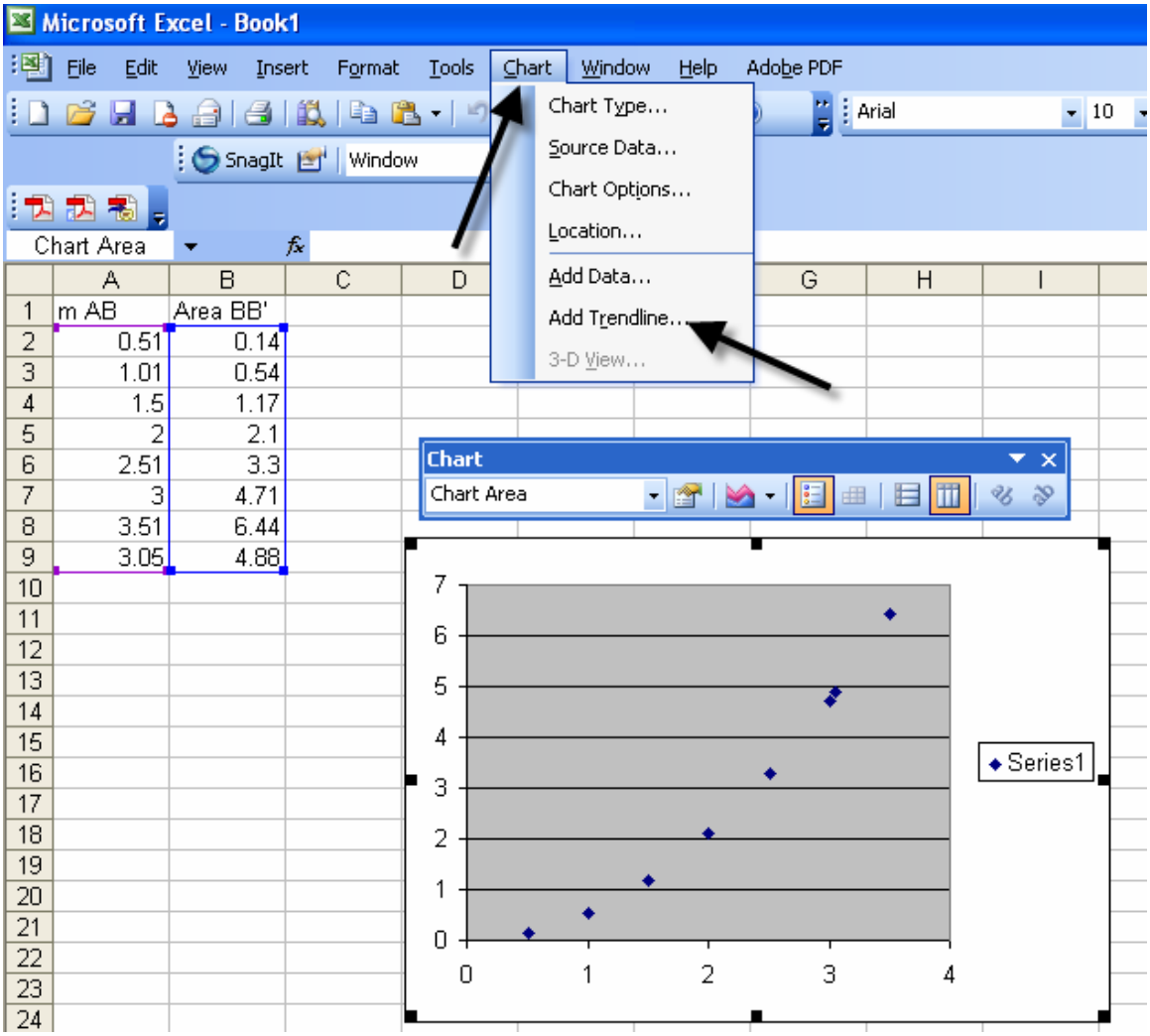


4. Click **Finish** to view the graph.

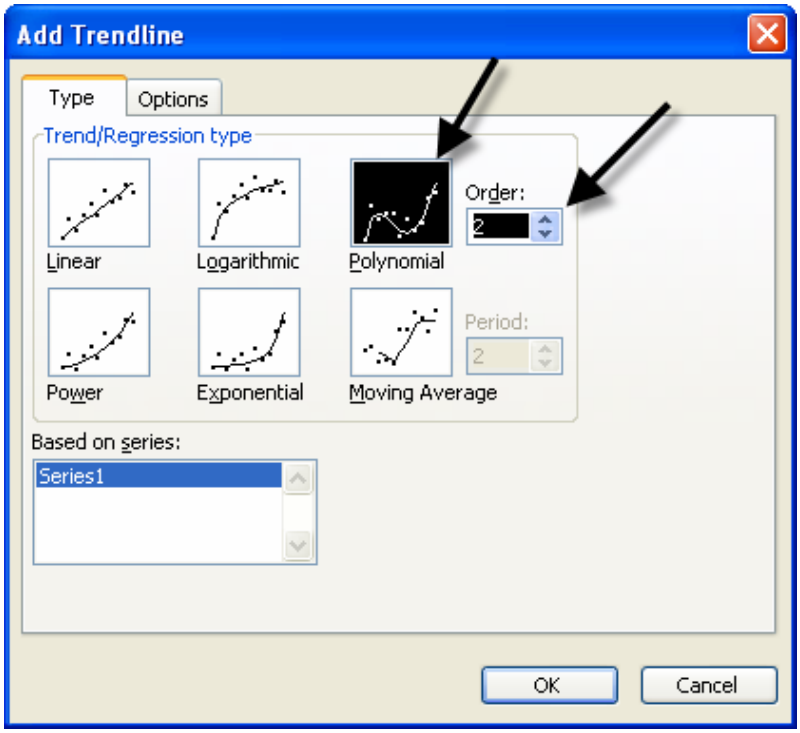




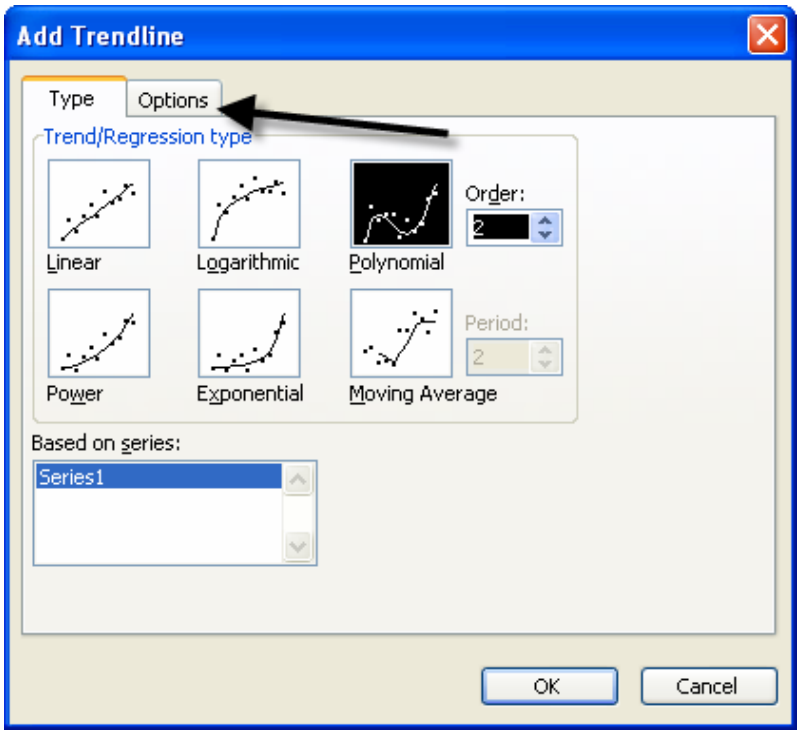
5. Select the graph, then use the Chart menu with the **Add Trendline** option.



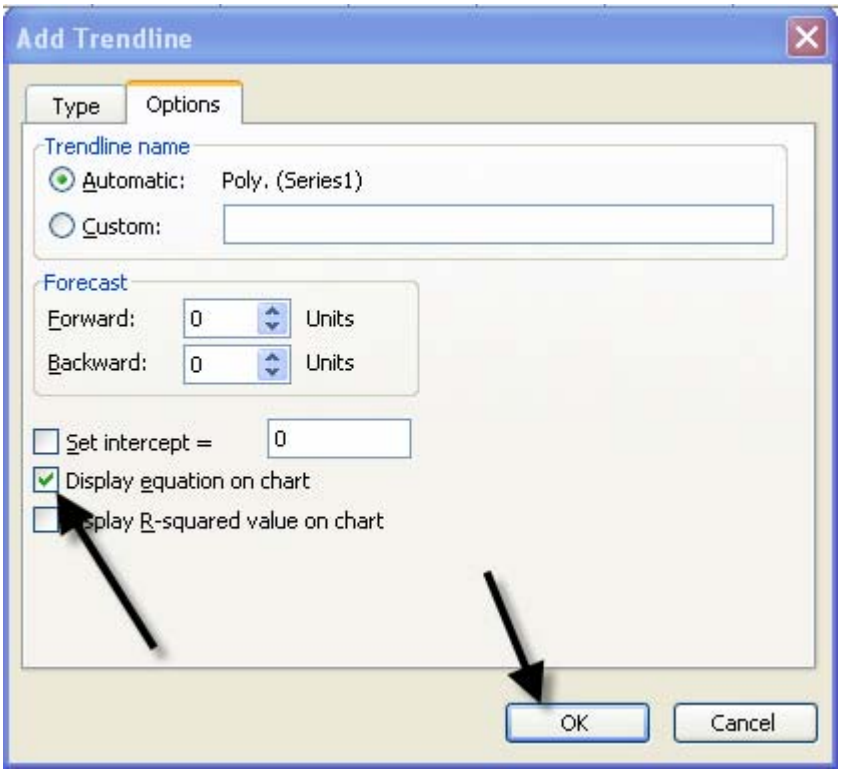
6. Since the scatterplot appears to be quadratic, select **Polynomial** order 2.

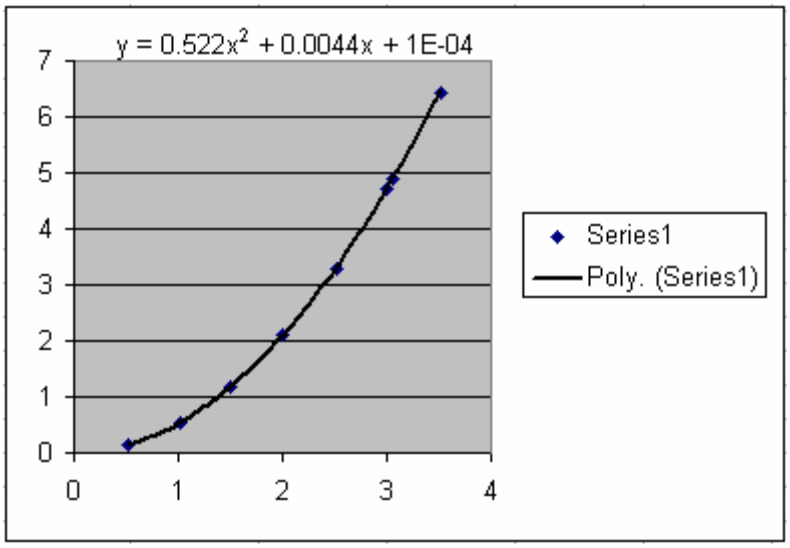


7. Click the **Options** tab.



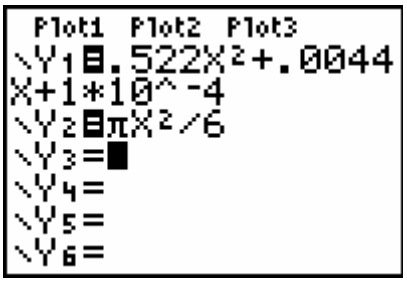
8. Check **Display Equation on Chart**, then click **OK**.



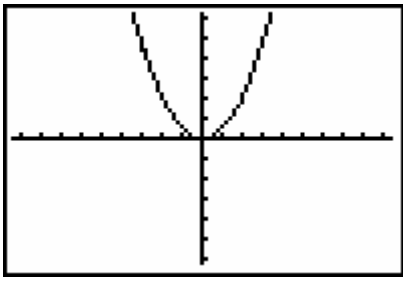


9. Use the graphing calculator to verify that the function that was developed by the spreadsheet is equivalent to $A_{sec} = \frac{\pi r^2}{6}$.

Press [ON].
Enter both functions into [Y=] .



Press the [GRAPH] key. If the functions are equivalent, they will graph on top of each other and the graphing window will show what appears to be only one graph.



For further verification, press [2nd] [GRAPH] to examine the table values.

X	Y1	Y2
0	1E-4	0
1	.5265	.5236
2	2.0969	2.0944
3	4.7113	4.7124
4	8.3697	8.3776
5	13.072	13.09
6	18.819	18.85

X=0