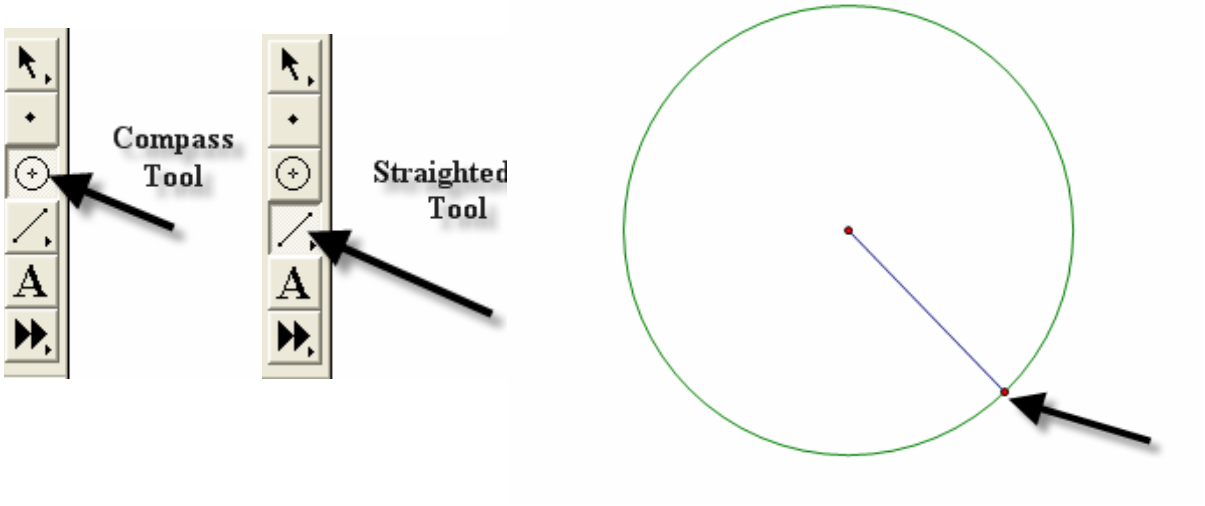
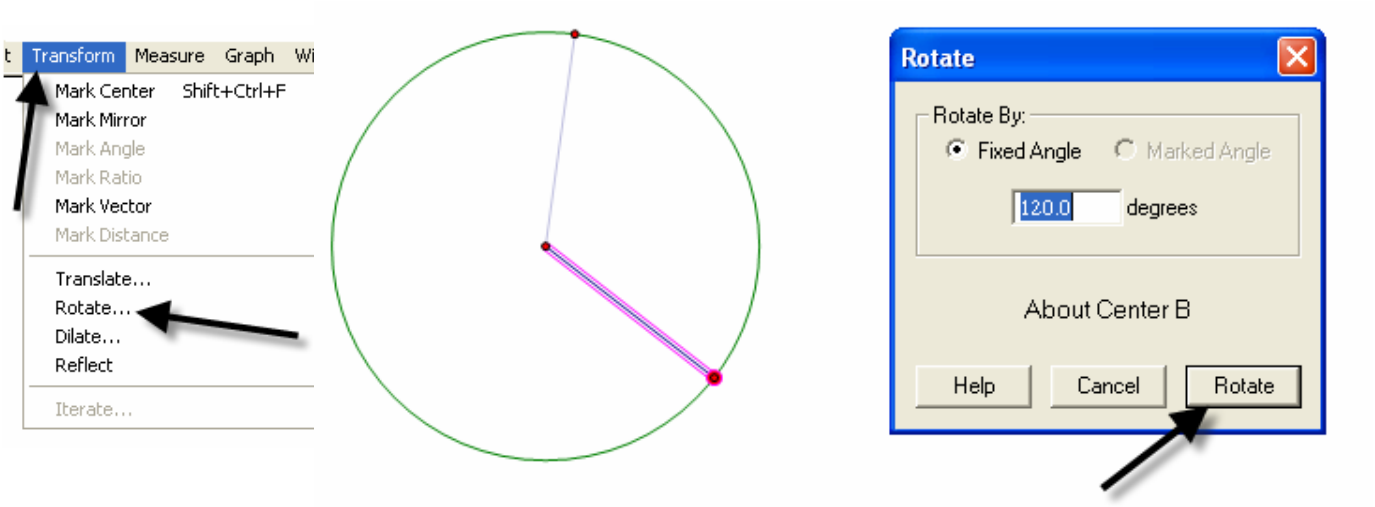
Polygarden Landscaping Company
Equilateral Triangle with Graph

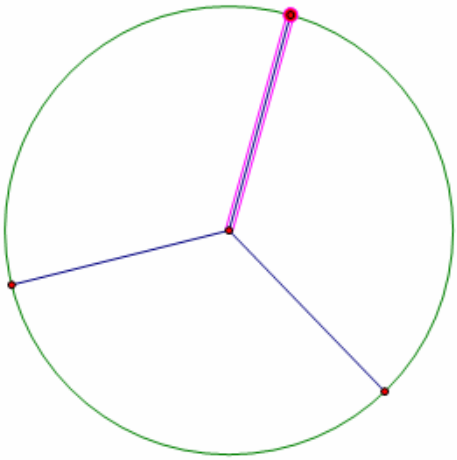
Using the **Compass tool** and the **Straightedge tool**, construct a circle and its radius. Be sure the radius is attached to the point that is constructed on the side of the circle—this will later allow all vertices of the triangle to act as control points to adjust the size of triangle.



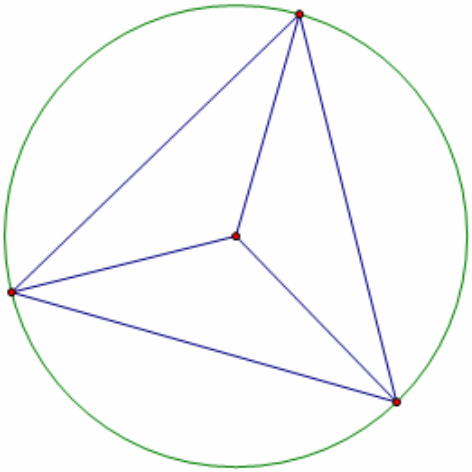
With the selection tool, highlight the radius and the point of intersection on the circle. Double click on the center point of the circle to mark it as a point of rotation. There will be a flash of concentric circles around the point as it is marked. From the Menu Bar use the **Transform** option and choose **Rotate**. A window will pop up with a box to enter the number of degrees of rotation desired. In this case enter 120 degrees, the number of degrees of the central angle of an equilateral triangle inscribed in a circle. Click the **Rotate** button to complete the rotation.



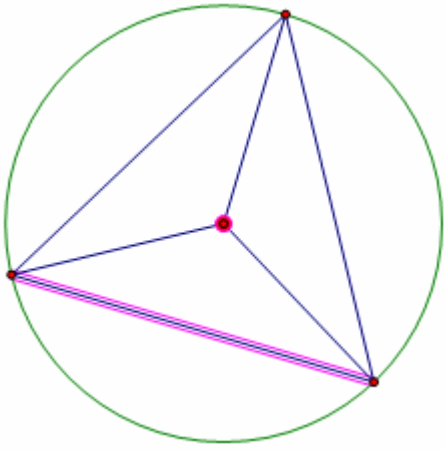
After the rotation, the new radius and its point of intersection are highlighted. The center point is still "marked" as the point of rotation. To rotate the radius, simply use the **Transform** and **Rotate** options again. The 120 degrees should still in the pop-up window; so to complete the rotation, click on the **Rotate** button.

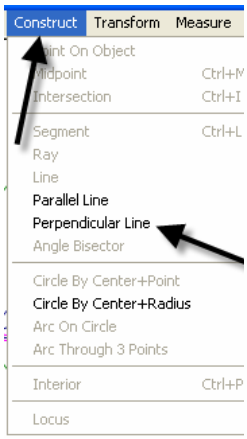


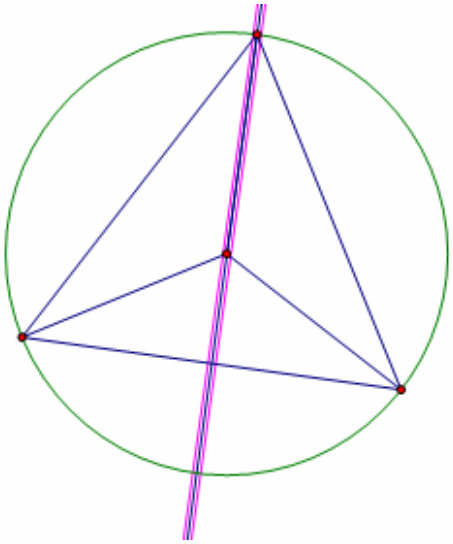
Use the **Segment** tool to connect the points on the circle forming the equilateral triangle.



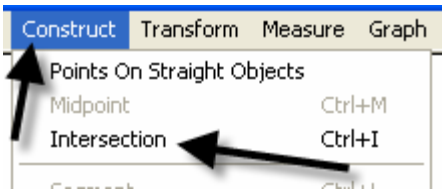
Construct a line perpendicular to one side of the triangle through the center by first highlighting the side and the center, then using the Construct and Perpendicular options from the Menu Bar.

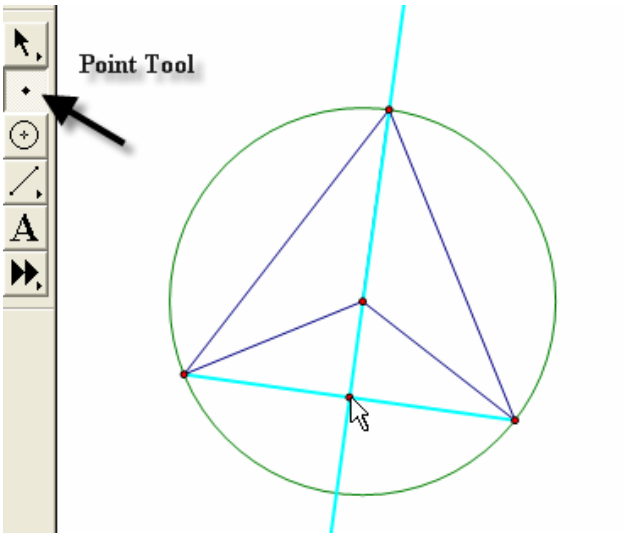




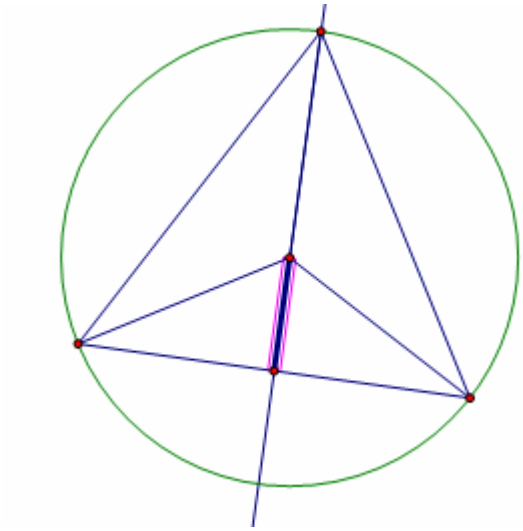


Construct the point of intersection between the side of the triangle and its perpendicular either by using the **Point** tool and clicking at the intersection when both lines turn blue OR by highlighting the side and the perpendicular and using the **Construct** and **Intersection** options from the Menu Bar.

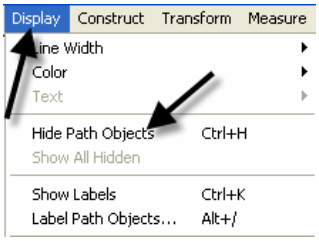


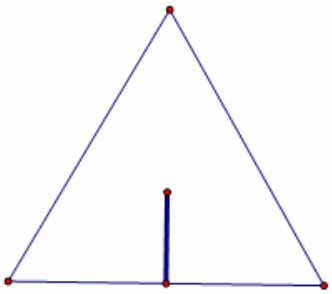


To construct the apothem, the only part of the perpendicular needed is the segment connecting the center to the side. Use the **Straightedge tool** to construct a segment (on top of the perpendicular line) that joins the two points.

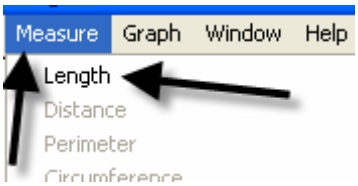


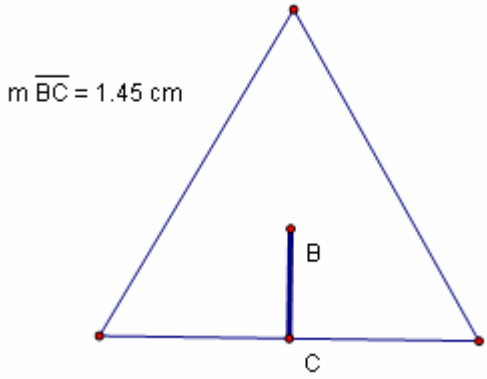
To hide the circle and the unnecessary lines, simply highlight them and use the **Display** and **Hide Path Objects** from the Menu Bar.



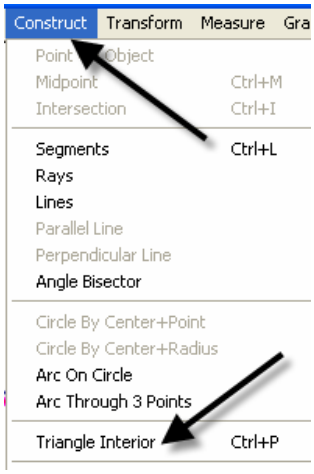


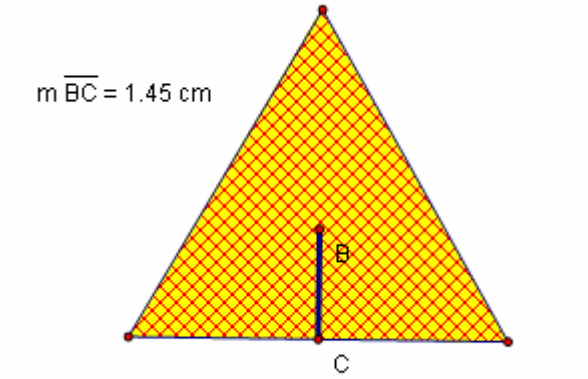
To measure the length of the apothem, highlight it and use the **Measure** and **Length** options from the Menu Bar. The points will automatically be labeled, and the measurement will appear. This measurement will be highlighted, and a click in the blank white area of the screen will deselected it.

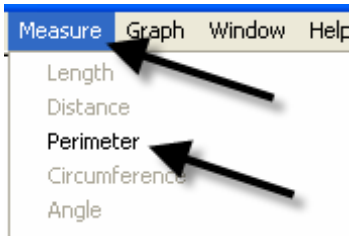


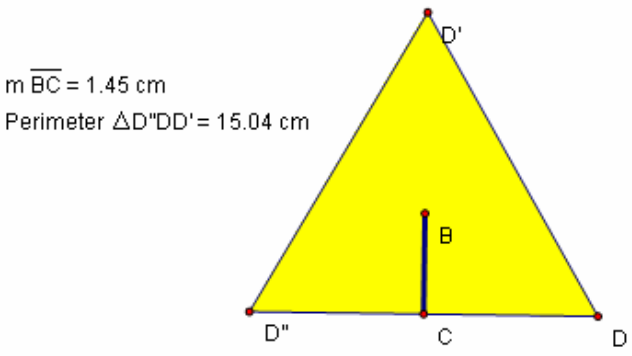


To use the **Measure** and **Perimeter** options from the menu bar, the *interior* of the triangle must first be constructed. Highlight the vertices. Use the **Construct** and **Triangle Interior** options from the Menu Bar. Once constructed, the interior is automatically selected (This is shown by cross hatching.) allowing the **Measure** and **Perimeter** options to become available. Click on them to measure.

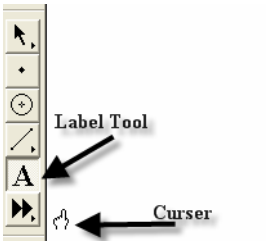


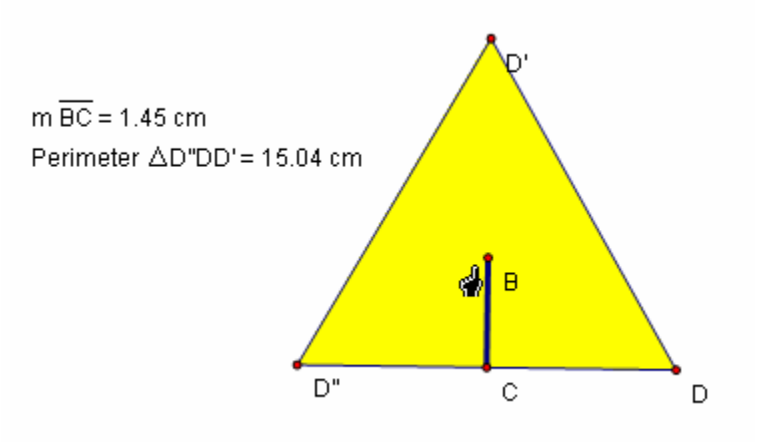


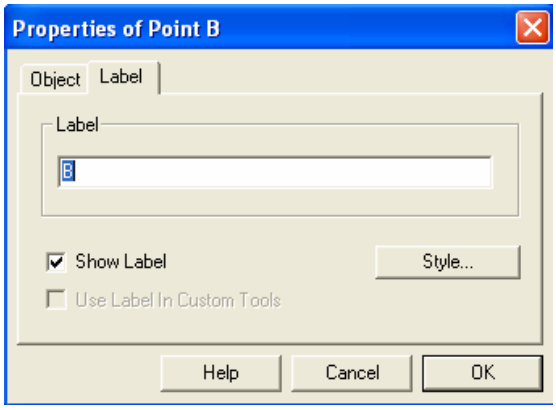


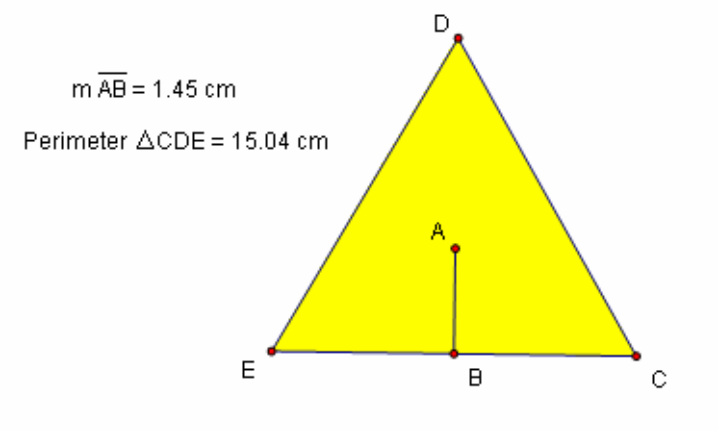


Geometer's Sketchpad labels automatically. In this particular case it used point D as the original point on the circle and D' and D" as the rotated points. If desired, rename the points by selecting the Text tool. A little outline of a hand will appear as the curser. As the curser becomes lined up with a label, it will change. Double click on a point and a window will pop up with a box allowing for the new name to be entered. As points are changed, the label with their respective measurements will also change.

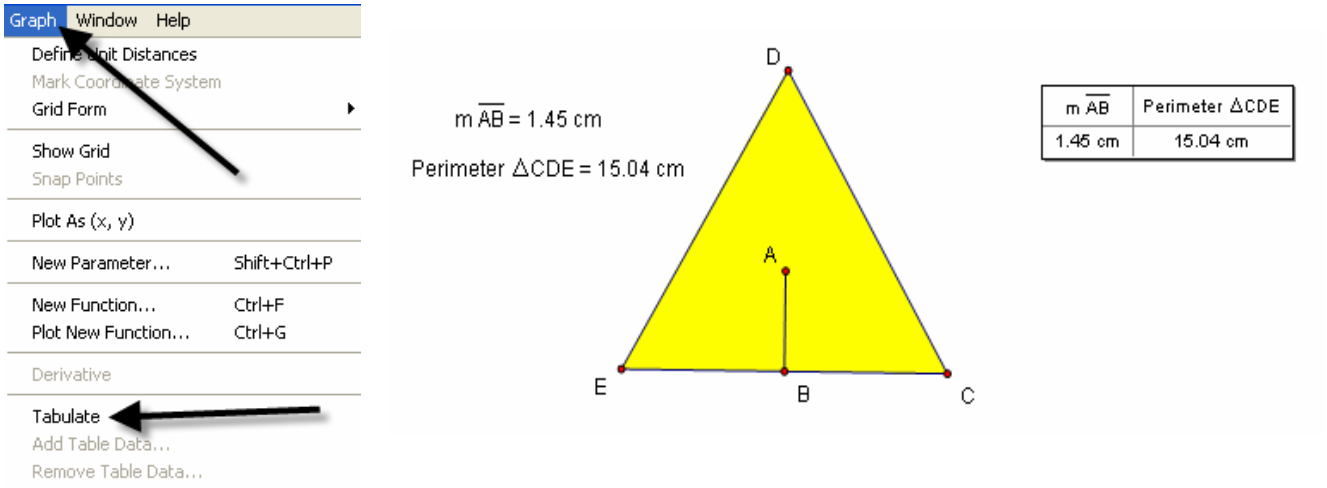




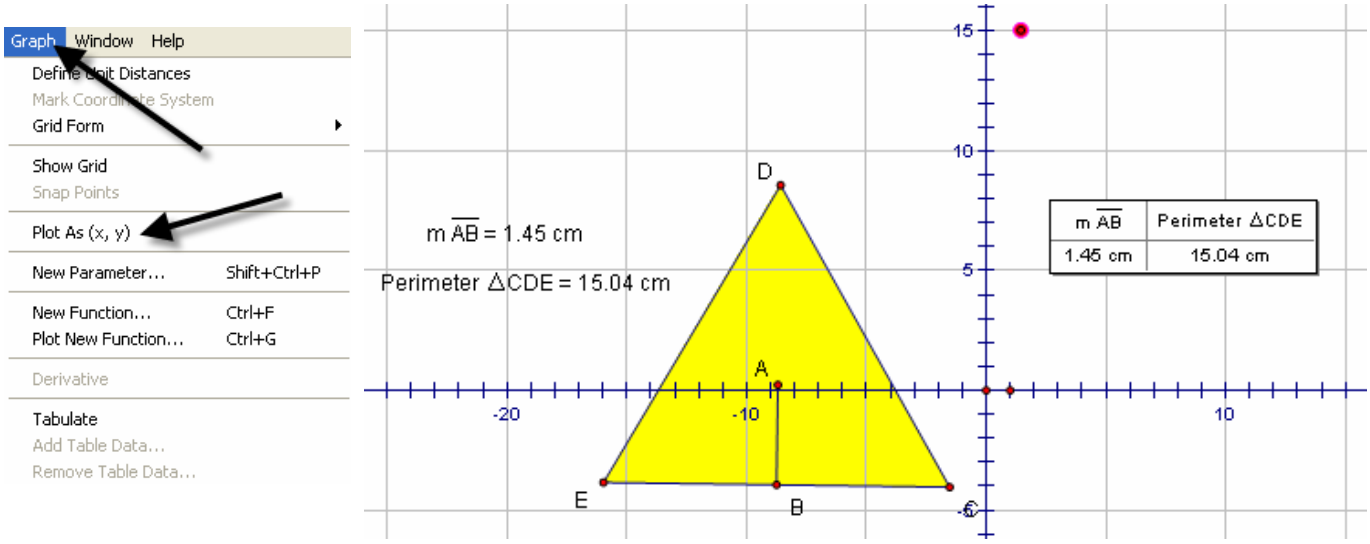




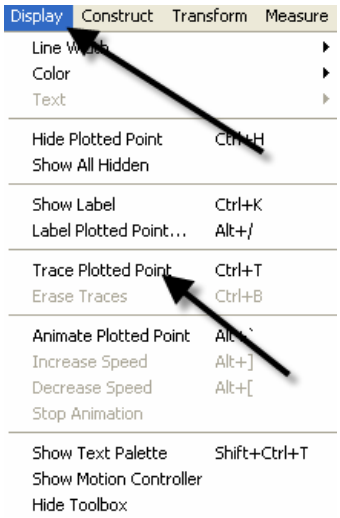
To build a table to explore the relationship between the length of the apothem and the perimeter, highlight in order first the independent variable followed by the dependent variable. In this case, the *measurement* of the apothem is the independent variable and the *perimeter* the dependent variable. Once highlighted, use the **Graph** and **Tabulate** options from the **Menu Bar.** A table with each value will appear. This table can be moved anywhere on the screen that is convenient.

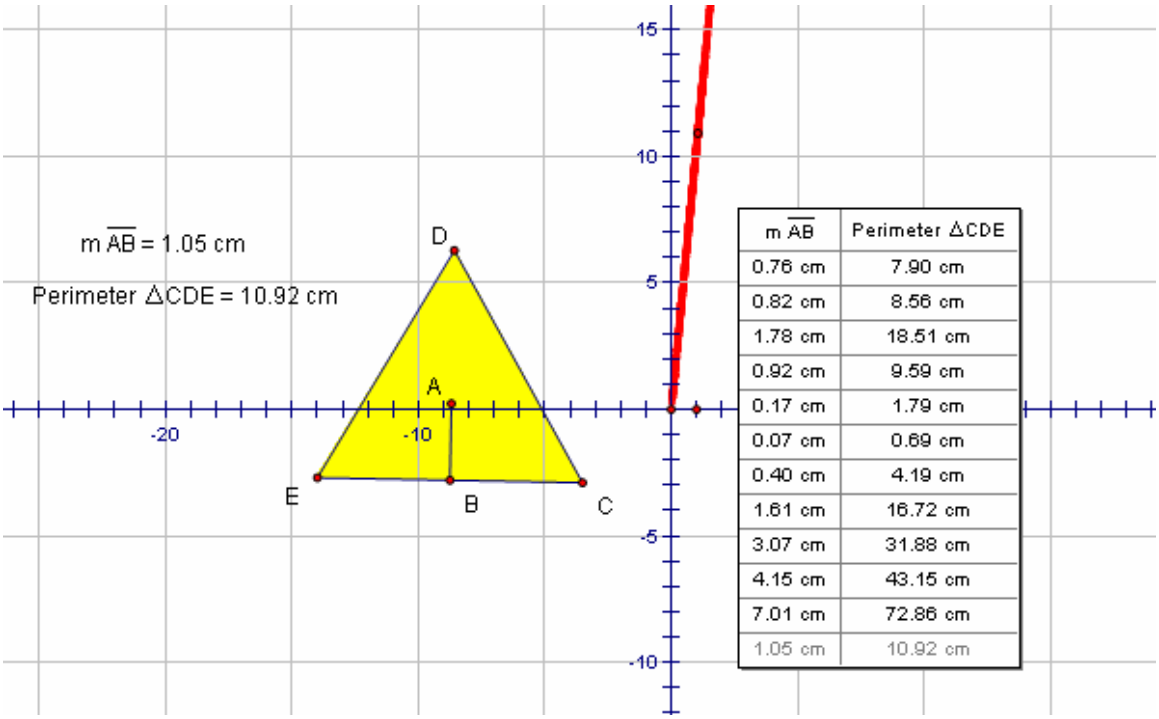


To plot the points, again highlight the independent then the dependent variable. In this case the length of the apothem then the perimeter. Once highlighted use the **Graph** and **Plot as (x, y)** option from the **Menu Bar**. A coordinate grid appears behind the triangle with the point highlighted.



To trace the point, highlight it and use the Display and Trace Plotted Point options from the Menu Bar. The point will trace on the coordinate grid as the triangle is manipulated from any one of its vertices. To add data to the table, double click in the table, adjust the size of the triangle and repeat until the number of data points desired are accumulated.

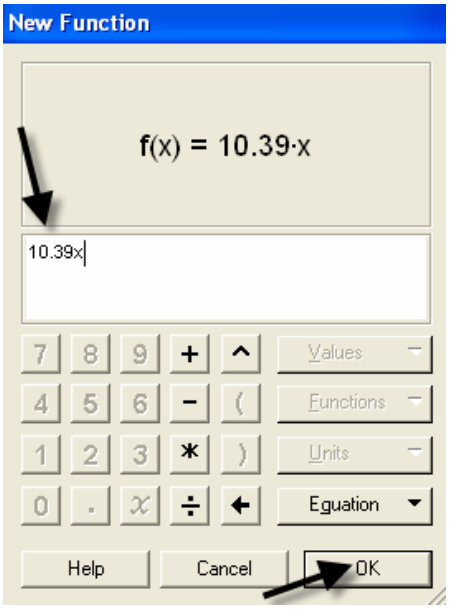


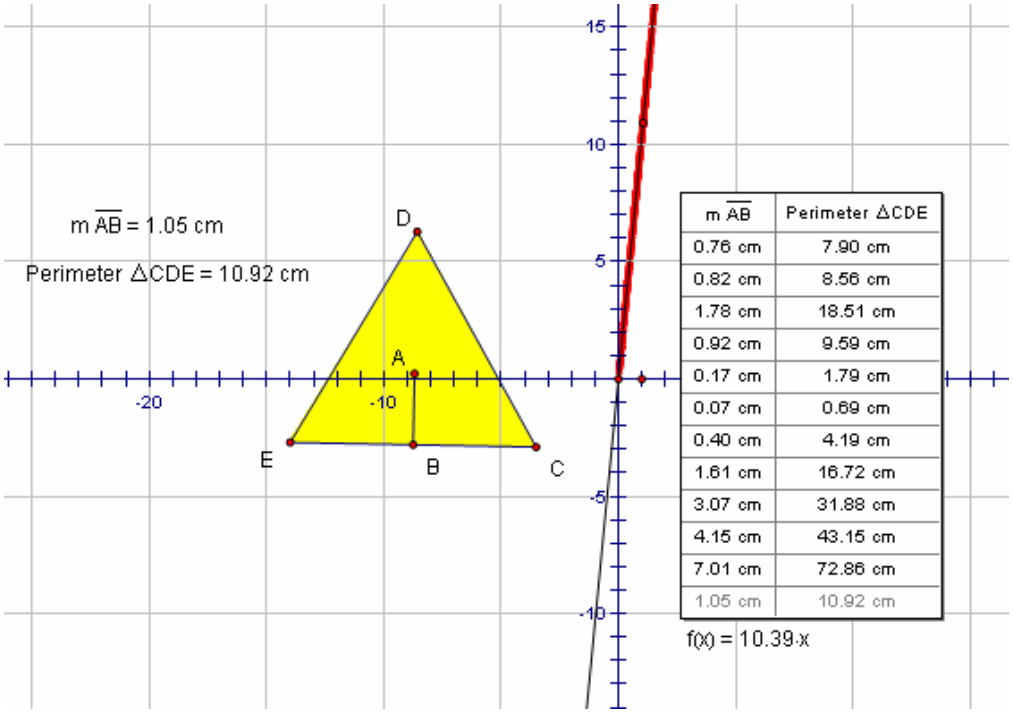


m AB	Perimeter ΔCDE
0.76 cm	7.90 cm
0.82 cm	8.56 cm
1.78 cm	18.51 cm
0.92 cm	9.59 cm
0.17 cm	1.79 cm
0.07 cm	0.69 cm
0.40 cm	4.19 cm
1.61 cm	16.72 cm
3.07 cm	31.88 cm
4.15 cm	43.15 cm
7.01 cm	72.86 cm
1.05 cm	10.92 cm

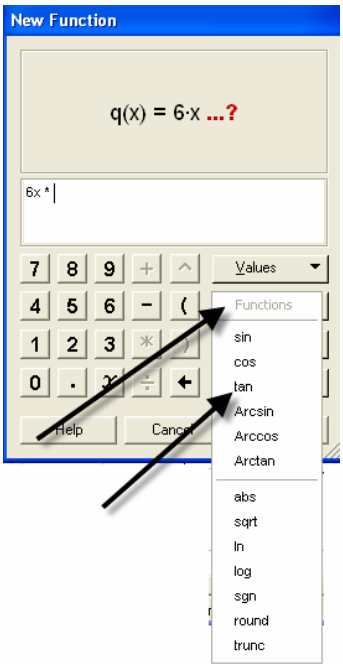
Verify a Function Rule

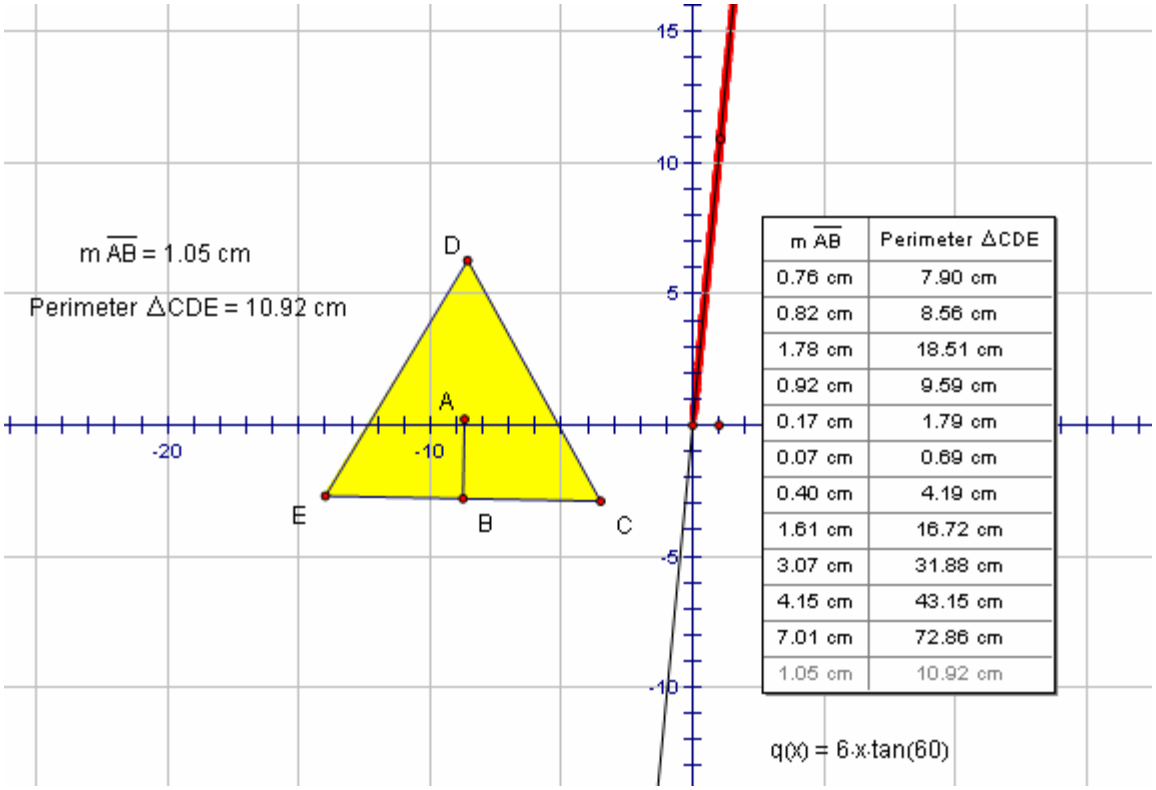
To use Geometer's Sketchpad to verify a function rule, in this case ***y = 10.39x*** , use the **Graph** and **Plot New Function** options from the Menu Bar. A calculator window will pop up allowing the equation to be entered. After entering the function, click the **OK** button. The function will graph, hopefully over the existing data, thus verifying the function rule.





To verify using a trigonometric function, follow the same procedure, but use the calculator to enter the specific trigonometric function desired. For instance, ***y = 6xtan(60º)***. The function will then graph verifying the plotted data.





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