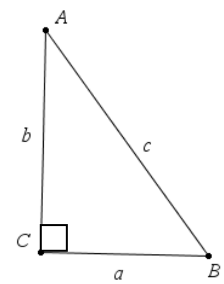
Name ____TEACHER NOTES__________

Investigating the Relationship between the Sides of Right Triangles and Oblique Triangles with TI-Nspire Handheld

1. What does the Pythagorean Theorem tell us about the relationship of sides *a, b*, and *c* of right ΔABC? State the formula as you know it.



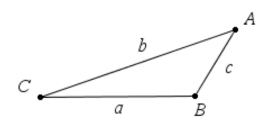
$a^2+b^2-c^2$

2. What is the value of $a^2+b^2-c^2$ for a right triangle? _______0_________

3. Open file "Triangle Investigation" on TI-Nspire and do problem #1.

4. If *a* and *b* stay constant and ∠C becomes an acute angle, predict whether $a^2+b^2-c^2$ is positive, negative, or zero.

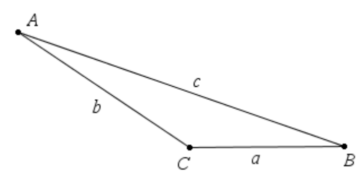
____Positive_______



Explain why.
Since c is becoming smaller, we will be subtracting a smaller amount than we did for the right triangle.

5. If *a* and *b* stay constant and ∠C becomes an obtuse angle, predict whether $a^2+b^2-c^2$ is positive, negative, or zero.

____Negative_______



Explain why.
Since c is becoming larger, we will be subtracting a larger amount than we did for the right triangle.

6. Based on your answers above, if ∠C varies from 0° to 180°, describe the behavior of $a^2+b^2-c^2$.
It will be positive at 0°, decreasing to zero at 90°, then becoming more negative as you approach 180°.

7. Do problem #2 from file "Triangle Investigation" on TI-Nspire to check your thinking.

8. On page 2.2 of file "Triangle Investigation", side *a* and side *b* are constant: *a*= 3 cm and *b*= 4 cm. Side *c* and ∠C vary. Collect some data from your drawing, and enter it in the chart on the right.

9. If you graph ∠C on the x-axis and $a^2+b^2-c^2$ on the y-axis, describe what you know about the shape of the graph from your observations.
There is a negative association so it will be decreasing, but it will not be linear because the rate of change is not constant.

∠C	$a^2+b^2-c^2$
0°	24
30°	20.8
60°	12
90°	0
120°	-12
150°	-20.8
180°	-24

10. Let's look at the relationship in the table from #8 a little further. We'll collect more data in a spreadsheet and graph that data. Go to problem #3 in the file "Triangle Investigation", and follow the directions carefully. You will be graphing m∠C on the x-axis and the algebraic expression $a^2 + b^2 - c^2$ on the y-axis.

11. Does the shape of the graph look like you thought it would? ________________________

12. What type of functions would fit this data? ___sin(x) or cos(x)______________________

13. Return to page 3.5 in the file "Triangle Investigation". To enter your function guess, you will need to show the function entry line. To do this press (menu), then 2:View, and 6:Show Entry Line. Press (enter). Enter your guess in the line f1(x)= .

Guess f1(x)= ____cos(x)________________

14. What features of your function are correct?

It has the right shape and the x-intercept is correct._______________________________

15. What features of your function need adjustment?

The altitude or vertical stretch needs to be much greater. The table suggests it will be 24.

16. Edit the function to better fit the data. (If the entry line now says f2(x)= , up arrow to return to f1(x)= .)

What is your final function? f1(x)= ___24cos(x)_________________

17. Side a and side b of the triangle were constants in this investigation: side a = 3 and side b = 4. How does the constant in your function relate to these constant sides?

___It is twice the product of the constant sides: 2 x 3 x 4 = 24_______

18. Generalize your hypothesis, and complete this equation for all triangles.

$a^2 + b^2 - c^2 =$ __2abcos(C)__________

19. Solve the equation for c^2.

$c^2 =$ $a^2 + b^2 - 2ab\cos(C)$

Extension:

In the extension, side b and m∠C are constant, and side a and side c will vary. Go to problem #4 in the file "Triangle Investigation" and follow directions carefully.

What is the shape of the graph? ______linear________________

Write an equation to fit the data & enter it in f1(x)= __f1(x)=(8cos80)x___________
(Refer to #13 to show function entry line.)

Explain the shape of the graph in relation to the triangle. $y = a^2 + b^2 - c^2 = 2ab\cos(C)$
a is constant, cos(C) is constant, & b is variable. It is a line with m=2acos(C)=2x4xcos(80°).