

## Should you measure carefully?

<b>Lesson Information</b>
<i>By Ron Lancaster</i>
<b>Subject:</b>
Trigonometry Geometry Pre-Calculus
<b>Topic:</b>
Functions Geometry and Measurement Graphing
<b>Technology:</b>
Graphing Calculator
<b>Level:</b>
Moderate
<b>Activity Structure:</b>
Pooled Data Analysis
<b>Duration of Activity:</b>
Whole Class Period Multiple Classes

### Overview:

This activity has students discover how small changes in the measurements of a right triangle can influence the whole triangle. Students track data and analyze changes in order to look for patterns. Students then use these patterns to develop a function that describes how the changes relate to one another.

### Learning Objectives:

- Solve for missing triangle information using trigonometric relationships
- Use patterns to predict values
- Use patterns to develop functions

### Materials:

- Graphing Calculator
- Worksheet
- Pencil
- Paper

**Question 1**

- (a) Given that  $TAN$  is a right triangle with  $\angle TAN = 90^\circ$  and  $\angle NTA = 85^\circ$  find the length of  $AN$  (see Figure 1) for each of the following cases. Before you begin, describe how you think the length of  $AN$  will change over the course of these cases.

$TA$ (meters)	$AN$ (meters)
100	
100.1	
100.2	
100.3	
100.4	
100.5	

$TA$ (meters)	$AN$ (meters)
100.6	
100.7	
100.8	
100.9	
101	

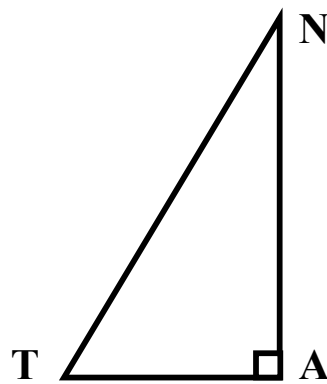


Figure 1

- (b) Study your results from part (a) and write a few sentences to describe how the length of  $AN$  changed as the value of  $TA$  steadily increased from 100 to 101 meters.
- (c) Search for a pattern in the results for part (a) and use your observations to predict the value of the length of  $AN$  for the case where  $TA = 104$ . Then find the length of  $AN$  using trigonometry and compare the result with your prediction.
- (d) Let  $TA = x$  and let  $y$  equal the length of  $AN$ . Develop an equation for  $y$  in terms of  $x$  and use this equation to sketch the graph of  $y$  versus  $x$ . Is this graph consistent with your results from parts (a) to (c) of this question?

## Question 2

- (a) Given that  $TAN$  is a right triangle, with  $\angle TAN = 90^\circ$  and  $TA = 100$ , find the length of  $AN$  (see Figure 1 on the previous page) for each of the following cases. Before you begin, describe how you think the length of  $AN$  will change over the course of these cases.

$\angle NTA$	$AN$ (meters)
$85^\circ$	
$85.1^\circ$	
$85.2^\circ$	
$85.3^\circ$	
$85.4^\circ$	
$85.5^\circ$	

$\angle NTA$	$AN$ (meters)
$85.6^\circ$	
$85.7^\circ$	
$85.8^\circ$	
$85.9^\circ$	
$86^\circ$	

- (b) Study your results from part (a) and write a few sentences to describe how the length of  $AN$  changed as the value of  $\angle NTA$  steadily increased from  $85^\circ$  to  $86^\circ$ .
- (c) Search for a pattern in the results for part (a) and use your observations to predict the value of the length of  $AN$  for the case where  $\angle NTA = 89^\circ$ . Then find the length of  $AN$  using trigonometry and compare the result with your prediction.
- (d) Let  $\angle NTA = x$  and let  $y$  equal the length of  $AN$ . Develop an equation for  $y$  in terms of  $x$  and use this equation to sketch the graph of  $y$  versus  $x$ . Is this graph consistent with your results from parts (a) to (c) of this question?