

LAW OF SINES, LAW OF COSINES AND (TAYLOR POLYNOMIALS!)

Student Worksheet

Name: _____

Each page of the activity which requires a written solution is listed below.

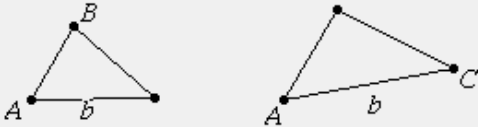
1.1 1.2 1.3 1.4 ▶ DEG AUTO REAL

LAW OF SINES and LAW OF COSINES (and TAYLOR POLYNOMIALS!)

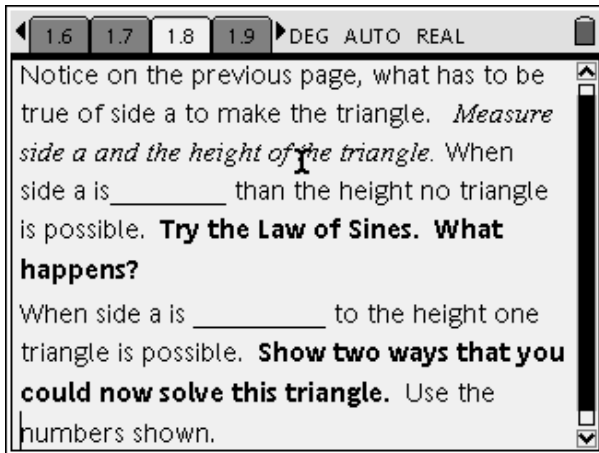
If a triangle doesn't have a right angle, and only some parts of the triangle are known, how might you solve it? These triangles are *oblique*. You need to know the measure of at least one side and any two other parts of the triangle to solve a triangle of this nature. Why?

My answers:

1.1 1.2 1.3 1.4 ▶ DEG AUTO REAL



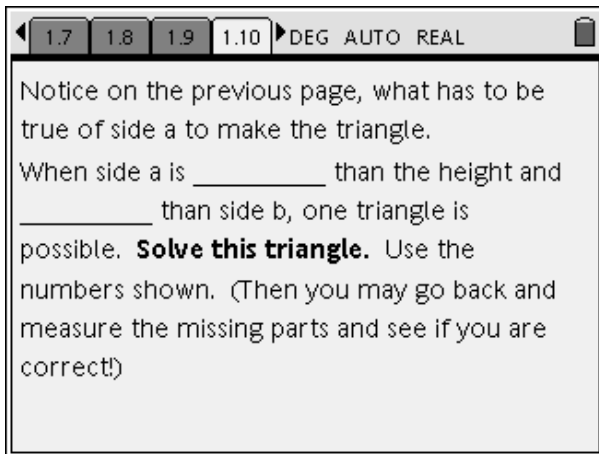
Give a step by step explanation of how the ratios will help solve the **entire** triangle in the case AAS or ASA as shown above. Assume the labeled parts are given quantities. This is the Law of Sines!



1st way (include diagram)

My answers:

2nd way (include diagram)



(include diagram)

1.10 1.11 1.12 1.13 DEG AUTO REAL

Notice on the previous page, what has to be true of side a to make a triangle.

I

When side a is _____ than the height and _____ than side b, **two** triangles are possible. Solve each triangle. Use the numbers shown if you wish and check your answers.

1st triangle (include diagram):

2nd triangle (include diagram):

1.11 1.12 1.13 1.14 DEG AUTO REAL

Notice on the previous page, what has to be true of side a to make a triangle.

When side a is _____ than side b, _____ triangle is possible.

1.12 1.13 1.14 1.15 DEG AUTO REAL

5 cm b a 130° A drag me

When side a is _____ than side b ,
 _____ triangle is possible.

1.13 1.14 1.15 1.16 DEG AUTO REAL

Summarize

When you use the Law of Sines, what seem to be the important things to look for to use the ratios?

In the no solution case, what will happen as you solve the problem algebraically?

In the two solution case, what will happen as you solve the problem algebraically?

1.2 1.3 1.4 1.5 DEG AUTO REAL CAPS

$r=0.1507819$ 0.1507819 0.1507819

Side $A=5.2$ cm Angle $A=9$

Grab angle B and observe what happens to the ratios. When do the ratios achieve a maximum value? Graph the data points and...

Write complete sentences and give examples if necessary.

1.2 1.3 1.4 1.5 DEG AUTO REAL CRPS

Looking at your graph, what function might you use to model this curve? What about a polynomial curve? On each of the following pages, you will investigate different polynomial functions to see which best approximates the data curve.

1.2 1.3 1.4 1.5 DEG AUTO REAL CRPS

A	a...	B	b...
		$=\pi/180$	
1	59.7	1.04	
2	65.7	1.15	
3	68.1	1.19	
4	68.9	1.2	
5	69.8	1.22	
6	70.6	1.23	

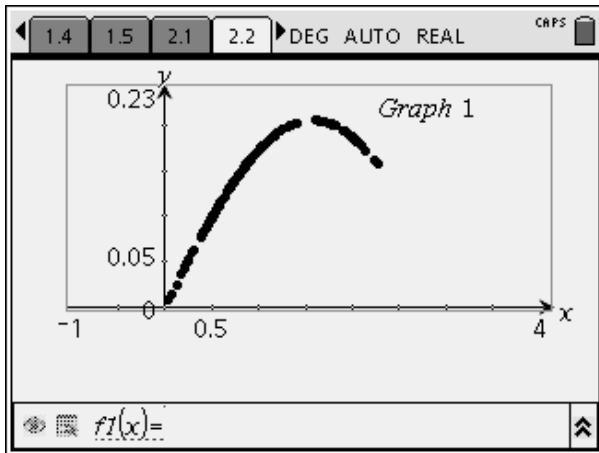
This table changes angle B from degrees to radians. Why do we need to do this?

47 |

1.3 1.4 1.5 2.1 DEG AUTO REAL CRPS

Problem 3

For *graph 1*, let's try a simple quadratic equation. Start with $y=x^2$. Manipulate the quadratic curve so that it fits the data points as close as possible. What is that function? Now, find the maximum of that function. Where do you expect that to occur? Where did it occur on your graph. Maybe we need to find a better polynomial fit.



Record your observations.

Let's try some more polynomials. On the graph 2, graph

$$y = \frac{1}{\text{sideb}} \left(x - \frac{x^3}{3!} \right)$$

How does that compare to our curve?
Can we get any better?

Since this appears to possibly be an odd function, let's try a polynomial with more odd powers.

$$y = \frac{1}{\text{sideb}} \left(x - \frac{x^3}{3!} + \frac{x^5}{5!} \right)$$

How does this compare? Can we get a better approximation by adding more terms? What pattern do you see? Can you generate a formula?

2.5 2.6 2.7 2.8 DEG AUTO REAL CAS

We generated our curve using a sine function. And now we can see that we can also get this graph using a polynomial function. Taylor was given credit for writing any function as a polynomial. In your notes, what are the characteristics of trig functions? What are the characteristics of polynomial functions? Why do you think this is a significant connection?

3.1 3.2 3.3 3.4 DEG AUTO REAL CAS

Using your CAS, generate more terms in your polynomial and observe how close the Taylor polynomial gets to the $\sin(x)$. What happens as you add more and more terms? What if you added an infinite number of terms?

3.3 3.4 3.5 3.6 DEG AUTO REAL CAS

Let's do some more exploring! Try e^x and use the CAS to generate that Taylor polynomial. What about $\cos(x)$? Think of their symmetry of your functions (i.e. even/odd), what is true about the trig function and the powers of the polynomial for each function?