# Investigating the Law of Sines

In this project, you will investigate one part of using the Law of Sines. In particular, you will discover the method of determining how many triangles can be formed from a particular set of data.

Background Information:

From geometry, we have the following theorem:

> For point P not on line AB, the shortest distance from P to AB is the segment that is
> _____ to the line and passes through P.

1: Find the segment that gives the shortest distance from P to AB for each of these figures.
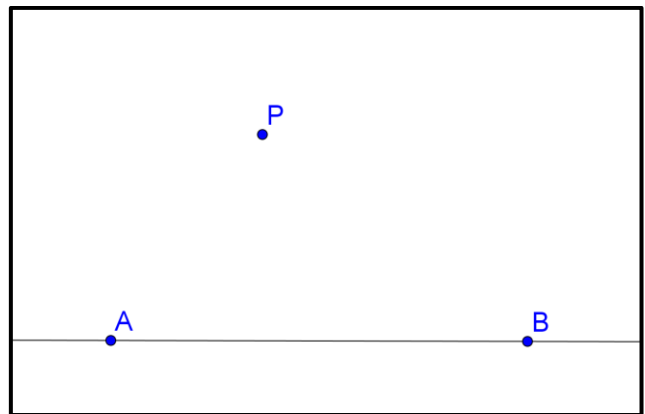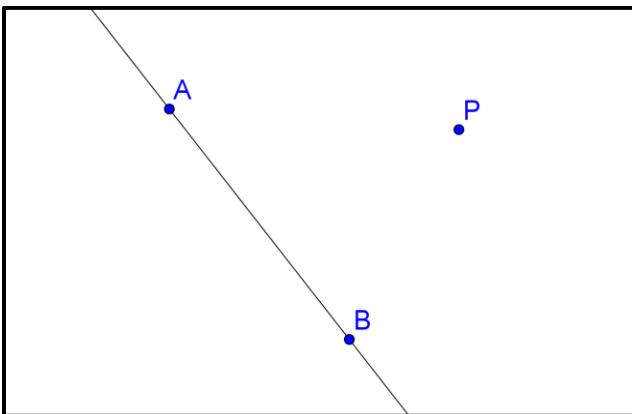
On the GeoGebra Module:

How to use the GeoGebra Module:

The scenario is set. You are given a fixed length $b = 6$ and angle $\alpha = 50°$. The angle α is with reference to a fixed ray AD. Point C is the point formed that is 6 units away with the angle of 50°. The segment across from vertex A is a. The angle that is formed at point C is called γ. You are in control of a and γ via the sliders at the top of the page. As you move those sliders, point B will move around along with the segment BC. Your goal is to form triangles with vertices A, B, and C and then to described those triangles.

Complete the following objectives and questions. Round all decimals to the tenth's place.

2.   Find the shortest distance a from point C to the ray AD by adjusting the sliders for a and γ.

The shortest distance is _____.

3.   When the shortest distance from point C to ray AD is formed, what is the measure of $\angle ABC$? _____

And what is the measure of γ? _____ What type of triangle is ΔABC? _____

4.   Compute the value of $h = 6\sin 50°$ in your calculator. How does this compare with your value of a above?

Why do you believe the variable for this quantity is named h? _____

_____

5. By changing the values of a and γ, determine if the given lengths of a can be used to form no triangles, one triangle, or two triangles with $b = 6$ and $\alpha = 50°$. **For multiple triangles, list all possibilities.**

a	Number of triangles	c	γ	Describe triangle (scalene, isosceles, equilateral, acute, right, obtuse) [multiple answers]
4.8				
7				
4.2				
6				
Create your own:				

Conclusions

For $b = 6$ and $\alpha = 50°$,.....

6. No triangles will be formed if $a <$ _____

7. If _____ $\leq a <$ _____, two triangles will be formed.

8. If $a \geq$ _____, exactly one triangle will be formed.

For any given b and α, answer these same questions in general (in terms of b and α)

9. No triangles will be formed if $a <$ _____

10. If _____ $\leq a <$ _____, two triangles will be formed.

11. If $a \geq$ _____, exactly one triangle will be formed.

Investigating the Law of Sines   Clear Trace

a = 6.24

γ = 82.5°

Segment will turn green when it makes contact with $\overrightarrow{AD}$.

$c = 8.07$

C

6

6.24

α = 50°

A

D

B
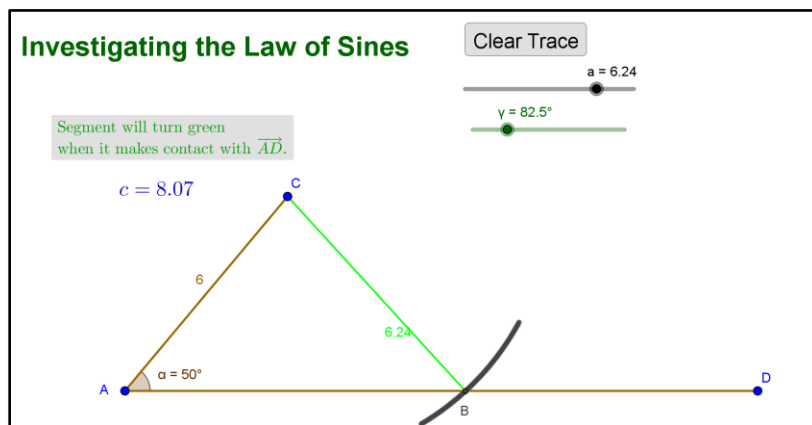
Project Due Date: _____

Project is due at the beginning of class. You may turn in the project up to two days late. There will be a 20 point late penalty for each day or portion thereof it is late.