

## Topic 8.1 Law of Sines and Law of Cosines

Essential Question:

*How can you use an inverse function to find all the solutions of a trigonometric equation?*

Explore and Reason

Complete online

**CONCEPT:** Law of Sines and Law of Cosines

### Law of Sines and Law of Cosines

The Law of Sines and the Law of Cosines allow you to apply trigonometric functions to non-right triangles. Given  $\triangle ABC$ , with angles  $A$ ,  $B$ , and  $C$  and opposite-side lengths  $a$ ,  $b$ , and  $c$ :

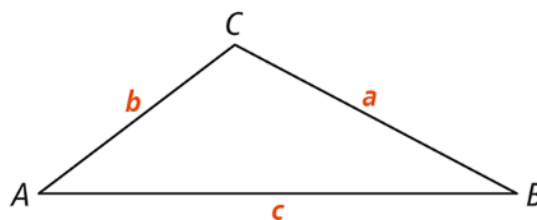
**Law of Sines:**  $\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$

**Law of Cosines:**

$$a^2 = b^2 + c^2 - 2bc(\cos A)$$

$$b^2 = a^2 + c^2 - 2ac(\cos B)$$

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



**NOTES:**

## Examples & Questions

### Examples 1

Q: What do you notice about  $\triangle ABC$  that is different from the triangles used in trigonometric functions?

Q: How is drawing an altitude helpful?

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Q: How does isolating  $x$  in both sine functions help prove the Law of Sines?

### Examples 2

Part A

Q: Under what circumstances can you use the Law of Sines?

Q: When using the Law of Sines, how do you isolate the sine function to solve for an angle measure?

Part B

Q: Which angle do you use when writing the equation to find the distance between the two people?

Q: Do you use the inverse sine function to find the distance between the two people?

### Examples 3

Q: What does  $A$  refer to in  $\sin A$ ?

Q: How is it possible for  $m\angle E$  to have two possible values if the angle looks small?

Q: What causes the ambiguous case?

Q: After finding one possible angle, how do you find the other option?

### Examples 4

Q: What do you notice about the Law of Cosines?

Q: How do you start proving the Law of Cosines?

### Examples 5

Q: When you determine which side of the triangle is represented by  $a$ , does it matter which sides are designated as  $b$  and  $c$ ?

### Examples 6

Q: Why do you use the Law of Cosines and the Law of Sines to solve?

Q: How do you know which angle to designate as  $\angle A$ ?

Q: Why do you have to use the Law of Cosines first and then the Law of Sines to find the angle measure?

## Practice and Problem Solving

Complete MathXL for School: Practice and Problem Solving (online)

Complete MathXL for School: Enrichment (online)

## Lesson Quiz 8.2