Name _____ Date _____

9.7 Law of Sines and Law of Cosines

For use with Exploration 9.7

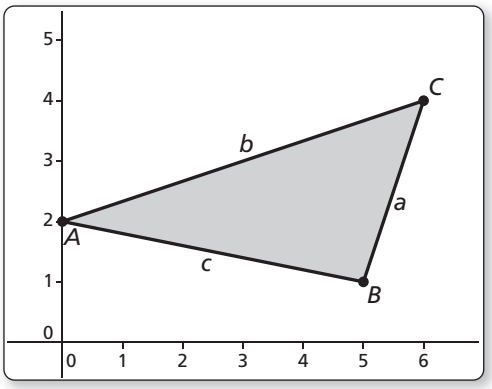
Essential Question What are the Law of Sines and the Law of Cosines?

1 EXPLORATION: Discovering the Law of Sines

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

a. Complete the table for the triangle shown. What can you conclude?



Sample
Segments
$a = 3.16$
$b = 6.32$
$c = 5.10$
Angles
$m\angle A = 29.74°$
$m\angle B = 97.13°$
$m\angle C = 53.13°$

$m\angle A$	a	$\frac{\sin A}{a}$	$m\angle B$	b	$\frac{\sin B}{b}$	$m\angle C$	c	$\frac{\sin C}{c}$

b. Use dynamic geometry software to draw two other triangles. Complete a table for each triangle. Use your results to write a conjecture about the relationship between the sines of the angles and the lengths of the sides of a triangle.

$m\angle A$	a	$\frac{\sin A}{a}$	$m\angle B$	b	$\frac{\sin B}{b}$	$m\angle C$	c	$\frac{\sin C}{c}$

$m\angle A$	a	$\frac{\sin A}{a}$	$m\angle B$	b	$\frac{\sin B}{b}$	$m\angle C$	c	$\frac{\sin C}{c}$

9.7 Law of Sines and Law of Cosines (continued)

2 EXPLORATION: Discovering the Law of Cosines

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner.

a. Complete the table for the triangle in Exploration 1(a). What can you conclude?

c	c^2	a	a^2	b	b^2	$m\angle C$	$a^2 + b^2 - 2ab \cos C$

b. Use dynamic geometry software to draw two other triangles. Complete a table for each triangle. Use your results to write a conjecture about what you observe in the completed tables.

c	c^2	a	a^2	b	b^2	$m\angle C$	$a^2 + b^2 - 2ab \cos C$

c	c^2	a	a^2	b	b^2	$m\angle C$	$a^2 + b^2 - 2ab \cos C$

Communicate Your Answer

3. What are the Law of Sines and the Law of Cosines?

4. When would you use the Law of Sines to solve a triangle? When would you use the Law of Cosines to solve a triangle?

Name _____ Date _____

9.7 Notetaking with Vocabulary

For use after Lesson 9.7

In your own words, write the meaning of each vocabulary term.

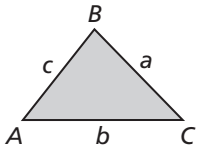
Law of Sines

Law of Cosines

Core Concepts

Area of a Triangle

The area of any triangle is given by one-half the product of the lengths of two sides times the sine of their included angle. For $\triangle ABC$ shown, there are three ways to calculate the area.



$$\text{Area} = \frac{1}{2}bc \sin A \qquad \text{Area} = \frac{1}{2}ac \sin B \qquad \text{Area} = \frac{1}{2}ab \sin C$$

Notes:

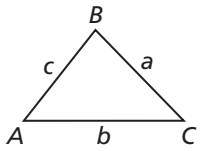
Name_____ Date _____

9.7 Notetaking with Vocabulary (continued)

Theorems

Theorem 9.9 Law of Sines

The Law of Sines can be written in either of the following forms for $\triangle ABC$ with sides of length a, b, and c.

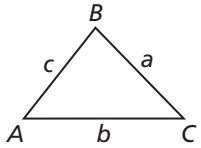


$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \qquad \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Notes:

Theorem 9.10 Law of Cosines

If $\triangle ABC$ has sides of length a, b, and c, as shown, then the following are true.



$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$b^2 = a^2 + c^2 - 2ac \cos B$$
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Notes:

Name _____ Date _____

9.7 Notetaking with Vocabulary (continued)

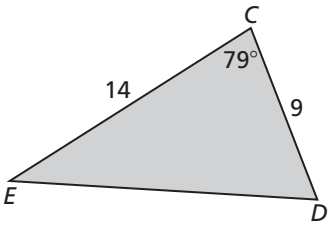
Extra Practice

In Exercises 1–3, use a calculator to find the trigonometric ratio. Round your answer to four decimal places.

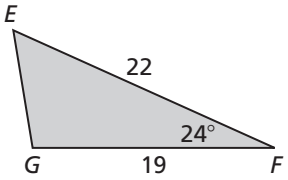
1. $\sin 225°$ **2.** $\cos 111°$ **3.** $\tan 96°$

In Exercises 4 and 5, find the area of the triangle. Round your answer to the nearest tenth.

4.

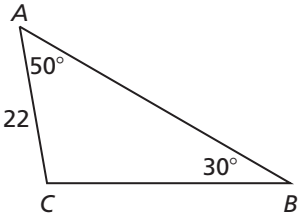


5.

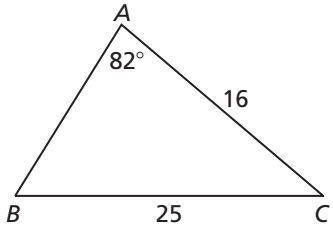


In Exercises 6-8, solve the triangle. Round decimal answers to the nearest tenth.

6.



7.



8.