13.5 Apply the Law of Sines

TEKS *a.1, a.4, 2A.4.C; P.3.E*

Before You solved right triangles.

Now You will solve triangles that have no right angle.

Why? So you can find the distance between faraway objects, as in Ex. 44.

Key Vocabulary
- law of sines

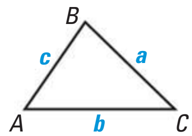
In Lesson 13.1, you solved right triangles. To solve a triangle with no right angle, you need to know the length of at least one side and any two other parts of the triangle. The **law of sines** can be used to solve triangles when two angles and the length of any side are known (AAS or ASA cases), or when the lengths of two sides and an angle opposite one of the two sides are known (SSA case).

KEY CONCEPT — *For Your Notebook*

Law of Sines

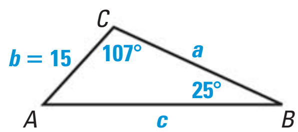
The law of sines can be written in either of the following forms for $\triangle ABC$ with sides of length a, b, and c.

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



EXAMPLE 1 Solve a triangle for the AAS or ASA case

Solve $\triangle ABC$ with $C = 107°$, $B = 25°$, and $b = 15$.



Solution

First find the angle: $A = 180° - 107° - 25° = 48°$.

By the law of sines, you can write $\frac{a}{\sin 48°} = \frac{15}{\sin 25°} = \frac{c}{\sin 107°}$.

$\frac{a}{\sin 48°} = \frac{15}{\sin 25°}$ **Write two equations, each with one variable.** $\frac{c}{\sin 107°} = \frac{15}{\sin 25°}$

$a = \frac{15 \sin 48°}{\sin 25°}$ **Solve for each variable.** $c = \frac{15 \sin 107°}{\sin 25°}$

$a \approx 26.4$ **Use a calculator.** $c \approx 33.9$

▶ In $\triangle ABC$, $A = 48°$, $a \approx 26.4$, and $c \approx 33.9$.

✓ GUIDED PRACTICE for Example 1

Solve $\triangle ABC$.

1. $B = 34°$, $C = 100°$, $b = 8$

2. $A = 51°$, $B = 44°$, $c = 11$