

5.7: The Ambiguous Case of the Law of Sines

STARTER 5.7

Solve each triangle. Round the nearest tenth.

1) $A = 41^\circ$, $B = 49^\circ$, $a = 6.5$

2) $B = 41^\circ$, $C = 52^\circ$, $c = 27$

Find the area of each triangle. Round the nearest tenth.

3) $a = 8.4$, $b = 10$, $C = 108^\circ$

4) $a = 14.2$, $A = 18^\circ 50'$, $B = 69^\circ 18'$

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Objective:

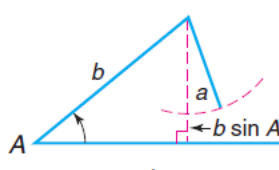
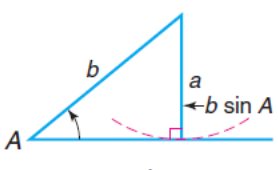
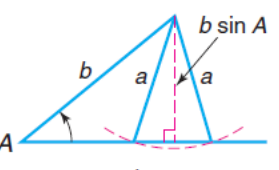
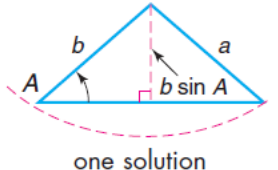
- Determine whether a triangle has zero, one, or two solutions.
- Solve triangles using the Law of Sines.

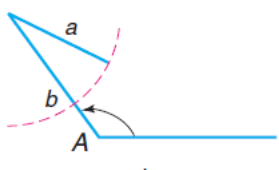
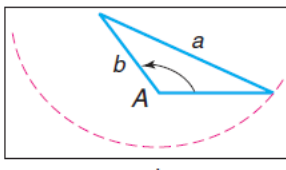
The Ambiguous Case...this happens when the given information is two sides and an angle in order (SSA)

- Given two sides and the measure of the angle opposite one of those sides, one of the following will be true

Situation	How will you know
<ul style="list-style-type: none">• No triangle exists (no solution)	<ul style="list-style-type: none">• The sine of the angle you are trying to solve for will be > 1 or < -1 (\sin^{-1} will be an error)
<ul style="list-style-type: none">• Only one triangle exists (1 solution)	<ul style="list-style-type: none">• The supplement of the angle you solve for will not allow you a valid third angle
<ul style="list-style-type: none">• Two triangles exist (2 solutions)	<ul style="list-style-type: none">• The supplement of the angle you solve for will allow you a valid third angle. Both situations work.

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Case 1: $A < 90^\circ$			
$a < b$	$a < b \sin A$  no solution	$a = b \sin A$  one solution	$a > b \sin A$  two solutions
$a \geq b$	 one solution		

Case 2: $A \geq 90^\circ$	
$a \leq b$  no solution	$a > b$  one solution

Example 1: Determine the number of possible solutions for each triangle.

a) $A = 30^\circ$, $a = 8$, $b = 10$

b) $b = 8$, $c = 10$, $B = 118^\circ$

Example 2: Find all solutions for each triangle. If no solutions exist, write *none*.

a) $a = 4$, $b = 3$, $A = 112^\circ$

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b) $A = 51^\circ$, $a = 40$, $c = 50$

c) $A = 134^\circ$, $a = 4$, $b = 6$

Example 3: Visitors near a certain national park can tune to a local radio station to find out about the activities that are happening in the park. The transmission tower for the radio station is along Park Road about 30 miles from the intersection of this road and the interstate. The interstate and the road form a 47° angle. If the transmitter has a range of 25 miles, how far along the interstate can the passengers in a car hear the broadcast?

