**PreCalculus - NOTES**

**5.5 The Law of Sines**

For any triangle (right, acute or obtuse), you may use the following formula to solve for missing sides or angles:

Use the Law of Sines when…**you have 3 dimensions** of a triangle and you need to find the other 3 dimensions - **they cannot be just ANY 3 dimensions** though, or you won’t have enough info to solve the Law of Sines equation. Use the Law of Sines if you are given:

**Example 1**

You are given a triangle, ABC, with angle A = 70°, angle B = 80° and side *a* = 12 cm. Find the measures of angle C and sides *b* and *c*.

**Example 2**

You are given a triangle, ABC, with angle C = 115°, angle B = 30° and side *a* = 30 cm. Find the measures of angle A and sides *b* and *c*.

**The Ambiguous Case**

When given **SSA** (two sides and an angle that is NOT the included angle) , the situation is ambiguous. The dimensions may not form a triangle, or there may be 1 or 2 triangles with the given dimensions. We first go through a series of tests to determine how many (if any) solutions exist.

**If angle A is obtuse…**

1. If angle A is obtuse, and a < b or a = b, no such triangle exists.
2. If angle A is obtuse, and a > b, one such triangle exists.

Ex I) Given a triangle with angle A = 120°, side

*a* = 22 cm and side *b* = 15 cm,

find the other dimensions.

**If angle A is acute…**



1. If angle A is acute, and a < h, no such triangle exists.
2. If angle A is acute, and a = h, one possible triangle exists.

Angle B is a right angle.

1. If angle A is acute, and a > b, one possible triangle exists.

Ex II-2) Given a triangle with angle A = 40°,

side a = 12 cm and side b = 10 cm,

find the other dimensions.

1. If angle A is acute, and h < a < b, two possible triangles exist.

Ex II-1)Given a triangle with angle A = 40°,

side a = 12 cm and side b = 15 cm,

find the other dimensions.

**SSA Summary:**

**Ambiguous Examples:**

1. Given: A = 130°, *c* = 9, *a* = 12… Find: B, C, *b*
2. Given: B = 90°, C = 30°, *c* = 2… Find: A, *a*, *b*
3. Given: A = 65°, *a* = 6, *c* = 8… Find: B, C, *b*

**Example 3**

Two observers are 600 ft apart on opposite sides of a flagpole. The angles of elevation from the observers to the top of the pole are 19⁰ and 21⁰. Find the height of the flagpole.



**Example 4**

Officer Chamblee at checkpoint A notices 2 wrecked cars in the direction 48⁰ east of north. Officer Thorne at checkpoint B, 12 miles due east of A, spots the same accident 30⁰ west of north. Find the distance from each checkpoint to the accident.