**6.1 Law of Sines**

**Objective: Use law of sines to solve and find the area of oblique triangles (AAS, ASA, SSA) while applying it to real life situations**

**Oblique Triangle:** triangles that have no right angles

It is standard practice to put side a across from angle A, side b across from angle B, and side c across from angle C.

**To Solve:** you need to know at least one side and two other measures (either two sides, two angles, or one side and one angle):

1. Two angles and any side (AAS or ASA)
2. Two sides and an angle opposite one of them (SSA)
3. Three sides (SSS)
4. Two sides and their included angle (SAS)

First two cases can be solved using ***Law of Sines,*** whereas the last two cases require the *Law of Cosines* (next section).

**Law of Sines**

If ABC is a triangle with sides a, b, and c then

Note: reciprocal form is also true (see proof on pg 487)

*Example 1:* Two angles and One side – AAS

For the triangle with C = 108 degrees, B = 24 degrees and b = 25. Find the remaining sides and angles.

***Solution:***

*Example 2:* Two angles and One side – ASA

A pole tilts toward the sun at an 8 degree angle from the vertical, and it casts an 22 foot shadow. The angle of elevation from the tip of the shadow to the top of the pole is 43 degrees. How tall is the pole?

***Solution:***

Ambiguous Case (SSA) (page 430)

If given two sides and one angle, there are three possible situations:

1. No such triangle exists
2. One such triangle exists
3. Two distinct triangles exist

A is acute A is acute A is acute A is acute

Necessary a < h a = h a b h < a < b

condition

Triangle

Possible none one one two

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A is obtuse A is obtuse

Necessary b a a > b

condition

Triangle

Possible none one

Consider a triangle in which you are given a, b and A. (h = bsinA)

*Example 3*: Single Solution – SSA

For a triangle, a = 20 inches, b = 10 inches, and A = 38 degrees. Find the remaining sides and angles.

***Solution:***

**degree**

C = 180-17.93-38 = **124.07 degree**

*Example 4:* No Solution – SSA

Show that there is no triangle for which a = 15, b = 25, and A = 85 degrees.

***Solution:***

Example 5: Two Solution – SSA

Find two triangles for which a = 12, b = 31 and A = 20.5 degrees

***Solution:***

**Area of an Oblique Triangle**

Note/remember the height of a triangle can be found: h = b sin A

Example 6: Finding the Area of a Triangular Lot

Find the area of a triangular lot having two sides of lengths 90 and 52 and an included angle of 102 degrees.

***Solution:***

Example 7: An Application of the Law of Sines

The course for a boat race starts at point A (shown) and proceeds in the direction S 52 degrees to point B, then in the direction 40 degrees E to point C, and finally back to A. Point C lies 8 km directly south of point A. Approximate the total distance of the race course.

***Solution:***

**Homework**

Pg 434 #1, 4, 5, 7, 9, 25, 27, 39, 40, 45, 46, 49