**Solving Oblique Triangles**

 6.1 2 angles and any side (AAS) or (ASA)

*B*

*a*

*C*

*c*

*A*

*b*

 2 sides and angle opposite one of them (SSA)\* ambiguous case

 6.2 3 sides (SSS)

 2 sides and the included angle (SAS)

**Law of Sines (for any triangle)**

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

**Example: (AAS)**

*C*

32

*B*

*A*

45ᵒ

30ᵒ

 $a=32 ft$ $A=30ᵒ$

 $b=$ $B=45ᵒ$

 $c=$ $C=$

 to find angle *C* to find side *b* to find side *c*

**Application**

*Because of prevailing winds, a tree grows so that it was leaning* $6°$ *from vertical. At a point* $30$ *meters from the base of the tree, the angle of elevation to the top of the tree is* $22.5°$*. Find the height,* h*, of the tree.*



**The Ambiguous Case (SSA) – the number of possible triangles is 0 or 1 or 2.**

 **(When the first thing you are finding is an angle – Using the Law of Sines)**

Example: No Triangle

 $A=60°, a=4, b=14$ $a=4$ $A=60ᵒ$

 $b=14$ $B=$

 $c=$ $C=$

Example: Two Triangles

 $A=58°, a=4.5, b=5$ $a=4.5$ $A=58ᵒ$

 $b=5$ $B=$

 $c=$ $C=$

Example: One Triangle

 $A=31°, a=12, b=5$ $a=12$ $A=31ᵒ$

 $b=5$ $B=$

 $c=$ $C=$

**Area of a Triangle (given two sides and the included angle)**

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

Example: Find the area of a triangular lot containing two side lengths that measure 24 yards and 18 yards and form an angle of $80°$.

**Application – Law of Sines**

On a small lake, a person swims from point A to point B at a bearing of N28°E. The person than swims to a point C at a bearing of N58°W. Point C is 800 meters due North of point A. How many total meters does the person swim?

Example: *A pilot has just started on the glide path for landing at an airport with a runway of length 9000 ft. The angles of depression from the plane to the ends of the runway are* $17.5°$ *and* $18.8°$*.*

1. Draw a diagram that visually represents the situation.
2. Find the air distance the plane must travel until touching down on the near end of the runway.
3. Find the ground distance the plane must travel until touching down.
4. Find the altitude of the plane when the pilot begins the descent.

Example: *A plane flies 500 kilometers with a bearing of* $316°$ *from Naples to Elgin (see figure). The plane then flies 720 kilometers from Elgin to Canton (Canton is due west of Naples). Find the bearing of the flight from Elgin to Canton.*

C

N

E

720

500

north

44°

Example: *The bearing from the Pine Knob fire tower to the Colt Station fire tower is* $65°E$ *, and the two towers are 30 kilometers apart. A fire spotted by rangers in each tower has a bearing of* $N80°E$ *from Pine Knob and* $S70°E$ *from Colt Station. (see figure). Find the distance of the fire from each tower.*

Pine Knob

Colt Station

Fire

south

north

30 km

70°

65°

80°