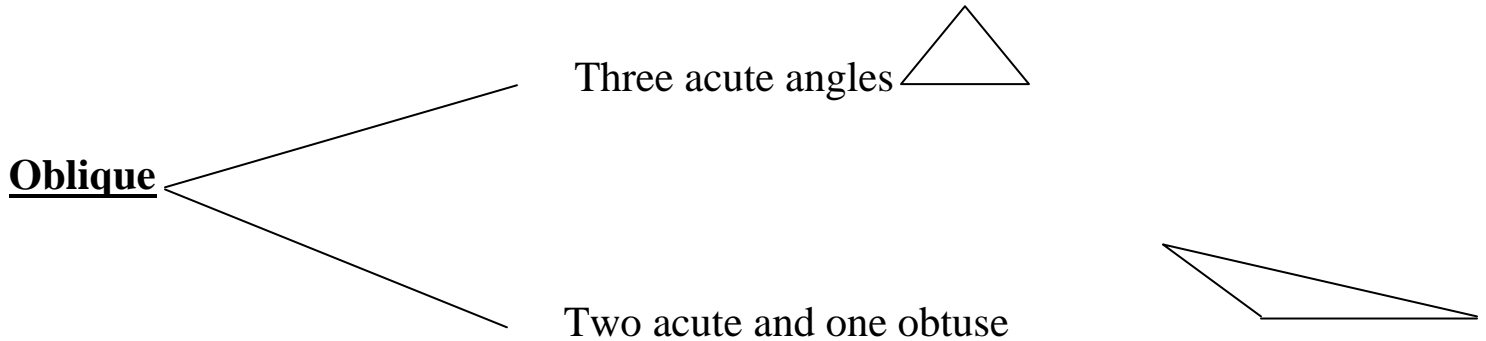
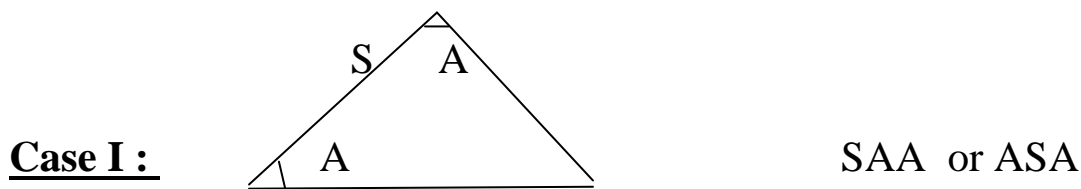


## Section 7.2: The Law of Sines

If none of the angles of a triangle is right angle. The triangle is called **Oblique**.



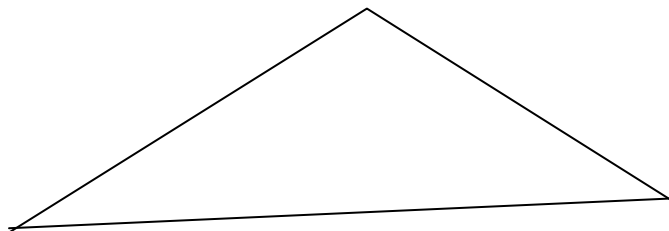
### To Solve Oblique Triangle:



Use law of Sine

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### Law Of Sines :



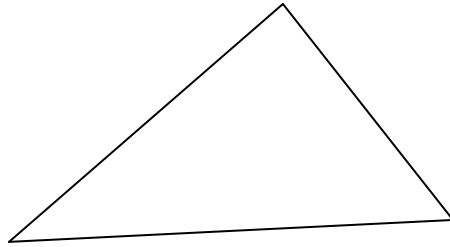
$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$$

**Ex:** In the triangle ABC , if  $\alpha = 40^\circ$  ,  $\beta = 60^\circ$  ,  $a = 4$  . Find  $b, c$ ?

**Ex:** In the triangle ABC , if  $\sin \beta = \frac{3}{4}$  ,  $b = 3$  ,  $a = 2$  . Find  $\sin \alpha$ ?

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**The Ambiguous Case:**



**I) If  $x < y$**

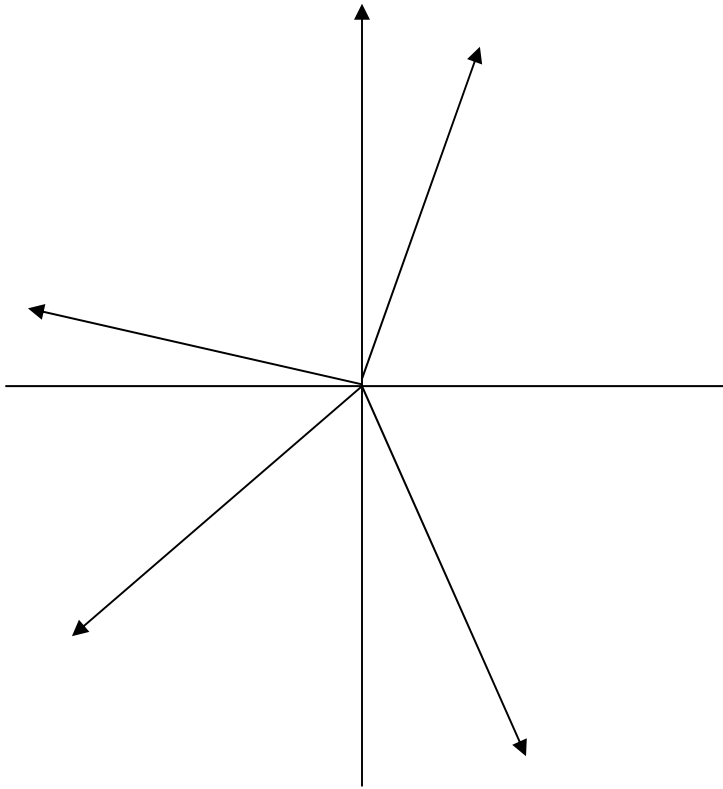
- 1)  $y \sin \theta < x \Rightarrow$  2 triangles
- 2)  $y \sin \theta = x \Rightarrow$  1 triangle (right)
- 3)  $y \sin \theta > x \Rightarrow$  No triangle

**II) If  $x \geq y \Rightarrow$  1 triangle**

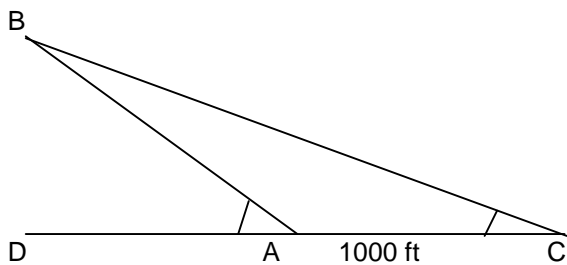
**EX:** How many triangles ABC can be constructed

- 1) with  $b = 2\sqrt{2}$  ,  $c = 4$  ,  $\beta = 45^\circ$  ?
  - 2) with  $a = 1$  ,  $b = \sqrt{3}$  ,  $\alpha = 30^\circ$  ?
  - 3) with  $a = \sqrt{3}$  ,  $c = 1$  ,  $\gamma = 60^\circ$  ?
  - 4) with  $a = 3$  ,  $b = 2$  ,  $\alpha = 140^\circ$  ?
- 

**Note:** In navigation and surveying, the direction or bearing from a point O to a point P equal to the acute angle  $\theta$  between the ray OP and the Vertical line through O , the North-South line



- 1- A point **P** on the level ground is 3 kilometers due north of a point **Q**. A runner proceeds in the direction  $N 25^\circ E$  from **Q** to a point **R**, then from **R** to **P** in the direction  $S 70^\circ W$ . Find the distance run.
- 2- Consult the figure. To find the length of the span of a proposed ski lift from **A** to **B**, a surveyor measures the angle  $DAB$  to be  $25^\circ$  and then walks off a distance of 1000 feet to **C** and measures the angle  $ACB$  to be  $15^\circ$ . What is the distance from **A** to **B**?



- 3- The angle of elevation of an airplane observed by two observers from two points **A** and **B** on level ground are  $40^\circ$  and  $35^\circ$  respectively. Point **A** and **B** are 1000 ft apart and the airplane is between the points, in the same vertical plane. **a-** How high is the airplane? **b-** Find the distance between the airplane and the observer at point **A**.
- 4- The angle of depression from a balloon to two points **A** and **B** on level ground are  $52^\circ$  and  $28^\circ$  respectively. Points **A** and **B** are 14 miles apart and the balloon is between the points, in the same vertical plane. Find the distance in miles between the balloon and the point **A**.