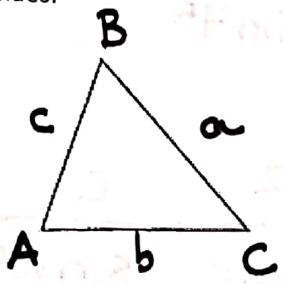
Notes 5.5 Law of Sines

Label the sides and angles of the following triangle. Use **A**, **B**, and **C** to denote angles and **a**, **b**, and **c** to denote sides.



To solve an Oblique Δ, you need to know the measure of at least one side and any two other measures of the triangle – either two sides, two angles, or one angle and one side. This breaks down into the following four cases.

1. Two angles and any side (AAS or ASA)
2. Two sides and angle opposite one of them (SSA)

→ Law of Sines (5.5)

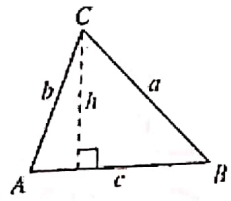
3. Three sides (SSS)
4. Two sides and their included angle (SAS)

→ Law of Cosines (5.6)

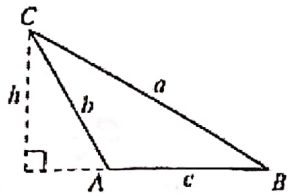
Law of Sines

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

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



A is acute.



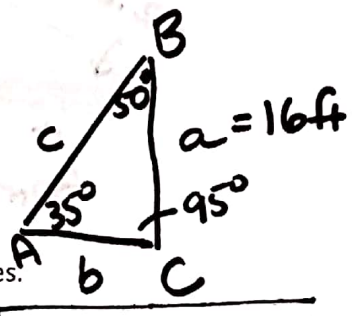
A is obtuse.

draw picture 1st!

Example #1 Given Two Angles and One Side - AAS

Solve Δ ABC

For triangle ABC, $A = 35°$, $B = 50°$, and $a = 16$ feet. Find the remaining angles and sides.



$m\angle C = 180 - (35 + 50)$

$180 - 85 = 95°$

$\frac{a}{\sin A} = \frac{16}{\sin 35°}$

$\frac{16}{\sin 35} = \frac{b}{\sin 50}$

$b \sin 35 = 16 \sin 50$

$b = \frac{16 \sin(50)}{\sin(35)} = 21.37$ FT

$\frac{16}{\sin 35} = \frac{C}{\sin 95}$

$16 \sin 95 = C \sin 35$

$C = \frac{16 \sin(95)}{\sin(35)}$

$m\angle C = 95°$

$b = 21.37$ ft

$C = 27.79$ ft

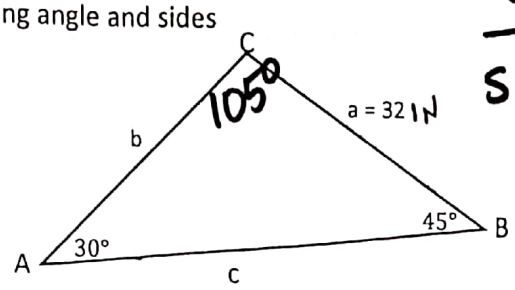
Checkpoint

Find the remaining angle and sides

$m\angle C =$

$b = 45.25$ in

$c = 61.82$ in



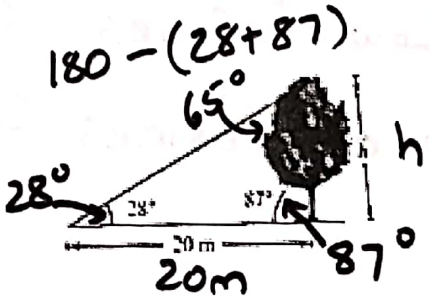
$m\angle C = 180 - (30+45)$

$$\frac{32}{\sin 30} = \frac{b}{\sin 45}$$

$$\frac{32}{\sin 30} = \frac{c}{\sin 105}$$

Example 2 Given Two Angles and One Side - ASA

Because of prevailing winds, a tree grew so that it was leaning 3° from the vertical. At a point 20 meters from the tree, the angle of elevation to the top of the tree is 28°. Find the height *h* of the tree.



$180 - (28+87)$

20m

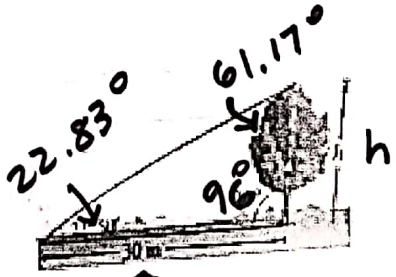
$$\frac{20}{\sin 65} = \frac{h}{\sin 28}$$

$$\frac{h \sin 65}{\sin 65} = \frac{20 \sin(28)}{\sin(65)}$$

$h = 10.36$ m

You try:

Find the height of the tree shown below.



30m

$$\frac{30}{\sin 61.17} = \frac{h}{\sin 22.83}$$

$h = 13.29$ m