6.1 – Law of Sines

Finding missing info in oblique $\triangle$'s (not a right $\triangle$)

Law of Sines — if the $\triangle$ info is AAS, ASA, SSA

Law of Cosines — SSS, SAS

Area of a $\triangle$ when you know 2 sides & angle between
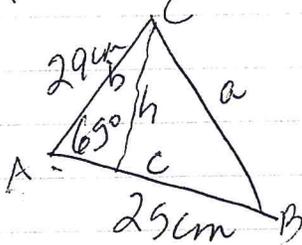
$$A = \frac{1}{2} \cdot 25 \cdot 29 \cdot \sin 65°$$
$$= \frac{1}{2} \overline{AB} \cdot \overline{AC} \cdot \sin A$$
$$= \frac{1}{2} bc \cdot \sin A$$

Law of Sines for any $\triangle ABC$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$
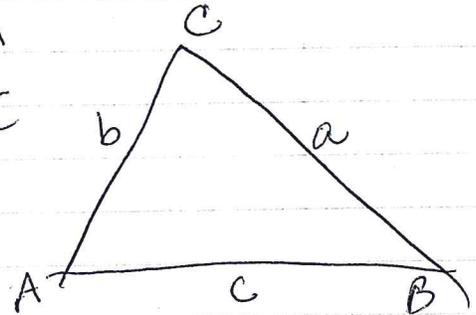
Given: ASA or SAA; plug and play it always works

EX) $\triangle ABC$, $A = 35°$, $B = 50°$ $a = 16$ ft
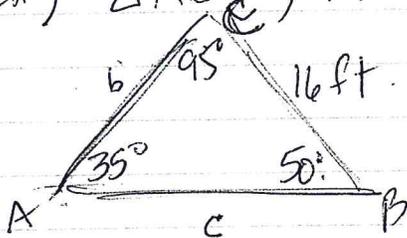
$\angle C = 95°$ ($\triangle$ Sum)

$$\frac{\sin 50°}{b} = \frac{\sin 35}{16} \qquad \frac{\sin 95°}{c} = \frac{\sin 35}{16}$$

$$\frac{b \cdot \sin 35°}{\sin 35°} = \frac{16 \cdot \sin 50°}{\sin 35°} \qquad c = \frac{16 \cdot \sin 95°}{\sin 35°}$$

$b \approx 21.369$ ft $\qquad c \approx 27.789$ ft.

SSA one Solution EX)

$h < b < a$
or $a > b$

$\angle A = 26°$
$b = 15$ in
$a = 24$ in

$$\frac{\sin B}{15} = \frac{\sin 26}{24}$$

$$\frac{24 \cdot \sin B}{24} = \frac{15 \cdot \sin 26}{24}$$
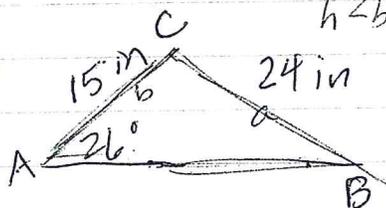
$$\sin^{-1}\left(\frac{15 \cdot \sin 26}{24}\right) = B$$

$B \approx 15.9°$

$$\frac{\sin 138.1°}{c} = \frac{\sin 26}{24} \qquad 138.1°$$

$$c \cdot \sin 26 = 24 \cdot \sin 138.1$$

$c \approx 36.563$ in

EX 4) Show that there is no $\triangle$ for which

$$A = 78°, \quad a = 7, \quad b = 35$$

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 78°}{7} = \frac{\sin B}{35}$$

$$\frac{35 \cdot \sin 78°}{7} = \sin B \qquad -1 \leq \sin \leq 1$$

$$4.89 = \sin B, \text{ no } \triangle.$$
$$\text{impossible,}$$
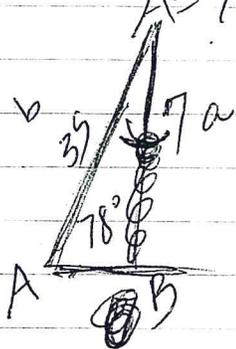
EX 5) Find 2 $\triangle$'s for which $A = 40°, \quad a = 12 \atop cm \quad b = 14 \atop cm$
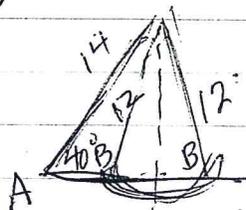
$$A = \frac{1}{2} b h$$
$$= \frac{1}{2} c \cdot \boxed{b \cdot \sin A}$$

$$14 \cdot \sin 40°$$
$$h < 12 < 14$$
$$h < a < b$$

$$\frac{\sin 40}{12} = \frac{\sin B}{14}$$

$$\frac{14 \cdot \sin 40}{12} = \sin B$$

$$\sin^{-1}\left(\frac{14 \cdot \sin 40}{12}\right) = B \qquad B \approx 48.583°$$
$$\text{or } B \approx 131.417°$$