Law of Sines/Law of Cosines

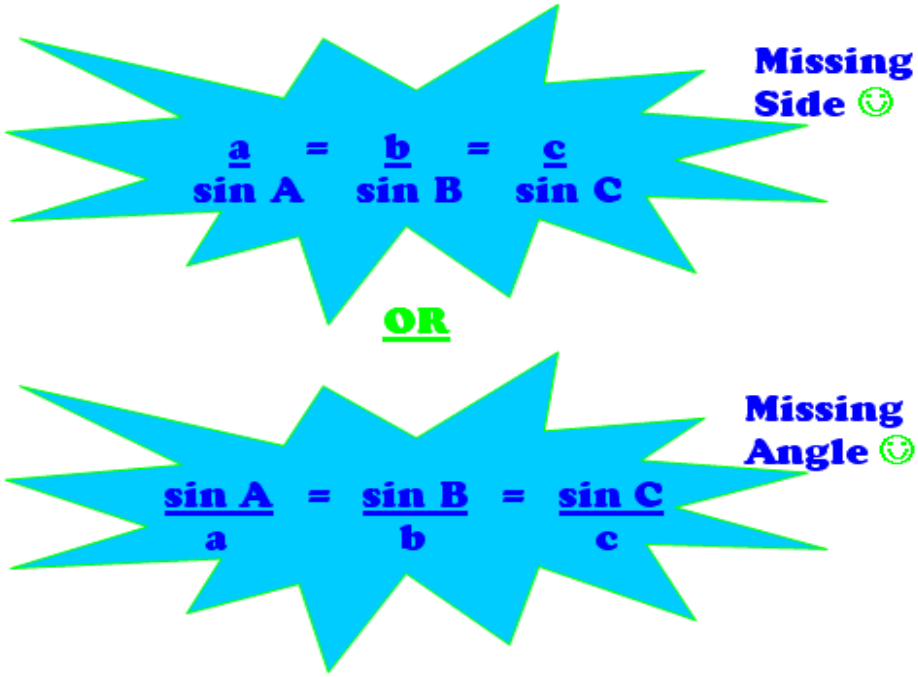
You now know how to solve for unknown angles and side lengths in a right-angled triangle.

How do we obtain missing measurements in oblique (non-right) triangles?

ANSWER:

- LAW OF SINES
- LAW OF COSINES

LAW OF SINES



Note: Any one proportional statement is all that is used at one time.

When will you use the Law of sines?

You will use the Law of Sines when:

A) **you are given two angles and a non-included side (AAS).**

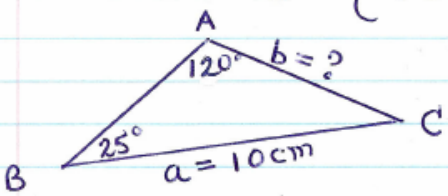
B) **you are given two angles and an included side (ASA).**

C) **you are given two sides and an angle opposite to one of them (SSA).**

LAW OF SINES EXAMPLES

1. To find a missing side:

A = 120° B = 25°
a = 10 b = ?



We have => "a", "A", & "B"

We are looking for => "b"

Therefore we can use:

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

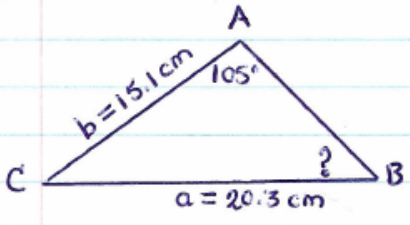
$$\frac{10}{\sin 120^\circ} = \frac{b}{\sin 25^\circ}$$ ("Cross multiply")

$$\frac{10 \sin 25^\circ}{\sin 120^\circ} = \frac{b \cancel{\sin 120^\circ}}{\cancel{\sin 120^\circ}}$$ (Solving for "b")

$$4.9 = b$$

The missing side "b" is 4.9 cm.

2. To find a missing angle:



We have => "a", "A", & "b".

We are looking for => "B"

Therefore we can use:

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

$$\frac{\sin 105°}{20.3} = \frac{\sin B}{15.1}$$ ("Cross Multiply")

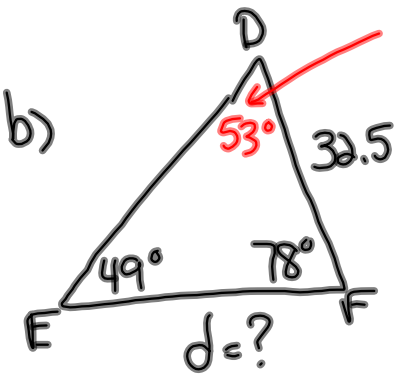
$$\frac{15.1 \sin 105°}{20.3} = \frac{20.3 \sin B}{20.3}$$ (Solving for "sin B")

$$0.7185 = \sin B$$

$$\sin^{-1}(0.7185) = B$$

$$46° = B$$

① b)



$180° - 78° - 49° = 53°$

$$\frac{d}{\sin D} = \frac{e}{\sin E}$$

$$\frac{d}{\sin 53°} = \frac{32.5}{\sin 49°}$$

$$\frac{d \sin 49°}{\sin 49°} = \frac{32.5(\sin 53°)}{\sin 49°}$$

$$d = 34.4$$

$$\frac{d}{0.7986} = \frac{32.5}{0.7547}$$

$$\frac{0.7547d}{0.7547} = \frac{(32.5)(0.7986)}{0.7547}$$

$$d = 34.4$$