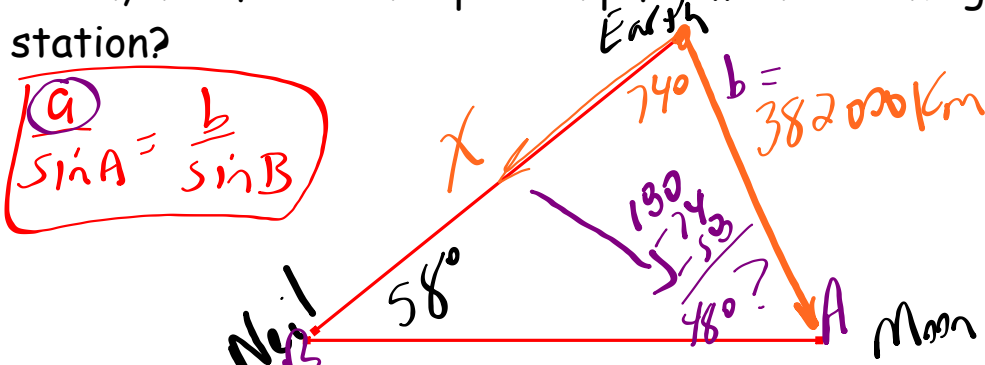# WARM-UP...

Ask yourself...

1. What am I given?
2. What am I trying to find?

EXAMPLE...

On a space flight, astronant Neil Armstrong reports that the angle formed by his lines of sight to the earth and to the moon was 58^0. At the same time, the observer on the earth reports that the angle formed by her lines of sight to the spaceship and to the moon is 74^0. If the moon is 382 000 km from the earth, how far is the spaceship from the tracking station?
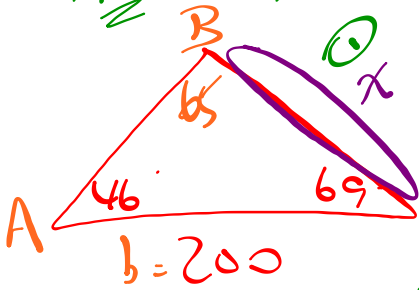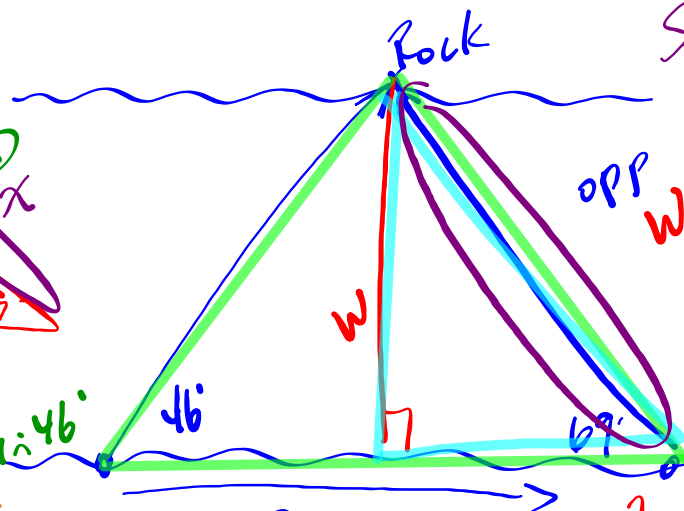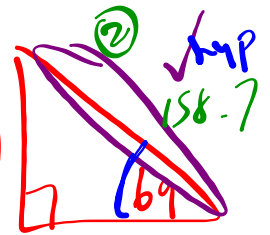
(a) $\dfrac{a}{\sin A} = \dfrac{b}{\sin B}$

Earth

74^0 $b = 382\,000\,km$

x

$\begin{matrix}180\\-74\\\overline{-58}\\48^0?\end{matrix}$

Neil! 58^0 A   Moon

B

$\dfrac{x \sin 48}{\sin 48} = \dfrac{382\,000 \sin 48}{\sin 58}$

$x = \boxed{\begin{array}{l}382000\sin(48)/\text{si}\\n(58)\\\quad\quad 334746.7256\\\blacksquare\end{array}}$

$x = 334746.7\,km$

HW. #3

SOH CAH TOA

Rock

B
65
Ⓧ
x

A   46°   69°

b = 200

Ⓞ

$$\frac{X}{\sin 46°} = \frac{200 \sin 46°}{\sin 65}$$

$$X = 158.7$$

46°

w

200

46°   69°

OPP
W

② ✓ hyp
158.7

69°

(158.7)

$158.7 \sin 69° = \dfrac{w}{158.7}$

$$\frac{w \sin 69}{\sin 69} = \frac{158.7 \sin 69}{(1) \sin 69} ②$$

148.2m = W

Law of Cosines

Derivation of the law of cosines...
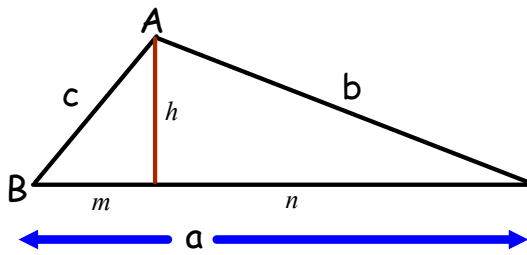
$$c^2 = h^2 + m^2 \quad \longleftarrow m = a - n$$

$$c^2 = h^2 + (a-n)^2$$

$$c^2 = h^2 + a^2 - 2an + n^2$$

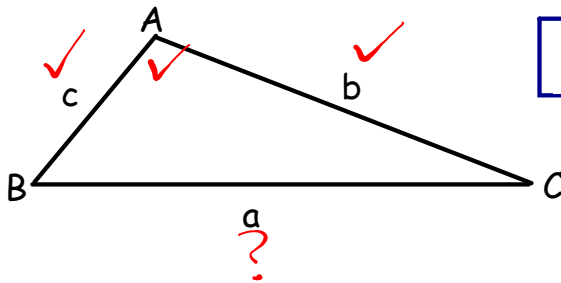$$c^2 = h^2 + n^2 + a^2 - 2an \quad \longleftarrow h^2 + n^2 = b^2$$

$$c^2 = b^2 + a^2 - 2an \quad \longleftarrow \cos C = \frac{n}{b}$$

$$\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad n = b \cos C$$

$$c^2 = a^2 + b^2 - 2a(b \cos C)$$

$$\boxed{c^2 = a^2 + b^2 - 2ab \cos C}$$

Finding an unknown side...
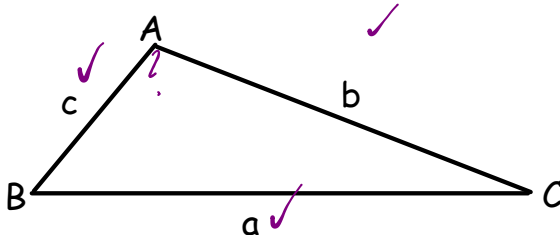- 2 sides and a contained angle (SAS)

$$\boxed{a^2 = b^2 + c^2 - 2bc\, \cos A}$$

$$\frac{2bc \cos A}{2bc} = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

Finding an unknown angle...
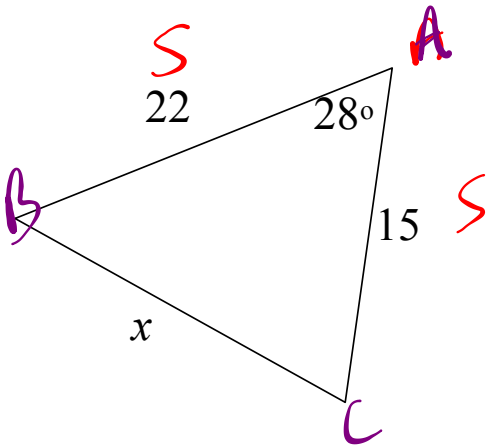- 3 known sides (SSS)

unknown angle

opposite to unknown

$$\boxed{\cos A = \frac{b^2 + c^2 - a^2}{2bc}}$$

EXAMPLE: Finding an unknown side.
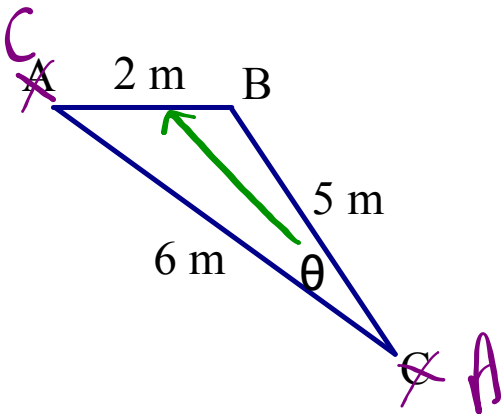

Need **SAS**

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$x^2 = 15^2 + 22^2 - 2(15)(22)\cos 28$$

$$\sqrt{x^2} = \sqrt{126.3}$$

$$x = 11.2$$

EXAMPLE: Finding an unknown angle.

Need **SSS**

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{6^2 + 5^2 - 2^2}{2(6)(5)}$$

$$\cos^{-1} \cos A = \cos^{-1}\left(\frac{57}{60}\right)$$

$$\cos^{-1} \cos A = \cos^{-1}(0.95)$$

$$\angle A = 18°$$

4

HW: 10.11 → # 1-7