

WARM-UP...

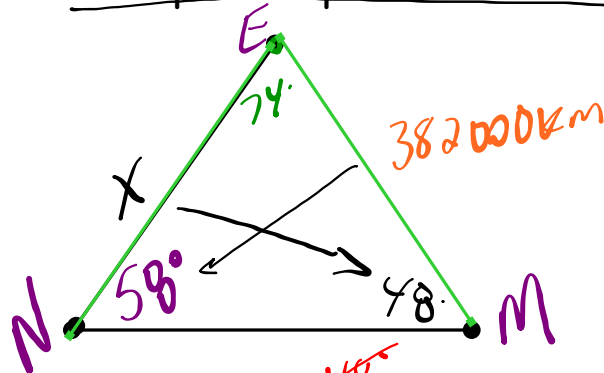
Ask yourself...

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



EXAMPLE...

On a space flight, astronaut Neil Armstrong reports that the angle formed by his lines of sight to the earth and to the moon was 58° . 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° . If the moon is 382 000 km from the earth, how far is the spaceship from the tracking station?



unknown side

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

unknown angle

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

$$\frac{X}{\sin 74^\circ} = \frac{382000 \sin 48^\circ}{\sin 58^\circ}$$

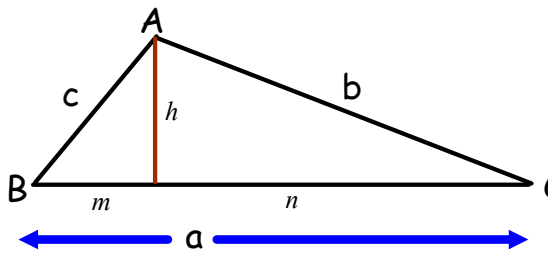
$$X = \frac{382000 * \sin(48) / \sin(58)}$$

$$X = 334746.7256$$

$$X = 334746.7 \text{ km}$$

Law of Cosines

Derivation of the law of cosines...



$$c^2 = h^2 + m^2 \leftarrow m = a - n$$

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

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

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

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

$$n = b \cos C$$

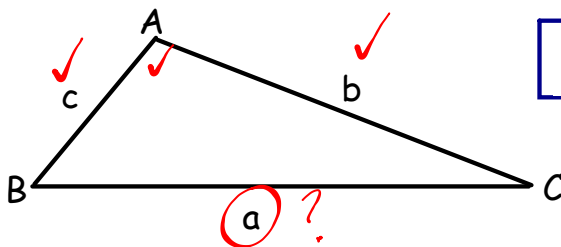
$$c^2 = a^2 + b^2 - 2a(b \cos C)$$

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

Law of Cosines

Finding an unknown side...

- 2 sides and a contained angle (SAS)



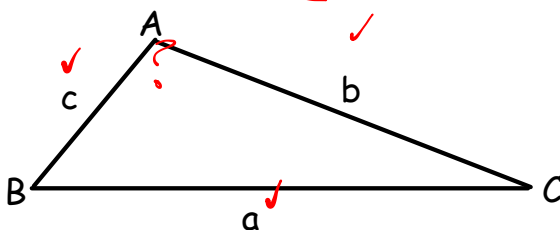
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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

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

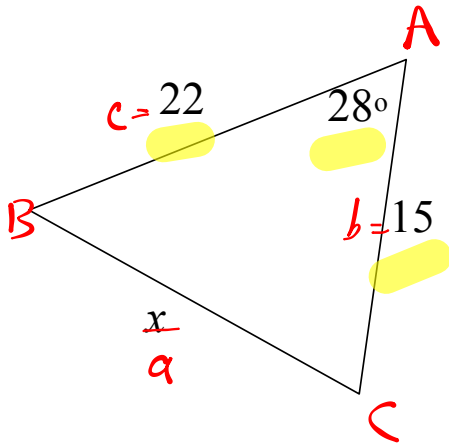
Finding an unknown angle...

- 3 known sides (SSS)



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

EXAMPLE: Finding an unknown side



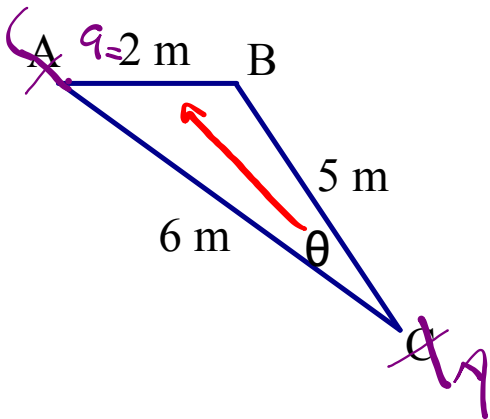
$$a^2 = b^2 + c^2 - 2bc \cos A$$

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

a^2	$15^2 + 22^2 - 2 * 15 * 22 \cos(28)$
	126.2545887
a	$\sqrt{\text{Ans}}$
	11.23630672

$a = 11.2$

EXAMPLE: Finding an unknown angle



unknown

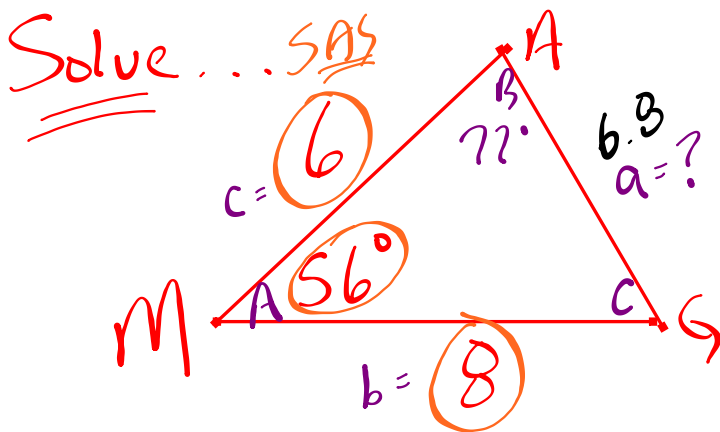
$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

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

$$\cos \theta = \frac{57}{60}$$

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

$$\theta = 18^\circ$$



$\angle A = ?$

$\angle C = ?$

$m = ?$

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

$m^2 = 8^2 + 6^2 - 2(8)(6)\cos 56^\circ$

$m^2 = \begin{matrix} 8^2 + 6^2 - 2 * 8 * 6 * \cos(\\ 56^\circ \end{matrix}$
 $\sqrt{\text{Ans}} = 46.31748127$
 $m = 6.805694767$
 $m = 6.8$

$\frac{8 \sin A}{8} = \frac{8 \sin 56^\circ}{6.8}$

$\sin^{-1} \sin A = \sin^{-1}(0.9753)$
 $\angle A = 77^\circ$

$\angle C = 180 - 56 - 77$
 $\angle C = 47^\circ$

Homework...

10.11
~~Worksheet~~ - Law of Cosines.doc

#1, 2, 3, 4, 5ac, 6a, 7ab

Attachments

Worksheet - Law of Cosines.doc