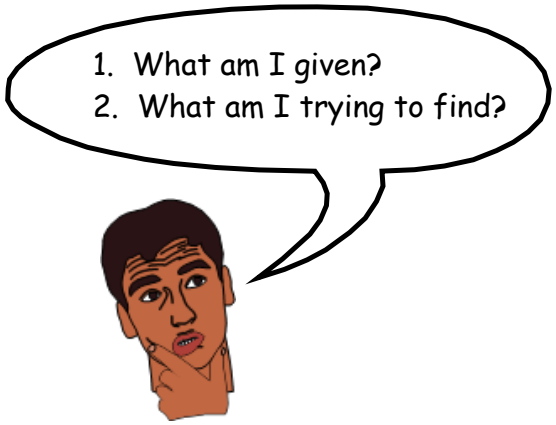
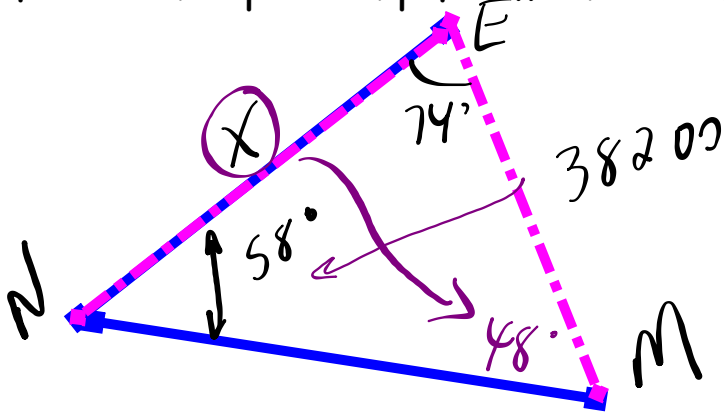
WARM-UP...

Ask yourself...



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?

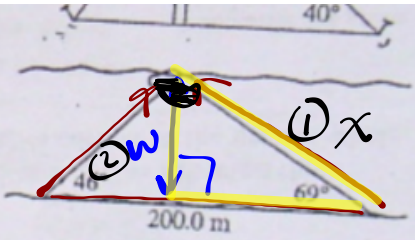


$\frac{a}{\sin A} = \frac{b}{\sin B}$

$\frac{X}{\sin 48} = \frac{382\,000}{\sin 58^\circ}$

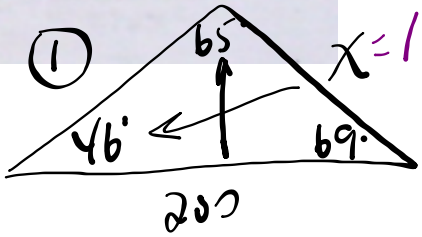
$X = 334746.1$ km

3 Along one bank of a river with parallel banks, a surveyor places a base line measuring 200.0 m as shown. From each end of the base line, a rock is sighted on the other bank of the river. The lines of sight of the rock make angles of 46° and 69° with the base line. Find the width of the river.



① $\frac{x}{\sin 46} = \frac{200}{\sin 65}$

$x = 158.7$

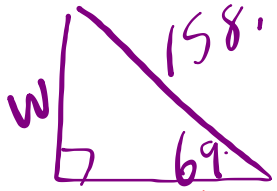


② $\sin 69° = \frac{w}{158.7}$

$158.7 \sin 69° = w$

$148.2\text{m} = w$

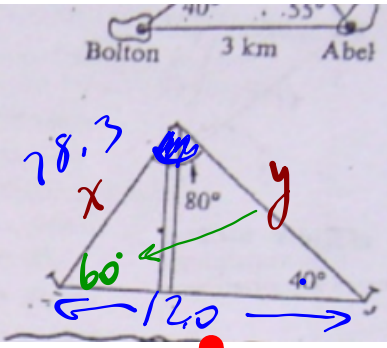
OR



$\frac{w}{\sin 69°} = \frac{158.7}{\sin 90°}$

$w = 158.7 \sin 69°$

2 A post is supported by two wires, as shown, in opposite directions forming an angle of 80° at the top of the post. The ends of the wire at the ground are 12.0 m apart with one wire forming an angle of 40° with the ground. Find the lengths of the wires.



3 Along one bank of a river with parallel

$\frac{x \sin 40^\circ}{\sin 40^\circ} = \frac{12.0 \sin 40^\circ}{\sin 80^\circ}$

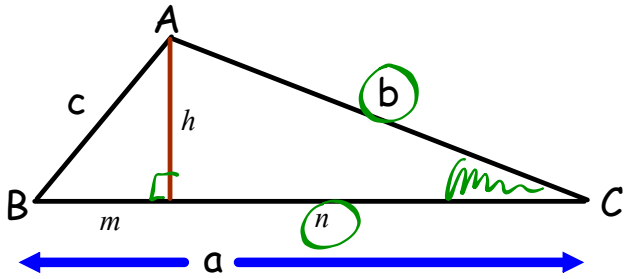
$x = 7.8\text{ m}$

$\frac{y \sin 60^\circ}{\sin 60^\circ} = \frac{12.0 \sin 60^\circ}{\sin 80^\circ}$

$y = 10.6\text{ m}$

Law of Cosines

Derivation of the law of cosines...



Pythagorus

$c^2 = h^2 + m^2$ ← $m = a - n$

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

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

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

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

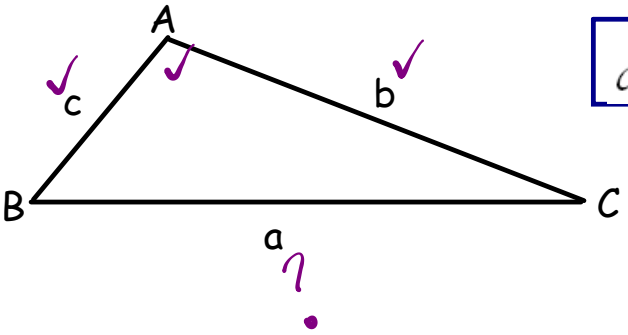
$n = b\cos C$

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

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

Finding an unknown side...

- 2 sides and a contained angle (SAS) ← 2 sides & angle between them



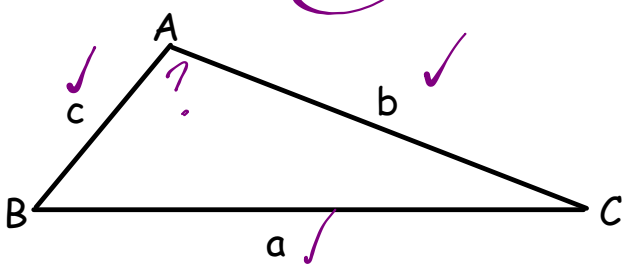
$$a^2 = b^2 + c^2 - 2bc\cos A$$

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

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

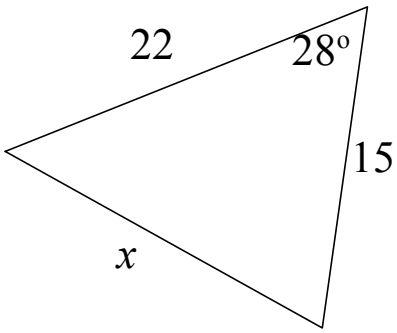
Finding an unknown angle...

- 3 known sides (SSS)



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

EXAMPLE: Finding an unknown side.



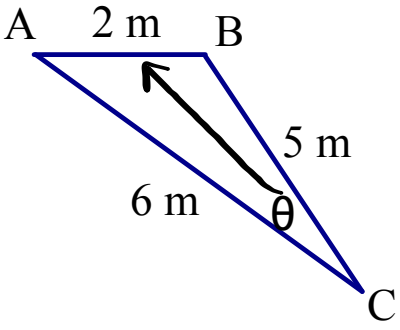
$a^2 = b^2 + c^2 - 2bc \cos A$

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

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

$x = 11.2$

EXAMPLE: Finding an unknown angle.



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

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

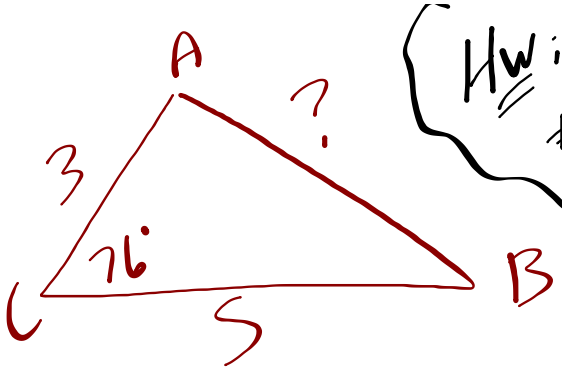
$\cos\theta = \frac{6^2 + 5^2 - 2^2}{2(6)(5)}$

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

$\theta = 18°$

10.11

1a)

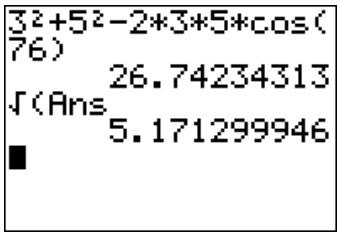


HW: 10.11 #1, 2, 5, 7

$c^2 = 3^2 + 5^2 - 2(3)(5)\cos 76°$

$c^2 =$

$c =$



$c \approx 5.2$