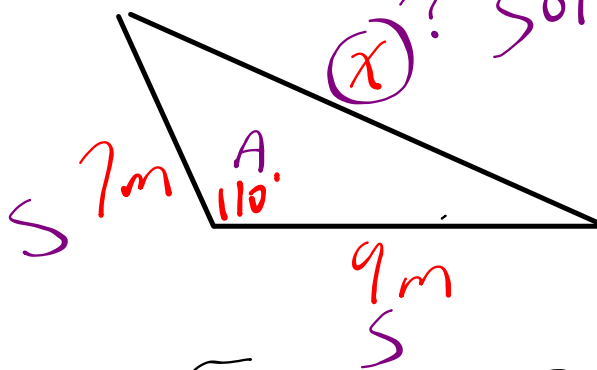· Warm-up ... Find x

(x)? Solve

$$\frac{x}{\sin 110°} = \frac{9}{\sin ?}$$

S 7m A. 110°

9m
S

$x^2 = 49 + 81 - (-43.1)$

$x^2 = 173.1$

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

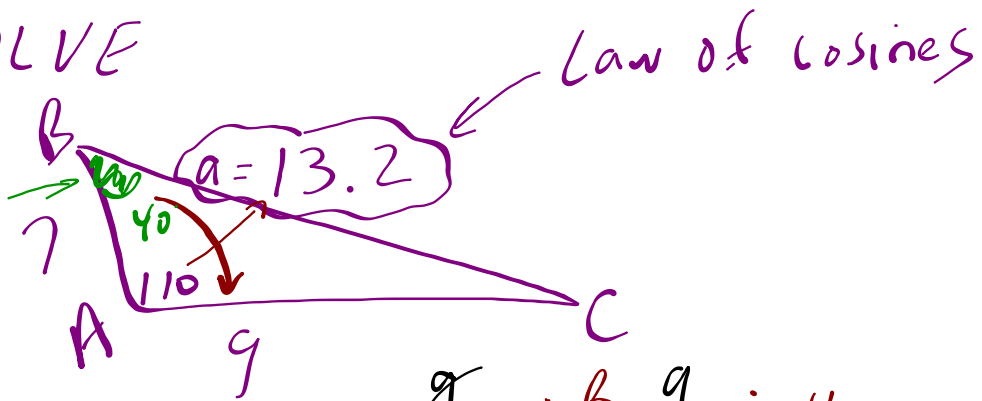$x^2 = 7^2 + 9^2 - 2(7)(9)\cos 110°$

$\sqrt{x^2} =$

```
7²+9²-2*7*9*cos(
110)
          173.0945381
√(Ans
          13.15653974
```

$x =$

$x = 13.2 m$

ex: SOLVE

Law of Cosines

Law of Sines

❌ OR

Law of Cosines

$a = 13.2$

B ▪ 40

40

7

110

A 9 C

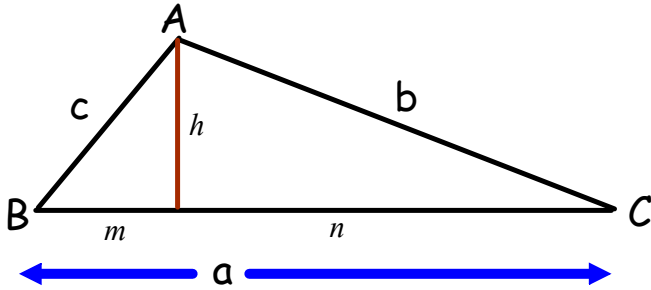$\angle C = 180 - 110 - 40$

$\angle C = 30°$

$\dfrac{\sin B}{9} = \dfrac{\sin 110}{13.2}$

$\sin^{-1} \sin B = (0.6407)$

$\sin^{-1}$

$\angle B = 40°$

Law of Cosines

Derivation of the law of cosines...

A diagram of triangle ABC with vertex A at top. Sides: c from B to A, b from A to C, and base a from B to C. An altitude h drops from A to the base, dividing a into segments m (left) and n (right).
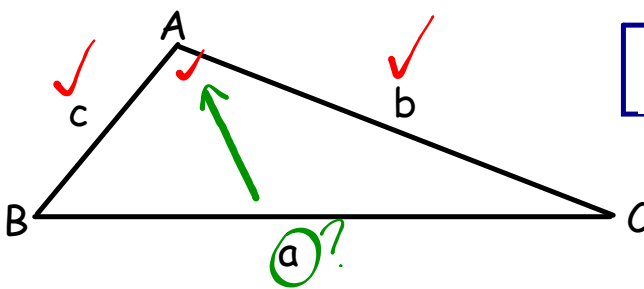
LAW of COSINES

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

Angle is between
the 2 known sides

Triangle ABC with sides c, b and angle a circled with a question mark.
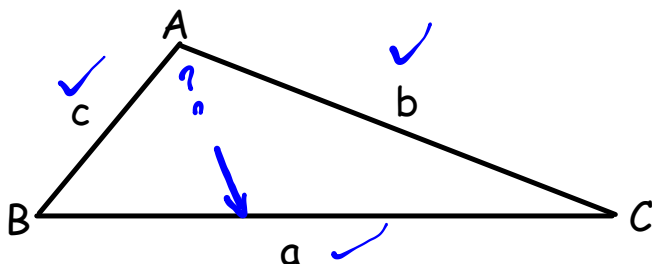
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\frac{2bc \cos A}{2bc} = \frac{b^2 + c^2 - a^2}{2bc}$$
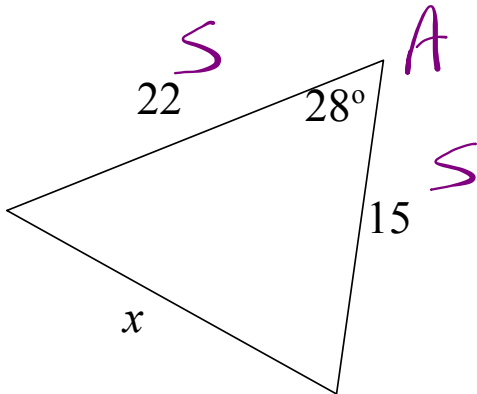
subtract the
side opposite
to unknown
angle

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

Triangle ABC with sides c, b, a and unknown angle at A.

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

3

EXAMPLE: Finding an unknown side. $a^2 = b^2 + c^2 - 2bc\cos A$

S   A
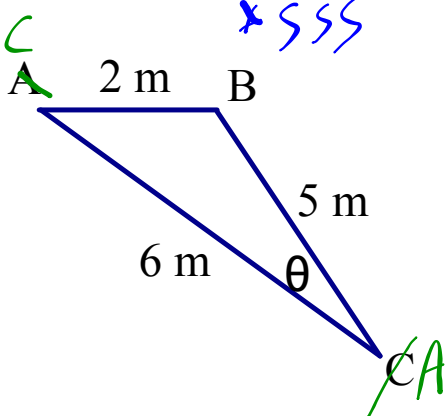22   28°
              S
         15

x

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

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

$$X = 11.2$$

EXAMPLE: Finding an unknown angle. $\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$

C
A   2 m   B
X SSS
          5 m
6 m   θ
           CA

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

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

$$\theta = 18°$$

Application Questions - Law of Cosines

Ask yourself...

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

EXAMPLE...

A hockey net is 1.83m wide. A player shoots from a point where the puck is 13m from one goal post and 11.5m from the other. Within what angle must he make his shot to score?

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

1.83

13   11.5 θ

$$\cos \theta = \frac{13^2 + 11.5^2 - 1.83^2}{2(13)(11.5)}$$

$$\cos^{-1} \cos \theta = \cos^{-1}\left(\frac{297.9011}{299}\right)$$

$$\theta = 4.9°$$

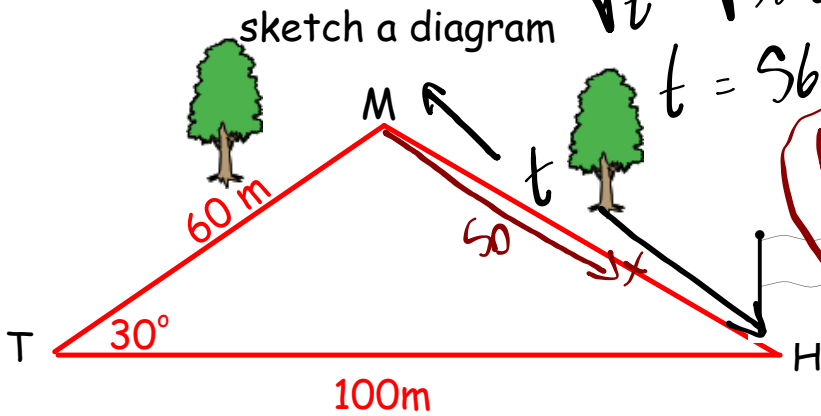Example #2: $$\left(a^2 = b^2 + c^2 - 2bc\cos A\right)$$

From T, a golfer aims a ball towards the hole at H which is 100m away. But the ball actually sliced in a direction $30°$ off course and lands at M, 60m away. If the next shot is hit 50 m towards the hole, will the ball go in the hole?

$$t^2 = 100^2 + 60^2 - 2(100)(60)\cos 30°$$
$$\sqrt{t^2} = \sqrt{3207.7}$$
$$t = 56.6m$$

Not in the
hole, 6.6m
short

sketch a diagram

M

60 m

50

t

$30°$

T

100m

H

Homework...

Worksheet - Law of Cosines.doc   QUESTIONS???

10.11 (Skills)

1, 2, 5ac, 7ab

10.12 (Word Problems)

#1, 2, 5, 6

Attachments

Worksheet - Law of Cosines.doc