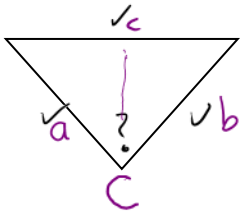
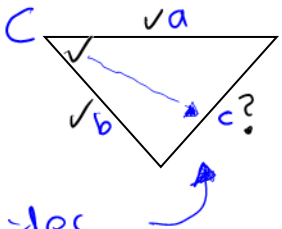
5.6: Cosine Law

Learning Goal: We are learning to use the Cosine law to solve problems involving non-right triangles.

When do you use cosine law?

- non-right
- SSS
- SAS





For Sides: In order to solve for a side, you need to know two sides

AND the angle inbetween them

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

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

$b^2 = a^2 + c^2 - 2ac\cos B$

Left side of equal sign = side you are trying to find

Right side of equal sign = the other 2 sides + the opposite angle.

For Angles: In order to solve for an angle, you need to know 3 side lengths

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

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

$\cos B = \frac{a^2+c^2-b^2}{2ac}$

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

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

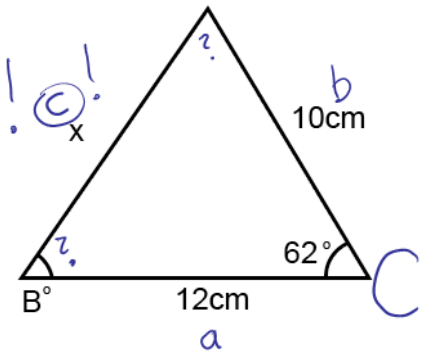
$-c^2 \quad -c^2$

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

Left side of equal sign = Cos of the angle you are trying to find

Right side of equal sign = the 3 sides

Solve for x (side)



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

$c^2 = (12)^2 + (10)^2 - 2(12)(10) \cos 62$

$c^2 = 144 + 100 - 240 \cos 62$

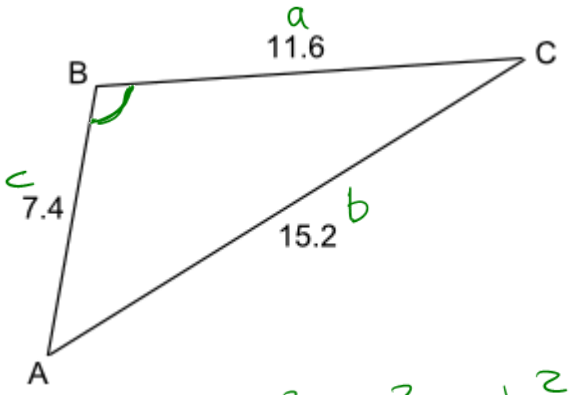
$c^2 = 244 - 112.6732$

$\sqrt{c^2} = \sqrt{131.3268}$

$c = 11.459$

$c = 11.5 \text{ cm}$

Solve for B (angle)



$\cos B = \dfrac{a^2 + c^2 - b^2}{2ac}$

$\cos B = \dfrac{(11.6)^2 + (7.4)^2 - (15.2)^2}{2(11.6)(7.4)}$

$\cos B = \dfrac{-41.72}{171.68}$

$\cos B = -0.2430$

$B = \cos^{-1}(-0.2430)$

$B = 104^\circ$

Success Criteria

- I can use the cosine law to solve for a missing angle or side length in a non-right triangle
- I can recognize when to use the cosine law: SAS or SSS