

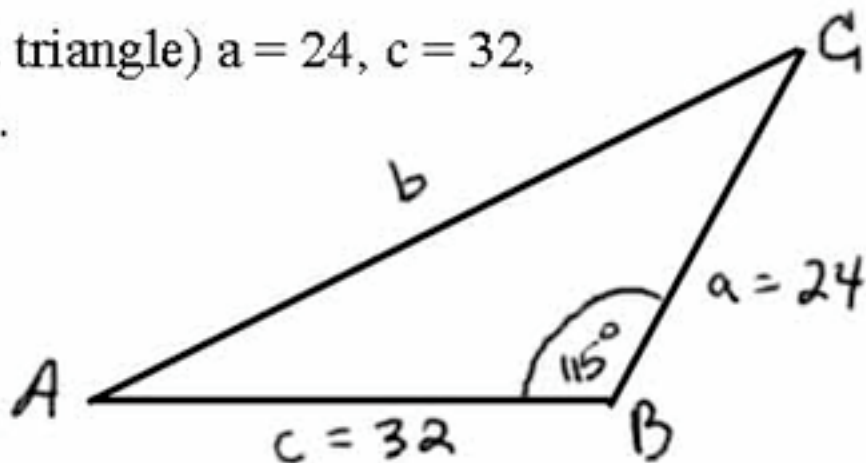
The Law of Cosines is used to solve triangles that are not right triangles.

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

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

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

Ex 1) In $\triangle ABC$ (not a right triangle) $a = 24$, $c = 32$,
and $\angle B = 115^\circ$, find side b .



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

$$b^2 = 24^2 + 32^2 - 2(24)(32)(\cos 115^\circ)$$

$$b^2 = 576 + 1024 - (1536 \cdot \cos 115^\circ)$$

$$b^2 = 1600 - (1536)(-0.4226)$$

$$b^2 = 1600 - (-649.1136)$$

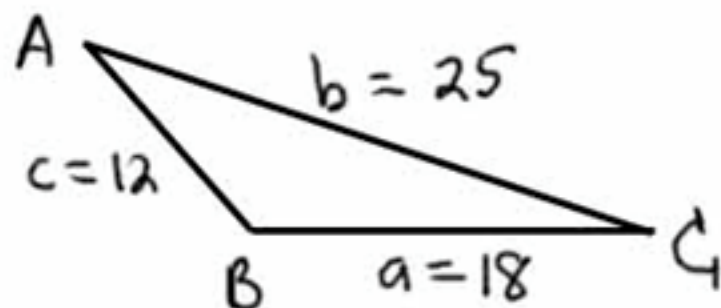
$$b^2 = 1600 + 649.1136$$

$$b^2 = 2249.1136$$

$$b = 47.4248$$

$$b \approx 47.4$$

Ex 2) In $\triangle ABC$ (not a right triangle) $a = 18$, $b = 25$, and $c = 12$. Find $\angle B$.



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

$$25^2 = 18^2 + 12^2 - [(2)(18)(12)(\cos B)]$$

$$625 = 324 + 144 - [432 \cos B]$$

$$625 = 468 - (432 \cos B)$$

$$\underline{157} = \underline{-432 \cos B}$$

$$\underline{-432} \quad \underline{-432}$$

$$-0.3634 = \cos B$$

$$B = \cos^{-1}(-0.3634)$$

$$B = 111.3^\circ$$

The most common use of the Law of Cosines is in triangles that are not right triangles where you have:

- 1) two sides and an included angle (SAS) and wish to solve for the other side or the other angles, or
- 2) the lengths of all three sides (SSS) and wish to solve for angles

...as we have seen in the two examples above.