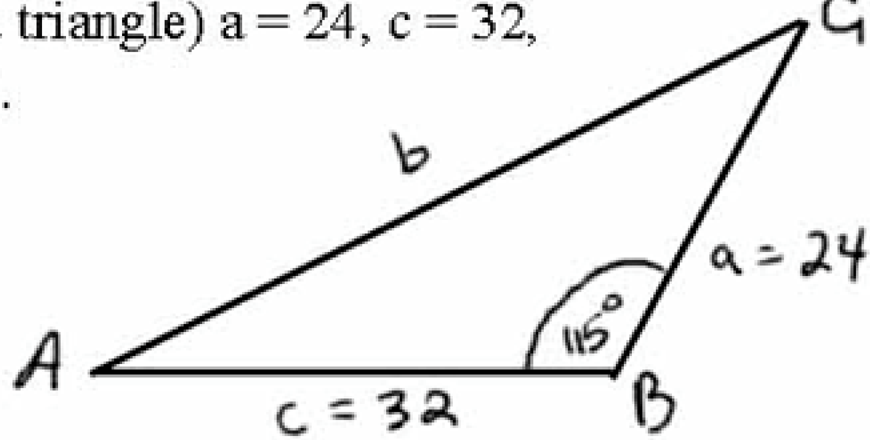
The Law of Cosines is used to solve triangles that are not right triangles.

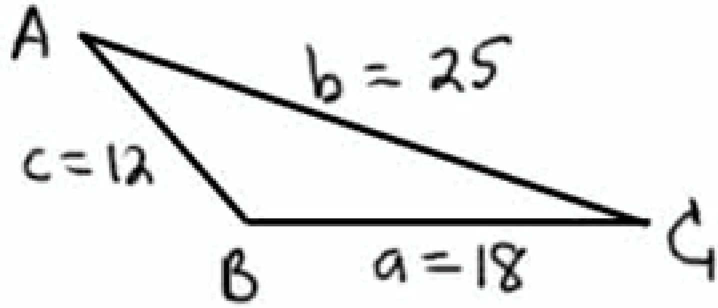
$$\boldsymbol{a^2 = b^2 + c^2 - 2bc \cos A}$$
$$\boldsymbol{b^2 = a^2 + c^2 - 2ac \cos B}$$
$$\boldsymbol{c^2 = a^2 + b^2 - 2ab \cos C}$$

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



$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$b^2 = 24^2 + 32^2 - 2(24)(32)(\cos 115°)$$
$$b^2 = 576 + 1024 - (1536 \cdot \cos 115°)$$
$$b^2 = 1600 - (1536)(-0.4226)$$
$$b^2 = 1600 - (-649.1136)$$
$$b^2 = 1600 + 649.1136$$
$$b^2 = 2249.1136$$
$$b = 47.4248$$
$$b \doteq 47.4$$

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



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

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

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

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

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

$$-0.3634 = \cos B$$

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

$$B = 111.3^\circ$$

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.