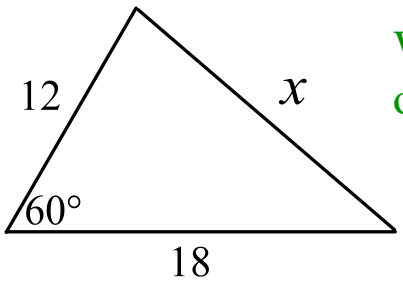
b) Law of Cosines

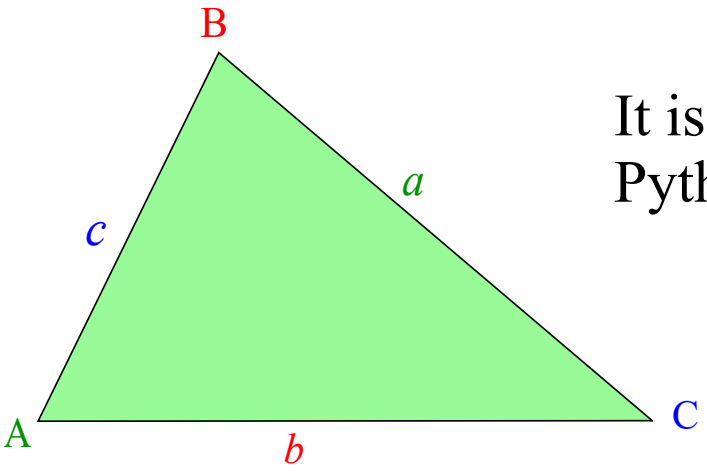
given:

i) Two sides and the included angle (SAS)



We can find the length of the side opposite the given angle.

Law of Cosines



It is derived from the Pythagorean theorem.

To determine the length of a side

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

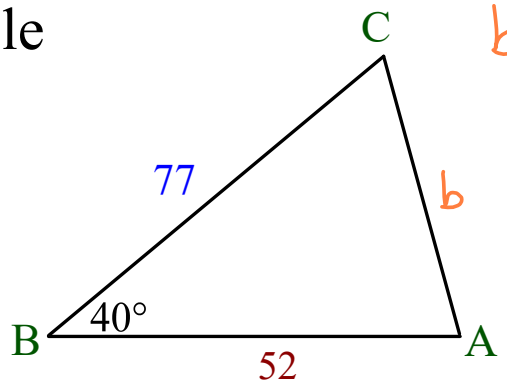
or

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

or

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

Example



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

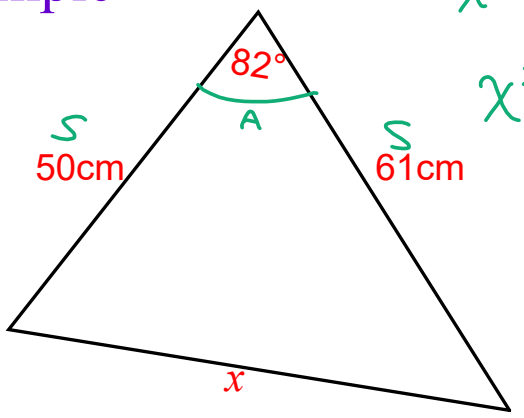
$b^2 = 77^2 + 52^2 - 2(77)(52)\cos(40°)$

$b^2 = 2498.5161$

$b = \sqrt{2498.5161}$

$b = 49.99$ units

Example



$x^2 = 50^2 + 61^2 - 2(50)(61)\cdot\cos 82°$

$x^2 = 5372.044$

$x = \sqrt{5372.044}$

$x = 73.29$ cm