# Law of Cosines: Question 9

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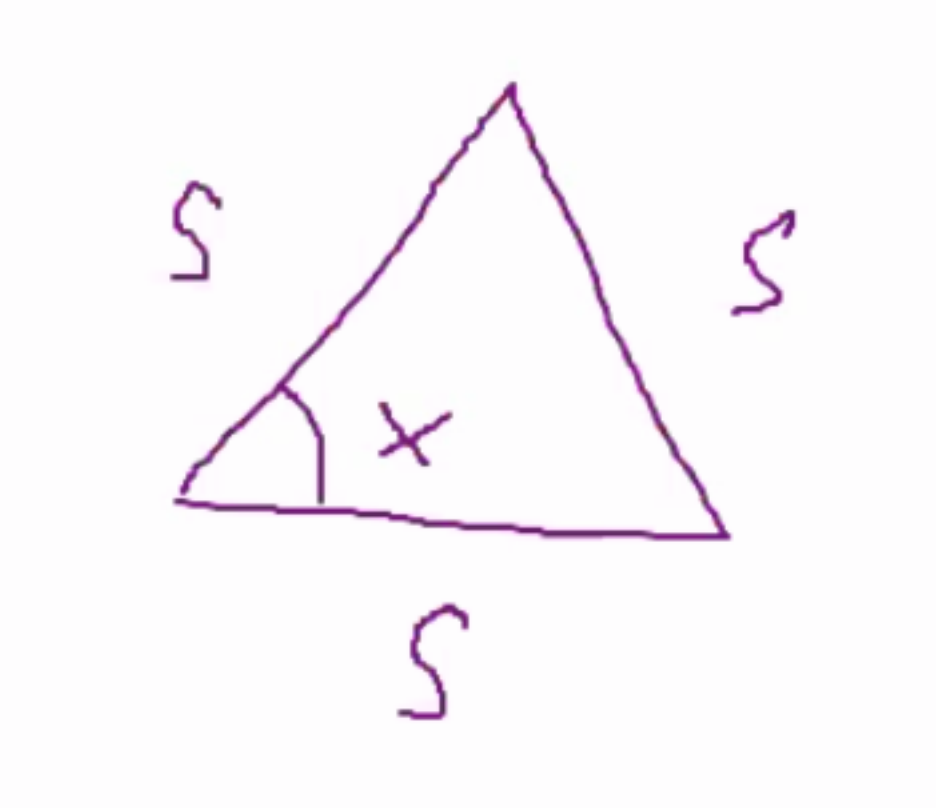
We first need to know that we are working with an equilateral triangle. This means that all the sides are equal to each other. See the visualization below. We can start by setting up the law of cosines for finding angle X.

Figure 1: Equilateral Triangle



$$s^2 = s^2 + s^2 - 2s^2 cos(x) \tag{1}$$
$$s^2 = 2s^2 - 2s^2 cos(x) \tag{2}$$
$$s^2 = 2s^2(1 - cos(x)) \tag{3}$$
$$\frac{1}{2} = (1 - cos(x)) \tag{4}$$

Using the identity $sin(x) + cos(x) = 1$, we can then substitute the $(1 - cos(x))$ with $sin(x)$ .

$$\frac{1}{2} = sin(x) \tag{5}$$
$$x = sin^{-1}(\frac{1}{2}) \tag{6}$$
$$x = 60^\circ \tag{7}$$

Since all the sides are equal to s, we can set up the same Law of Cosines equality to find the other two angles and the result for all angles $x^\circ$ will be equal to $60^\circ$ .