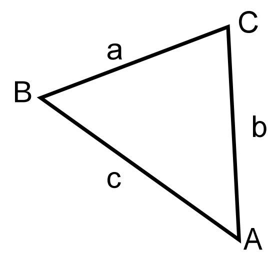
You need to memorize this :

Law of Cosines



For any ΔABC,

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

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

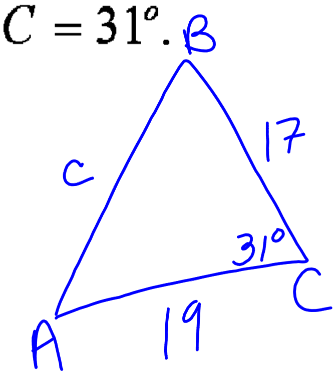
$$c^2 = a^2 + b^2 - 2ab\cos C$$

A Proof of Law of Cosines

http://www.themathpage.com/aTrig/law-of-cosines.htm#proof

Law of Cosines Examples

1. *Given* $\Delta ABC; a = 17, b = 19, \angle C = 31^o$.
Find c to the nearest tenth.



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

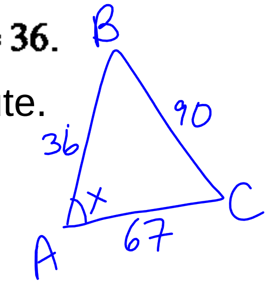
$$\sqrt{c^2} = \sqrt{17^2 + 19^2 - 2(17)(19)\cos 31^\circ}$$

$$c = \sqrt{96.26992375}$$

$$c \approx 9.8\,u$$

2. *Given* $\Delta ABC; a = 90, b = 67, c = 36.$

Find $\angle A$ to the nearest minute.



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

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

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

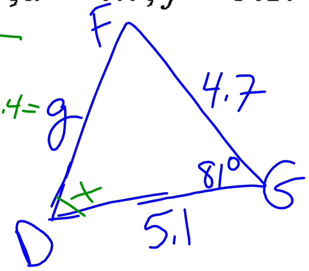
$$\cos A = \left(\frac{90^2 - 67^2 - 36^2}{-2(67)(36)}\right)$$

$$\cos A = -.4798922056$$

$$A = \cos^{-1}(-.4798922056)$$

$$\boxed{A = 118^\circ 41'}$$

3. *Solve* ΔDFG. *Given* $\angle G = 81°; d = 4.7; f = 5.1.$



$$\sqrt{g^2} = \sqrt{(4.7)^2 + (5.1)^2 - 2(4.7)(5.1)\cos 81^\circ}$$

$$\boxed{g \approx 6.4\text{ u}}$$

now use law of sines

$$\frac{\sin 81^\circ}{6.4} = \frac{\sin X}{4.7}$$

$$\frac{\cancel{6.4}\sin x}{\cancel{6.4}} = \frac{(4.7)\sin 81^\circ}{6.4}$$

$$x = \sin^{-1}\left(\frac{4.7\sin 81^\circ}{6.4}\right)$$

$$x = 46^\circ 30'$$

$$\boxed{\angle D = 46^\circ 30'}$$

$$F = 180^\circ - 81^\circ - 46^\circ 30'$$

$$\boxed{\angle F = 52^\circ 30'}$$