More Trig – Law of Cosines

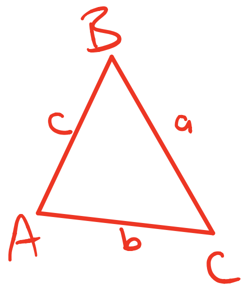
Notes Section 10.3 Name_______________

<u>Law of Cosines:</u> Let ΔABC be any triangle with a, b, and c representing the measures of sides opposite angles with measures A, B, and C respectively. Then, the following equations hold true.

$a^2 = b^2 + c^2 - 2bc\cos(m\angle A)$

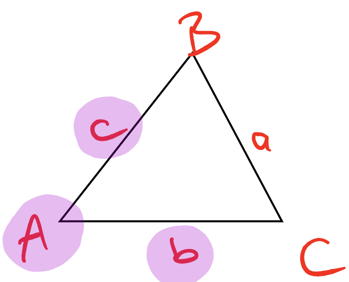
$b^2 = a^2 + c^2 - 2ac\cos(m\angle B)$

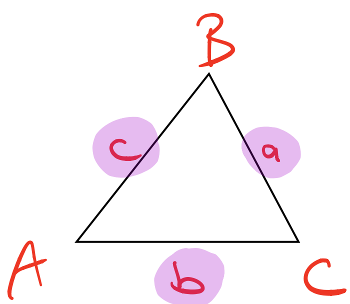
$c^2 = a^2 + b^2 - 2ab\cos(m\angle C)$



<u>The law of cosines can be used to solve a triangle in the following cases.</u>

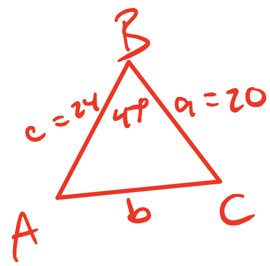
1. To find the measure of the third side of any triangle if the measures of the two sides and the included angle are given.
2. To find the measure of an angle of a triangle if the measures of the three sides are given. (If you are given SSS, **YOU CANNOT USE SINES TO FIND THE *LARGEST* ANGLE.**)





For the following examples, round the sides to the nearest tenth and the angles to the nearest whole number.

#1) In ΔABC if a = 20, c = 24, and m∠B = 47°, find b.



$b^2 = a^2 + c^2 - 2ac \cdot \cos(m\angle B)$

$b^2 = (20)^2 + (24)^2 - 2(20)(24)\cos(47^\circ)$

$b^2 = 400 + 576 - 960\cos(47^\circ)$

$b^2 = 976 - 960\cos(47^\circ)$

$b = \pm\sqrt{976 - 960\cos(47^\circ)}$

$b \approx 17.9$

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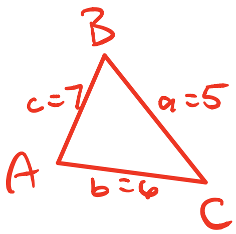
#2) In ΔABC if a = 5, b = 6, and c = 7, find m∠C.



$$c^2 = a^2 + b^2 - 2ab\cos(m\angle C)$$

$$(7)^2 = (5)^2 + (6)^2 - 2(5)(6)\cos(m\angle C)$$

$$49 = 25 + 36 - 60\cos(m\angle C)$$

$$49 = 61 - 60\cos(m\angle C)$$

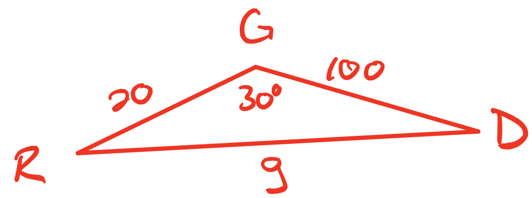
$$-12 = -60\cos(m\angle C)$$

$$\frac{12}{60} = \cos(m\angle C)$$

$$\cos^{-1}\left(\frac{12}{60}\right) = m\angle C$$

$$78^\circ \approx m\angle C$$

#3) George is 20 inches from Rickito and 100 inches from Danny Devito. The angle formed by the two and George is 30°. How many inches apart are Rickito and Danny Devito?



$$g^2 = r^2 + d^2 - 2rd\cos(m\angle G)$$

$$g^2 = (100)^2 + (20)^2 - 2(100)(20)\cos(30^\circ)$$

$$g^2 = 10{,}000 + 400 - 4000\cos(30^\circ)$$

$$g^2 = 10{,}400 - 4000\cos 30^\circ$$

$$g = \pm\sqrt{10{,}400 - 4000\cos 30^\circ}$$

$$g \approx 83 \text{ inches}$$

Rickito and Danny are about 83 inches apart.