Mathematics 10D

8.4 Cosine Law

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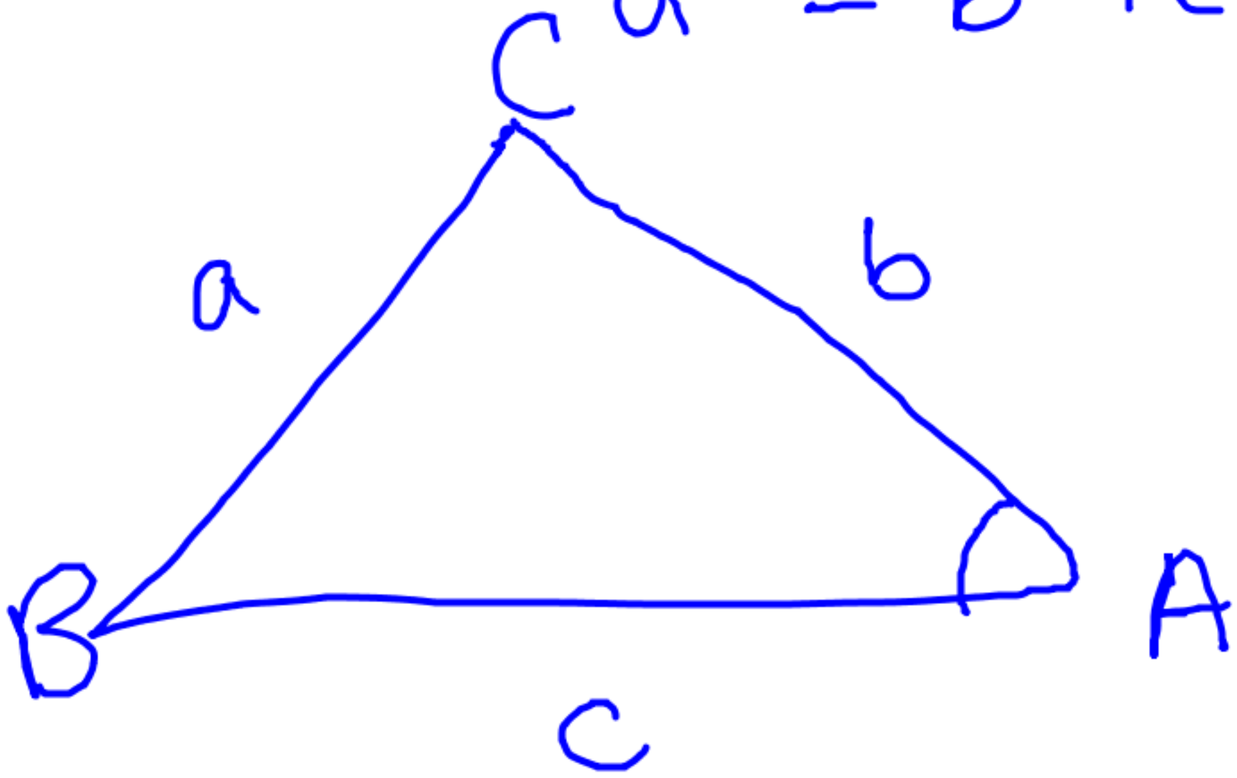
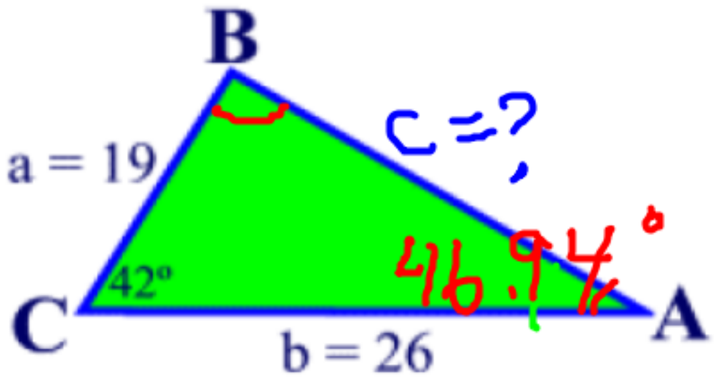
Cosine Law:

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



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

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



$\angle A = 46.94°$

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

$c^2 = 19^2 + 26^2 - 2(19)(26)\cos(42)$

$c^2 = 361 + 676 - 988\cos(42)$

$c^2 = 1037 - 988\cos(42)$

$\sqrt{c^2} = \sqrt{1037 - 988\cos(42)}$

$c = \sqrt{302.77}$

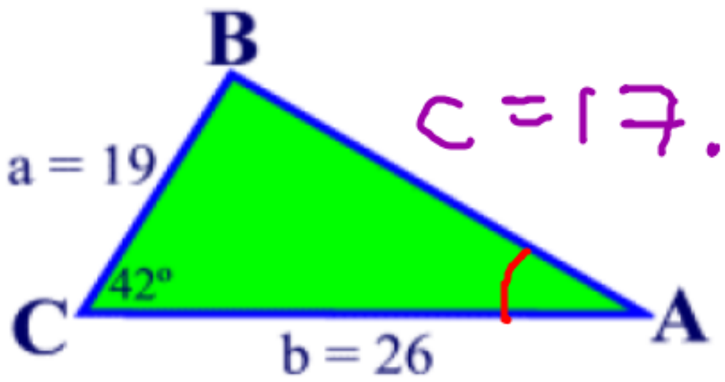
$c \approx 17.4$

$\angle B = 180° - 42 - x.$

$\angle B = 180° - 42° - 46.94$

$\angle B = 91.06°$

∴ $\triangle ABC$ is obtuse, scalene



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

$$19^2 = 26^2 + 17.4^2 - 2(26)(17.4)\cos(A)$$

$$361 = 676 + 302.76 - 904.8\cos(A)$$

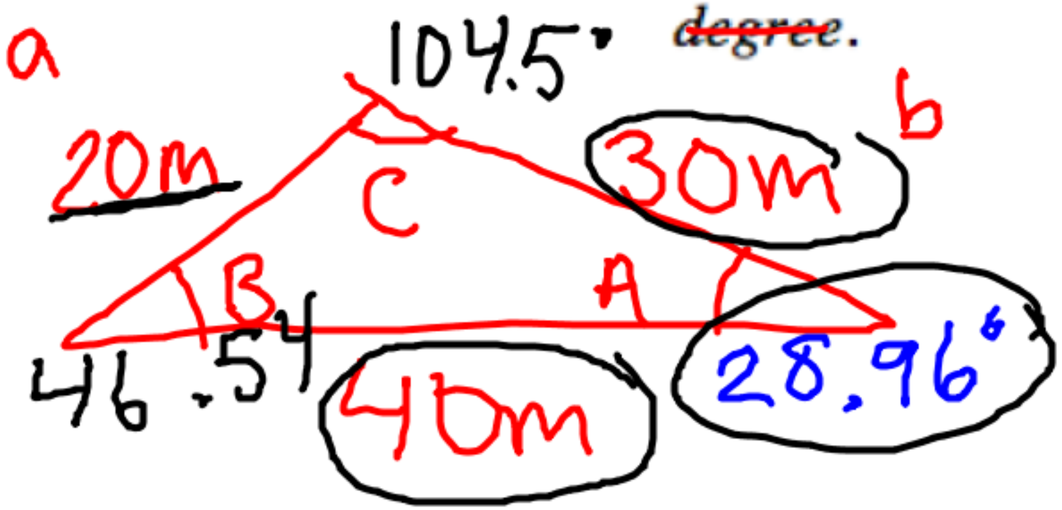
$$904.8\cos(A) = 978.76 - 361$$

$$\frac{904.8\cos(A)}{904.8} = \frac{617.76}{904.8}$$

$$\cos^{-1}(\cos(A)) = \cos^{-1}(0.6828)$$

$$\boxed{\angle A \approx 46.94^\circ}$$

Three sides of a triangle measure 20m, 30m, and 40m.
Find the largest angle of the triangle ~~to the *nearest* *degree*~~.



$\angle B = 180° - 104.5° - 28.96$

$= 46.54°$

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

$20^2 = 30^2 + 40^2 - 2(30)(40)\cos(A)$

$400 = 900 + 1600 - 2400\cos(A)$

$\frac{2400\cos A}{2400} = \frac{2100}{2400}$

$\cos^{-1}(\cos A) = \cos^{-1}\left(\frac{21}{24}\right)$

$\angle A \approx 28.96°$

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

$40^2 = 20^2 + 30^2 - 2(20)(30)\cos(C)$

(2C)

$$40^2 = 20^2 + 30^2 - 2(20)(30)\cos(C)$$

$$1600 = 400 + 900 - 1200\cos(C)$$

$$\frac{1200\cos(C)}{1200} = \frac{1300 - 1600}{1200}$$

$$\cos^{-1}(\cos(C)) = \cos^{-1}\left(\frac{-300}{1200}\right)$$

$-\frac{1}{4}$

$$\angle C = \cos^{-1}\left(-\frac{3}{12}\right)$$

$$\angle C \approx 104.5^\circ$$

$\therefore \angle C$ is the largest angle in $\triangle ABC$