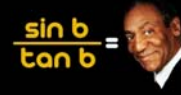


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3.4 Cosine Law

The Cosine Law states that, for any triangle ABC:

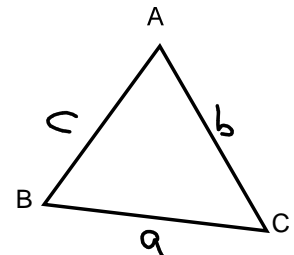
The Cosine Law

In any $\triangle ABC$

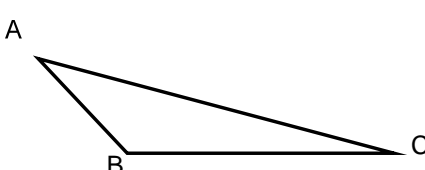
$c^2 = a^2 + b^2 - 2ab \cos C$

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


to solve angles



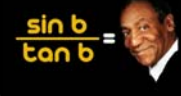
Acute Triangle



Oblique Triangle



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The Cosine Law

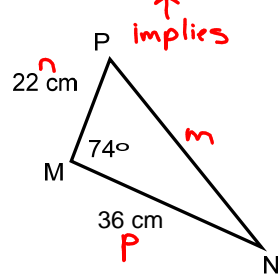
When NO opposite side & angle are given to use the Sine Law, the Cosine Law can be used in any triangle to determine:

any side or angle.
SSS SAS

Ex.) In $\triangle MNP$, determine the measure of side PN to the nearest tenth of a cm.

$SAS \Rightarrow$ Cosine Law

\uparrow
implies




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

$m^2 = n^2 + p^2 - 2np \cos M$

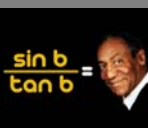
$m^2 = 22^2 + 36^2 - 2(22)(36) \cos 74^\circ$

$\sqrt{m^2} = \sqrt{1343...}$

$m = 36.7 \text{ cm}$



TRIG

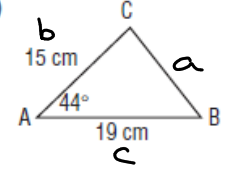


Example 1 Using the Cosine Law to Determine the Length of a Side

Ex.) In each triangle, determine the length of BC to the nearest tenth of a centimeter.

SAS ⇒ Cosine Law

a)



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

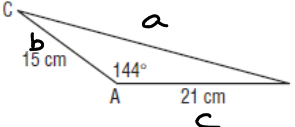
$$a^2 = 15^2 + 19^2 - 2(15)(19) \cos 44^\circ$$

$$a^2 = 175.97 \dots$$

$$a = \sqrt{175.97 \dots}$$

a = 13.3 cm

b)




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

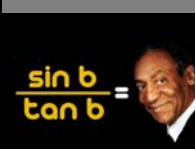
$$a^2 = 15^2 + 21^2 - 2(15)(21) \cos(144^\circ)$$

$$a^2 = 1175.68 \dots$$

a = 34.3 cm

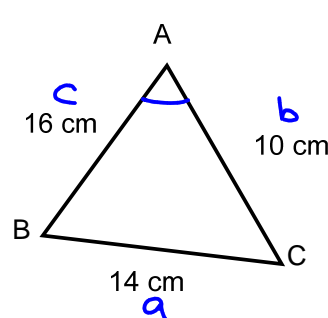


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The Cosine Law - Solving an Angle

Ex.) In $\triangle ABC$, determine the measure of $\angle A$ to the nearest degree. **Situation: SSS**




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

$$\cos A = \frac{(10^2 + 16^2 - 14^2)}{(2 \times 10 \times 16)} *$$

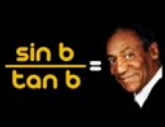
$$\cos A = 0.5$$

$$\cos^{-1}(\cos A) = \cos^{-1}(0.5)$$

$\angle A = 60^\circ$

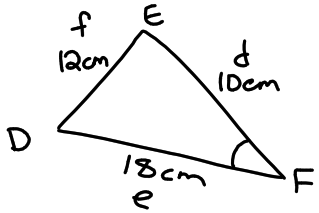


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Example 2 Using the Cosine Law to Determine the Measure of an Angle

a) In $\triangle DEF$, $DF = 18$ cm, $DE = 12$ cm, and $EF = 10$ cm; determine the measure of $\angle F$ to the nearest degree.



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

$$\cos F = \frac{d^2 + e^2 - f^2}{2de}$$

$$\cos F = \frac{(10^2 + 18^2 - 12^2)}{(2 \times 10 \times 18)}$$

$$\cos F = 0.7$$

$\angle F = 39^\circ$



TRIG



Pg. 119 # 1-5.