Cosine Law

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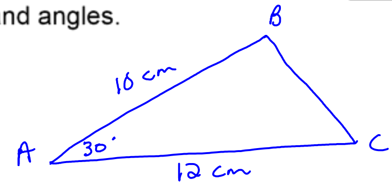
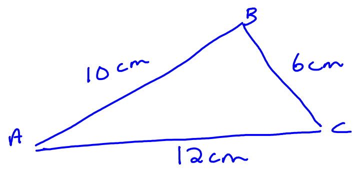
MATHEMATICS 10
TRIGONOMETRY
COSINE LAW

When two sides and the contained angle of a triangle are known or you have all angles and no sides identified, the **SINE LAW** cannot be used to determine the measures of the other sides and angles.

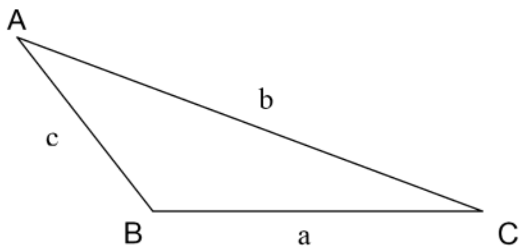




* You do not need to do a triangle construction with Cosine Law.

A. Cosine Law

Remember how we label a non-right triangle.



$$a^2 = b^2 + c^2 - 2bcCosA$$

$$b^2 = a^2 + c^2 - 2acCosB$$

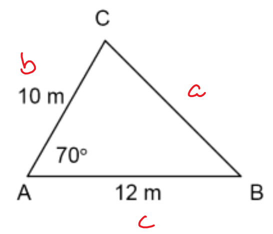
$$c^2 = a^2 + b^2 - 2abCosC$$

Important Points About Cosine Law

1) Cosine Law is used when you do not have the correct information to use Sine Law.
2) Be careful when you are looking for an angle with Cosine Law. You must do the calculations correctly.

B. Examples

1) Find the length of BC. Round to one decimal.



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

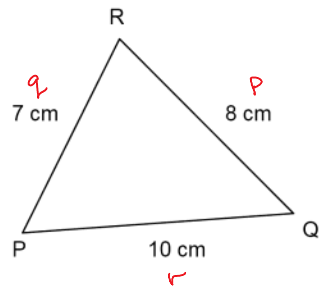
$a^2 = (10)^2 + (12)^2 - 2(10)(12)\cos 70°$

$a^2 = 161.91516\ldots$

$a = \pm\sqrt{161.91516}$

$\boxed{BC = 12.7 \text{ m}}$

2) Find the measure of $\angle R$. Round to the nearest degree.



$r^2 = p^2 + q^2 - 2pq \cos R$

$(10)^2 = (8)^2 + (7)^2 - 2(8)(7)\cos R$

$100 = 113 - 112\cos R$

$-113 \quad -113$

$-13 = -112\cos R$

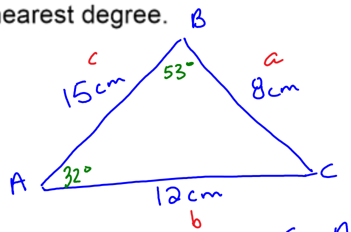
$\frac{-13}{-112} = \frac{-112\cos R}{-112}$

$\cos R = \frac{13}{112}$

$\boxed{\angle R = 83°}$

3) Solve the following ΔABC, BC = 8 cm, AC = 12 cm, and AB = 15 cm. Round to the nearest degree.

Solve the angles from smallest to largest.



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

$(8)^2 = (12)^2 + (15)^2 - 2(12)(15)\cos A$

$64 = 369 - 360\cos A$

$-369 \quad -369$

$\frac{-305}{-360} = \frac{-360}{-360}\cos A$

$\cos A = \frac{305}{360}$

$\boxed{\angle A = 32°}$

$\frac{\sin A}{a} = \frac{\sin B}{b}$

$24\left[\frac{\sin 32°}{8} = \frac{\sin B}{12}\right]$

$\frac{(3)(\sin 32°)}{2} = \frac{2\sin B}{2}$

$\sin B = 0.79487\ldots$

$\boxed{\angle B = 53°}$

$180° - 32° - 53°$

$\boxed{\angle C = 95°}$

Assignment: Pg. 498 #3, 4, 5, 6, 7