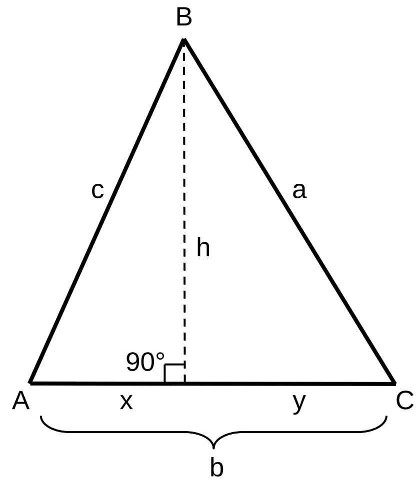
LAW of SINES DERIVATION



Equation 1 $h = c \cdot \sin A$

Equation 2 $h = a \cdot \sin C$

Equate the right sides of equations 1 and 2 and rearrange…

Equation 3 $\dfrac{a}{\sin A} = \dfrac{c}{\sin C}$

Note: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B}$ and $\dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ are derived similarly.

Law of Sines… $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ or $\dfrac{\sin A}{a} = \dfrac{\sin B}{b} = \dfrac{\sin C}{c}$

LAW of COSINES DERIVATION

Equation 4 $h^2 = a^2 - y^2 = a^2 - (b-x)^2$

Equation 5 $h^2 = c^2 - x^2$

Equate the right sides of equations 4 and 5 and rearrange…

$a^2 - (b-x)^2 = c^2 - x^2$

Equation 6 $a^2 = b^2 + c^2 - 2bx$

Equation 7 $x = c \cdot \cos A$

Substitute for x from equation 7 into equation 6…

Equation 8 $a^2 = b^2 + c^2 - 2bc \cdot \cos A$

Note: equations for b^2 and c^2 are derived similarly.

Law of Cosines…

alternate versions

$\cos A = \dfrac{b^2 + c^2 - a^2}{2bc}$ or $a^2 = b^2 + c^2 - 2bc \cdot \cos A$

$\cos B = \dfrac{a^2 + c^2 - b^2}{2ac}$ or $b^2 = a^2 + c^2 - 2ac \cdot \cos B$

$\cos C = \dfrac{a^2 + b^2 - c^2}{2ab}$ or $c^2 = a^2 + b^2 - 2ab \cdot \cos C$