

3.4 Law of Cosines

- 1.) $a^2 = b^2 + c^2 - 2bc \cos A$
- 2.) $b^2 = a^2 + c^2 - 2ac \cos B$
- 3.) $c^2 = a^2 + b^2 - 2ab \cos C$

Example 1

a.) $A = 120^\circ, b = 9, c = 5$

side ~~A~~: a

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

$$a^2 = 9^2 + 5^2 - 2 \cdot 9 \cdot 5 \cdot \cos 120$$

$$a^2 = 81 + 25 - 90 \cos 120$$

$$a^2 = 106 + 45$$

$$\sqrt{a^2} = \sqrt{151}$$

$$a = 12.29$$

Angle B

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

$$9^2 = 12.29^2 + 5^2 - 2(12.29)(5) \cos B$$

$$81 = 151 + 25 - 122.9 \cos B$$

$$81 = 176 - 122.9 \cos B$$

$$-176 \quad -176$$

$$-95 = -122.9 \cos B$$

$$\frac{-95}{-122.9} = \frac{-122.9 \cos B}{-122.9}$$

$$.77 = \cos B$$

$$\cos^{-1}(.77) = B$$

$$39.65 = B$$

Angle C

$$\angle C = 180 - (\angle A + \angle B)$$

$$\angle C = 180 - (120 + 39.65)$$

$$\angle C = 180 - 159.65$$

$$\angle C = 20.35$$