THE COSINE LAW

Learning Goals

- Explore the relationship between side lengths and angle measures in a triangle using the cosines of angles.

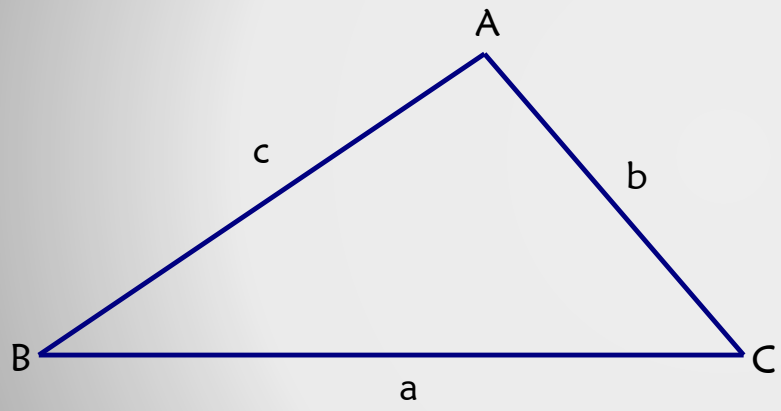
- Use the cosine law to calculate unknown measures of sides and angles in acute triangles.

Minds on …

- What if we are given 3 sides of a non-right triangle and asked to find an angle?
- Or 2 sides, an angle and asked to find the third side?
- The Sine Law either cannot be applied or needs to be applied twice.
- We need a new formula.

The Cosine Law

- In a non-right triangle ABC,



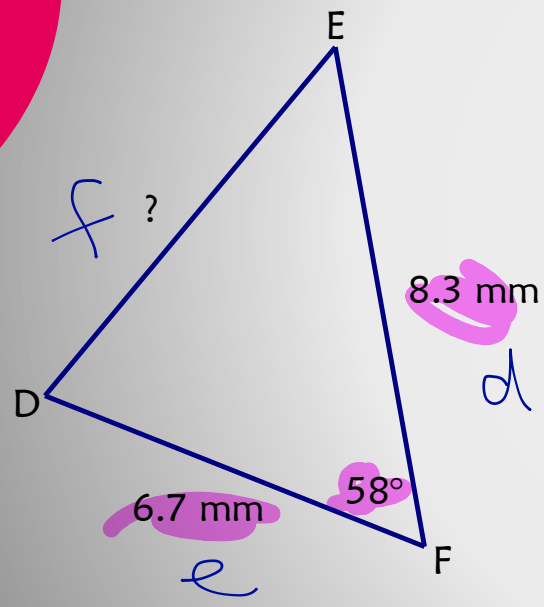
$$a^2 = b^2 + c^2 - 2bc(\cos A)$$

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

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

Examples

1. Find the indicated measurements.



$f^2 = e^2 + d^2 - 2ed(\cos F)$

$= 6.7^2 + 8.3^2 - 2(6.7)(8.3)(\cos 58°)$

$= 44.89 + 68.89 - 111.22(\cos 58°)$

$= 44.89 + 68.89 - 111.22(0.5299)$

$= 44.89 + 68.89 - 58.94$

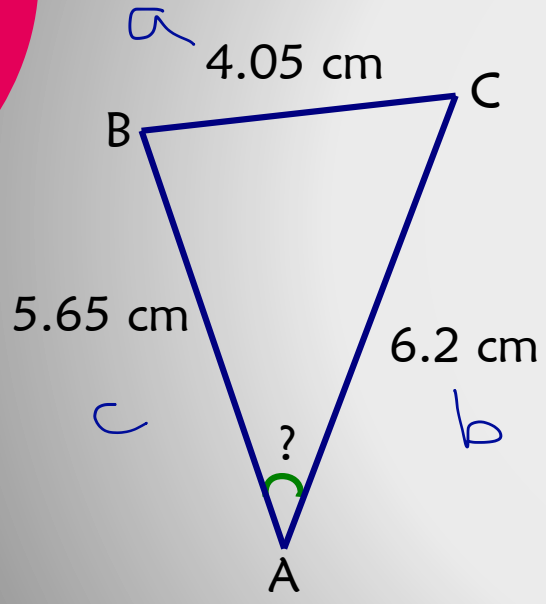
$f^2 = 54.84$

$f = \sqrt{54.84}$

$f = 7.4$ mm

Examples

1. Find the indicated measurements.



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

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

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

$$\cos A = \frac{6.2^2 + 5.65^2 - 4.05^2}{2(6.2)(5.65)}$$

$$\cos A = \frac{53.96}{70.06}$$

$$\angle A = \cos^{-1}(0.770)$$

$$\angle A = 40^\circ$$

Consolidation

- Use the Cosine Law when given:
  - 3 sides to find an angle.
  - 2 sides & 1 angle (contained) to find a side.

Add to E412 Monday

1 Sine Law question

1 cosine law question

Reinforcement

- Page 443 - 444
  - #3, 4, 5ac, 6