

MPM2D

April 14

Cosine Law

Youtube: "Law of cosines"  
by Math Meeting

Reminder: Quiz on Wed

Test on Mon (April 20)

**Recall:**

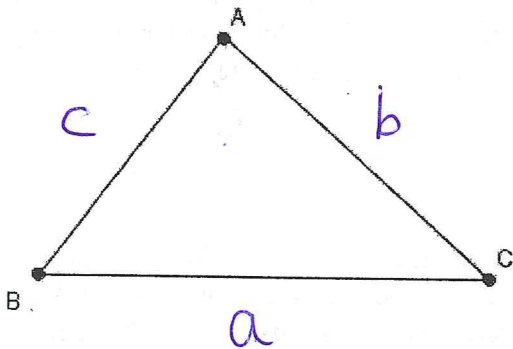
The primary trig ratios (sin, cos and tan) can only be used if ... we have a right angle triangle.

The sine law can only be used if... we have a non-right angle triangle and we have a matching side and angle.

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What happens when we can't use either sine law or  $S_{\frac{O}{H}} C_{\frac{A}{H}} T_{\frac{O}{A}}$ ?

Deriving the cosine law:



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

## Cosine Law:

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

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

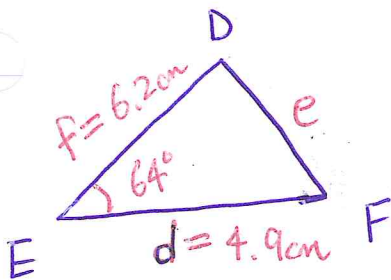
$$c^2 = a^2 + b^2 - 2ab \cos C$$

Cosine Law can be used...

1. When you know 3 sides and want to find an angle = sine law can't be used.
2. When you know 2 sides and the angle between and want to find the 3<sup>rd</sup> side :

To Find a Side Using the Cosine Law:

Example 1 In acute  $\triangle DEF$ ,  $d = 4.9$  cm,  $f = 6.2$  cm, and  $\angle E = 64^\circ$ . Solve  $\triangle DEF$ . Round measures to the nearest degree or tenth of a centimeter, if necessary.



To find  $e$

$$e^2 = f^2 + d^2 - 2fd \cos E$$

$$e^2 = (6.2)^2 + (4.9)^2 - 2(6.2)(4.9) \cos 64$$

$$e^2 = 38.44 + 24.01 - 60.76 \cdot \cos 64^\circ$$

$$\sqrt{e^2} = \sqrt{35.8}$$

$$\therefore e = 6 \text{ cm}$$

To find  $\angle F$

$$\frac{\sin F}{f} = \frac{\sin E}{e}$$

$$\frac{\sin F}{6.2} = \frac{\sin 64^\circ}{6}$$

$$6 \times \sin F = 6.2 \times \sin 64^\circ$$

$$\sin F = \frac{6.2 \sin 64^\circ}{6}$$

$$\angle F = \sin^{-1} \left( \frac{6.2 \sin 64^\circ}{6} \right)$$

$$\therefore \angle F = 68^\circ$$

To find  $\angle D$

$$\angle D = 180^\circ - 68^\circ - 64^\circ$$

$$\therefore \angle D = 48^\circ$$