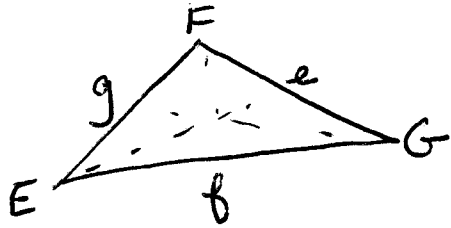


## Law of Cosines

Equation used to find missing sides and angles in a triangle

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

\* Capital ~~angles~~ letters represent angles and lowercase letters represent sides

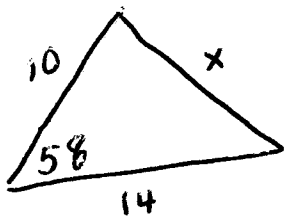


Law  
of  
Cosines

#lovetrig

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

$$\left( \begin{array}{l} \text{Side} \\ \text{Opposite} \\ \text{Given angle} \\ \text{or angle} \\ \text{you are} \\ \text{looking for} \end{array} \right)^2 = \left( \begin{array}{l} \text{Given} \\ \text{side} \\ 1 \end{array} \right)^2 + \left( \begin{array}{l} \text{Given} \\ \text{side} \\ 2 \end{array} \right)^2 - 2 \left( \begin{array}{l} \text{Given} \\ \text{side} \\ 1 \end{array} \right) \left( \begin{array}{l} \text{Given} \\ \text{side} \\ 2 \end{array} \right) \cos \left( \begin{array}{l} \text{angle} \\ \text{you have} \\ \text{or angle} \\ \text{you are} \\ \text{looking} \\ \text{for} \end{array} \right)$$

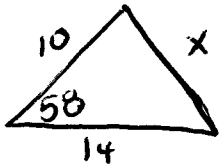


$$x^2 = 10^2 + 14^2 - 2(10)(14) \cos 58$$

- \* When given 2 sides and included angle
- \* When given all 3 sides!

2 sides and Included Angle

1) Plug values into equation



$$x^2 = 10^2 + 14^2 - 2(10)(14) \cos 58$$

2) simplify right side of equation.

$$x^2 = 296 - 280 \cos 58$$

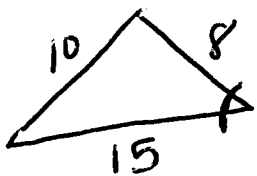
3) Take the square root of both sides

$$x^2 = 147.6$$

$$x = 12.1 \leftarrow \text{final answer!}$$

When Given All 3 sides!

1) Plug values into equation



$$10^2 = 8^2 + 15^2 - 2(8)(15) \cos X$$

2) Simplify exponents and multiplication/addition

$$100 = 64 + 225 - 240 \cos X$$

3) Subtract constant or first # from both sides

$$100 = 289 - 240 \cos X$$

4) Divide by # in front of cosine

$$\begin{array}{r} 100 \\ -289 \\ \hline \end{array}$$

$$\begin{array}{r} -189 \\ -240 \\ \hline \end{array} = \frac{-240}{-240} \cos X$$

5) Take inverse for angle

$$\cos^{-1} \left( \frac{-189}{-240} \right) \text{ or } \left( \frac{189}{240} \right)$$