

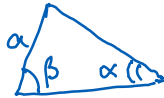
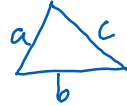
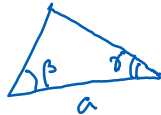
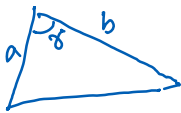
Lecture 9

Tuesday, May 21, 2024 2:38 PM

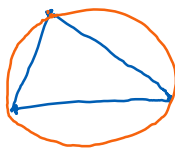
Law of sines and law of cosines are effective tools to solve a triangle.

To solve a triangle is to find all the lengths and angles.

To be able to solve a triangle, we need to know at least 3 data (out of 6).



* Law of sines: $\frac{\sin \alpha}{a} = \frac{\sin \beta}{b} = \frac{\sin \gamma}{c}$ ($= \frac{1}{d}$ where d is the diameter of the circumcircle)



If you know a, α, β , you can solve for b, c, γ .

* Law of cosine: $\cos \alpha = \frac{b^2 + c^2 - a^2}{2bc}$, $\cos \beta = \frac{c^2 + a^2 - b^2}{2ca}$, $\cos \gamma = \frac{a^2 + b^2 - c^2}{2ab}$

If you know a, b, c , you can solve for the angles.

Ex Assume $a = 5$, $\alpha = 30^\circ$, $\beta = 70^\circ$. Solve the triangle.

$$\frac{\sin \alpha}{a} = \frac{\sin \beta}{b}$$

$$\text{Thus, } b = \frac{a \sin \beta}{\sin \alpha} = \frac{5 \sin 70^\circ}{\sin 30^\circ} \approx \dots$$

$$\gamma = 180^\circ - \alpha - \beta = 180^\circ - 30^\circ - 70^\circ = 80^\circ.$$

$$\frac{\sin \gamma}{c} = \frac{\sin \alpha}{a} \quad \rightsquigarrow \quad c = \frac{a \sin \gamma}{\sin \alpha} = \frac{5 \sin 80^\circ}{\sin 30^\circ} \approx \dots$$

* Review for midterm exam (work on the worksheet).