Law of Sines and Law of Cosines

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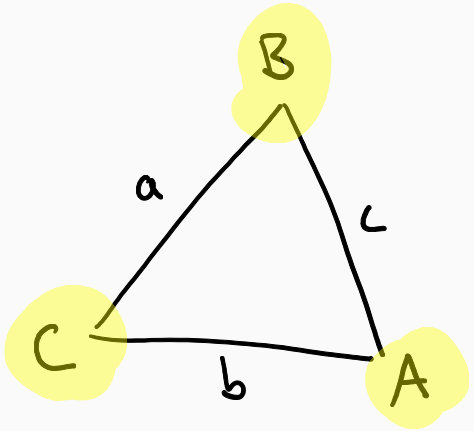
Outline

- Law of Sines
- Law of Cosines

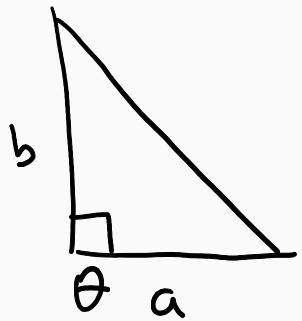
Review: Area of a Triangle



Recall: Area is $\frac{1}{2} a \cdot b \cdot \sin(C)$

→ Previously only able to look at areas of right triangles

$\theta = \frac{\pi}{2}$ $\sin(\theta) = 1$

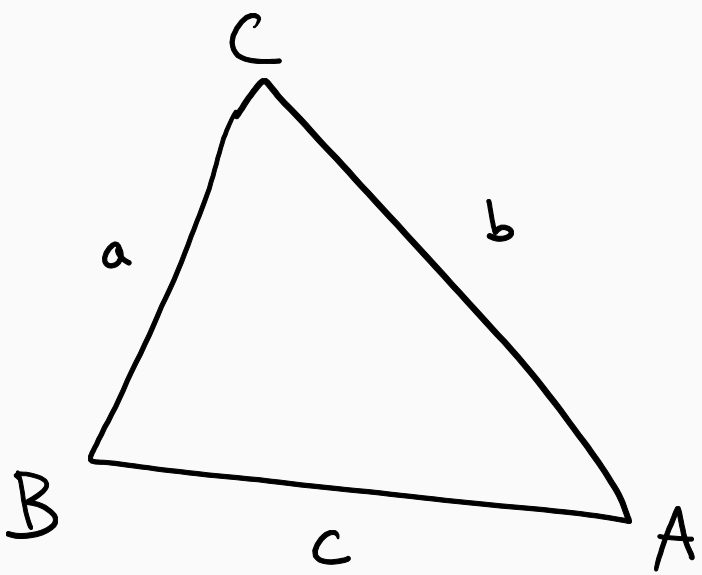


Area: $\frac{1}{2} a \cdot b$

Now: Extends facts about right triangles to all triangles

Notation: a, b, c be sidelengths
$A\ B\ C$ be opposite angles

Area of a triangle in three ways



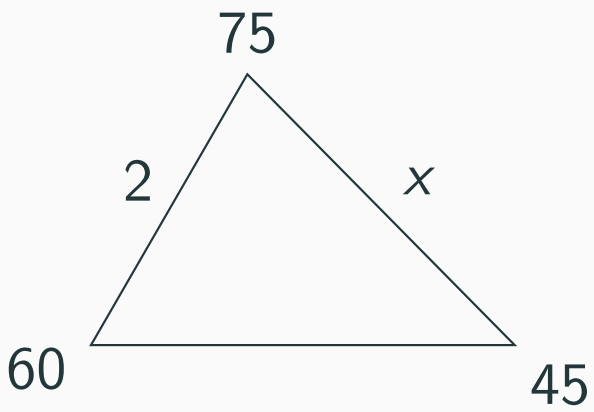
$$\text{Area} = \frac{1}{2} a \cdot b \cdot \sin(C)$$

$$\text{Area} = \frac{1}{2} b \cdot c \cdot \sin(A)$$

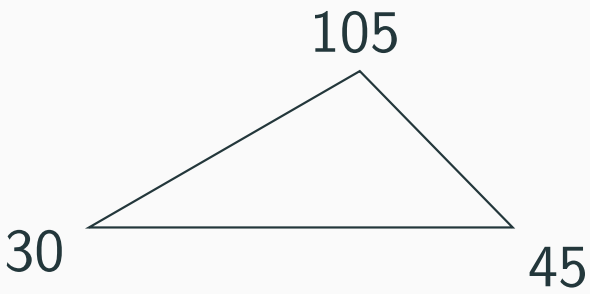
$$\text{Area} = \frac{1}{2} a \cdot c \cdot \sin$$

The law of Sines

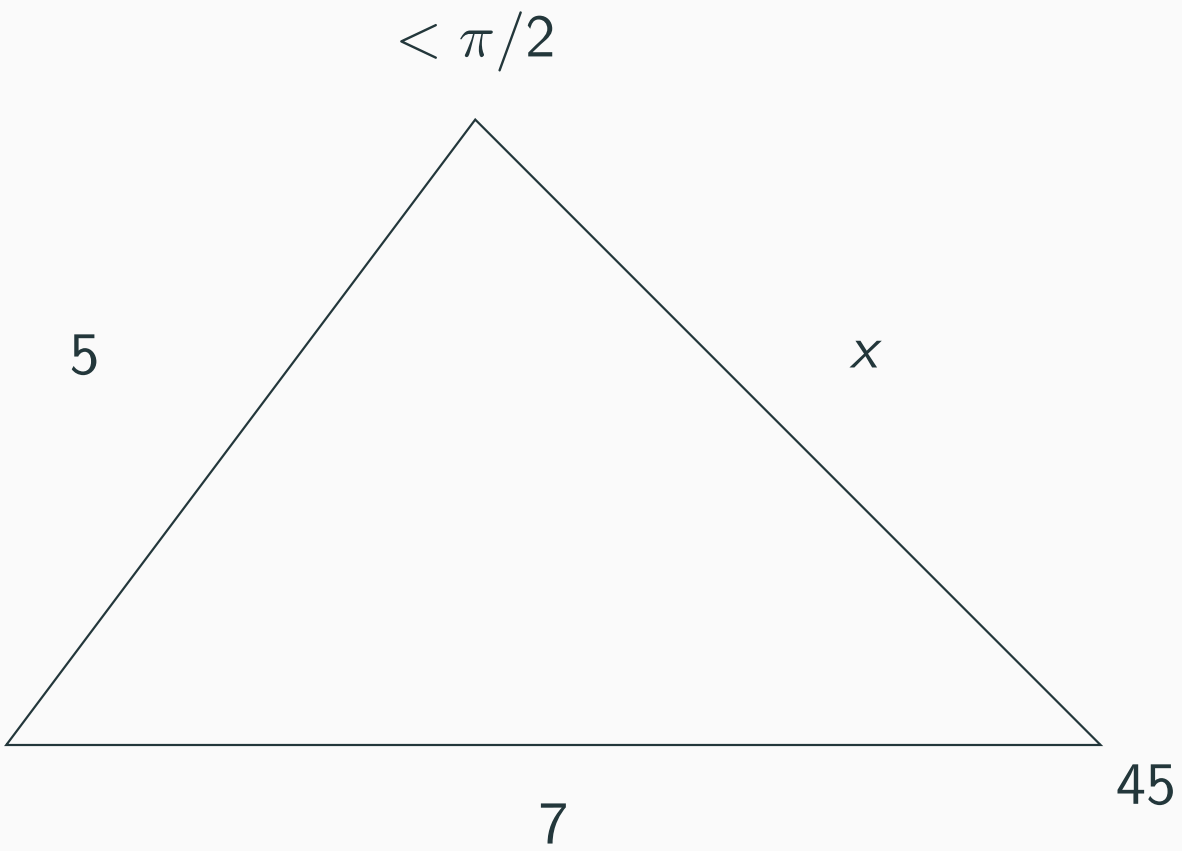
Example:Find the measure of the side x



Example: Compute sin(105).

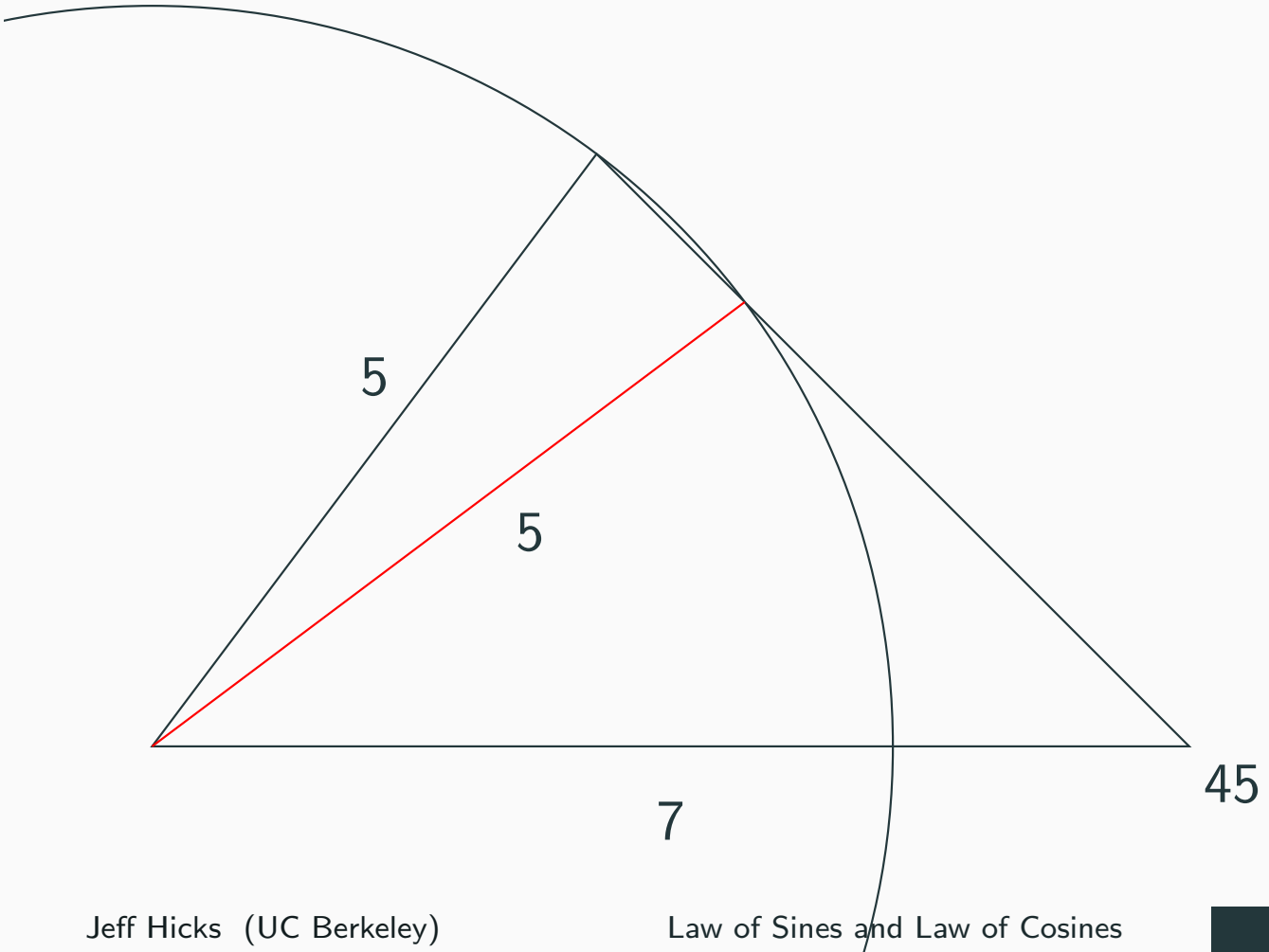


Example: Find x



There is no SSA Rule!

Why did we need the $< \pi/2$ in the last example?

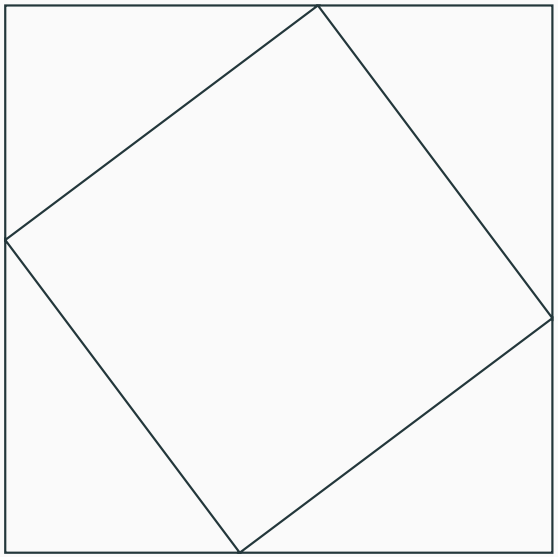


What kinds of problems can this solve?

- Two Angles and a Side.
- Two Sides, and an angle not belonging to both sides (With some additional Information)

Law of Cosines

Review: Pythagorean Theorem

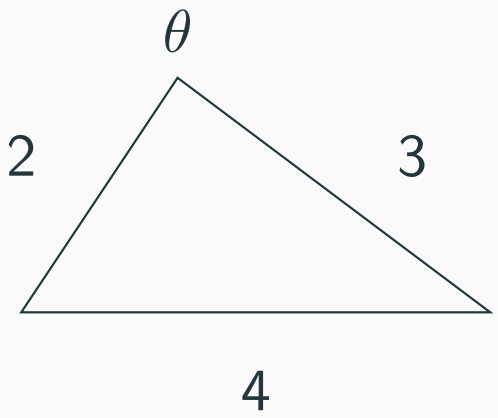


Computing all side lengths from SAS

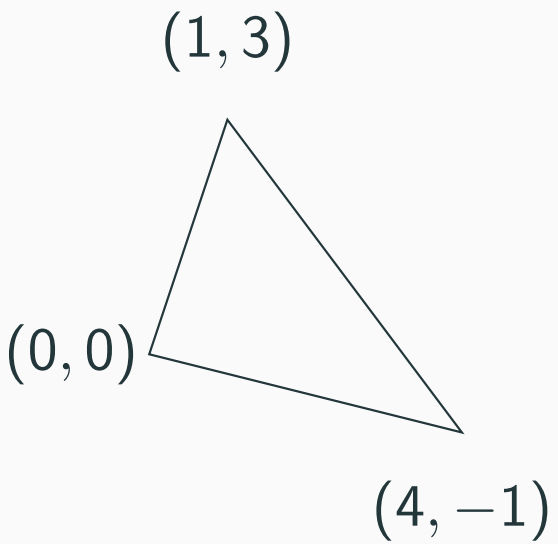
The Law of Cosines

Comparing Pythagorean to Law of Cosines

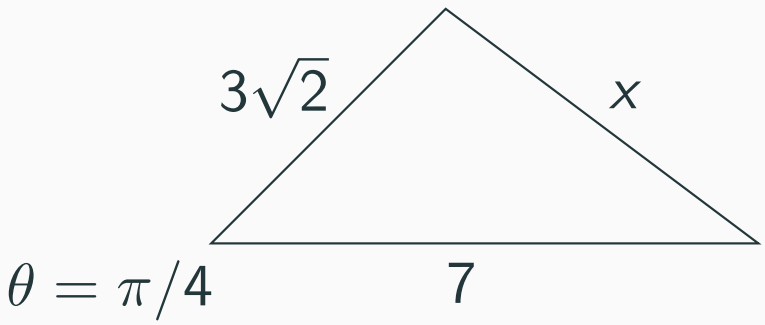
Example: Compute $\cos(\theta)$ of the below triangle.



Example: Compute $\cos(\theta)$ at the origin.



Finding the Missing Side Length



When to Use law of Cosines

Takeaways: Comparison between right triangles and general triangles