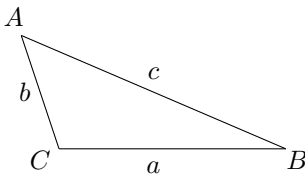


Sections 8.1-8.2 Lecture Notes

**Standard Triangle:** The following illustration is a standard way of labeling any triangle.

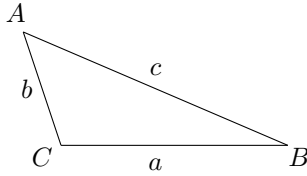


**Law of Sines:** In any triangle (with the above labeling), the following is true.

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

**Brainstorm:** The above equalities are useful if you're solving for an angle ( $A$ ,  $B$ , or  $C$ ). What is another way we can write the equalities that would be useful for solving for a side ( $a$ ,  $b$ , or  $c$ )?

**Brainstorm:** Using the fact that the area of a triangle is equal to half of the product of any two sides times the sine of their included angle, prove the Law of Sines.



**Law of Cosines:** In any triangle (with the above labeling), the following three things are true.

- $a^2 = b^2 + c^2 - 2bc \cos A$
- $b^2 = a^2 + c^2 - 2ac \cos B$
- $c^2 = a^2 + b^2 - 2ab \cos C$

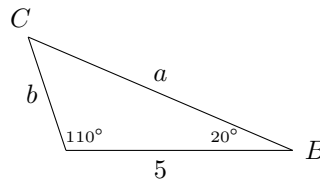
**Recall:** The sum of the interior angles of any triangle add up to  $180^\circ$  or  $\pi$  radians.

**Brainstorm (some examples):**

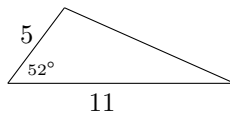
- (1) If you are given  $b$ ,  $\angle A$ , and  $\angle C$ . Which law should you use to find side length  $c$ ?
- (2) If you are given sides  $a$ ,  $b$ , and  $c$ . Which law should you use to find angle  $C$ ?

**Exercises:**

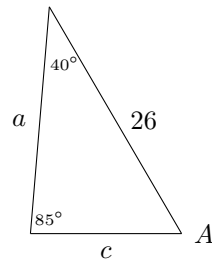
- (1) Find all unknown values in the following triangle:



- (2) Find the missing side in the following triangle:



(3) Find all unknown values in the following triangle:



(4) Find the angle  $\gamma$  in the following triangle:

