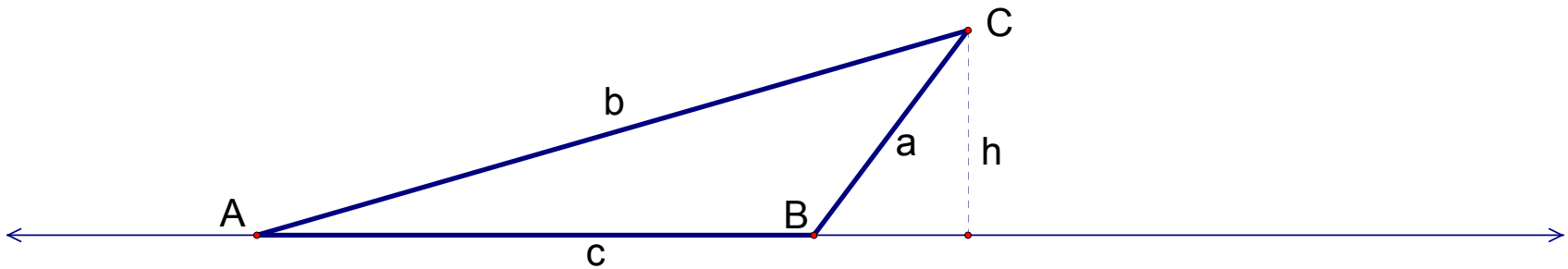
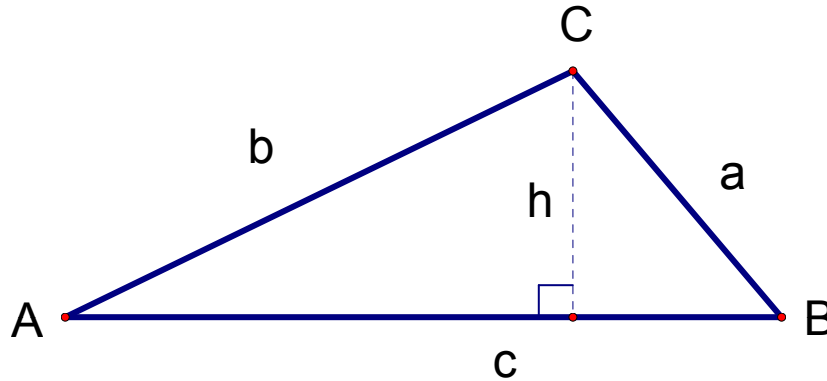


# Law of Sines and Law of Cosines

MATH 1112

S. F. Ellermeyer

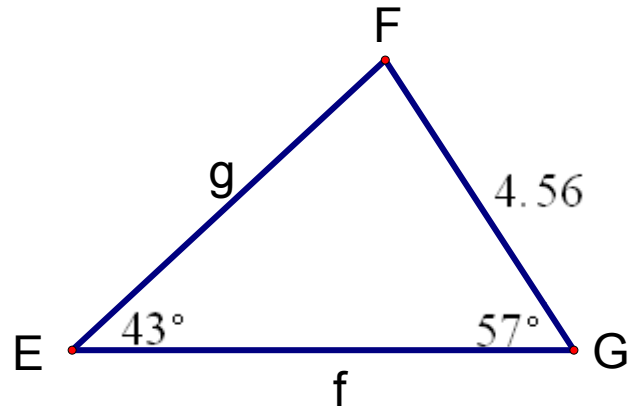
# The Law of Sines



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

# Example

Solve this triangle.



# Example (No Solution)

$$Q = 43.6^\circ \quad q = 15$$

$$R = ? \quad r = 28$$

$$S = ? \quad s = ?$$

# Example (One Solution)

$$X = 39.7^\circ \quad x = 23.5$$

$$Y = ? \quad y = 9.8$$

$$Z = ? \quad z = ?$$

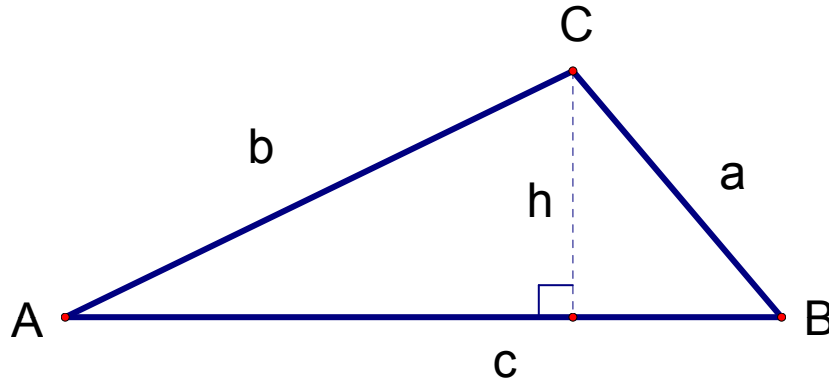
# Example (Two Solutions)

$$A = ? \quad a = ?$$

$$B = 29^\circ \quad b = 15$$

$$C = ? \quad c = 20$$

# The Area of a Triangle



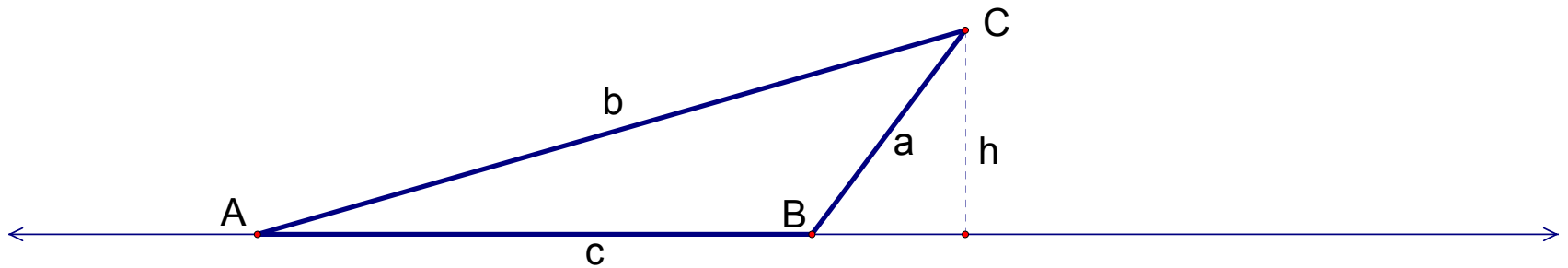
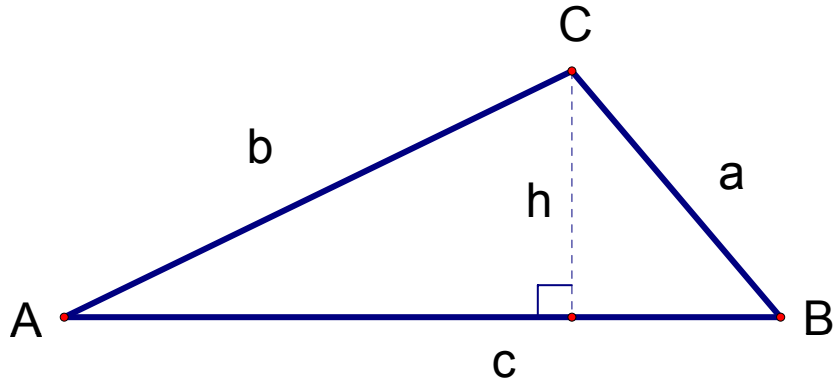
$$\text{Area} = \frac{1}{2}bc \sin(A) = \frac{1}{2}ab \sin(C) = \frac{1}{2}ac \sin(B)$$

# Example

A university landscaping architecture department is designing a garden for a triangular area in a dormitory complex. Two sides of the garden, formed by the sidewalks in front of buildings A and B, measure 172 feet and 186 feet respectively, and together form a 53 degree angle. The third side of the garden, formed by the sidewalk along Crossroads Avenue, measures 160 feet. What is the area of the garden to the nearest square foot?



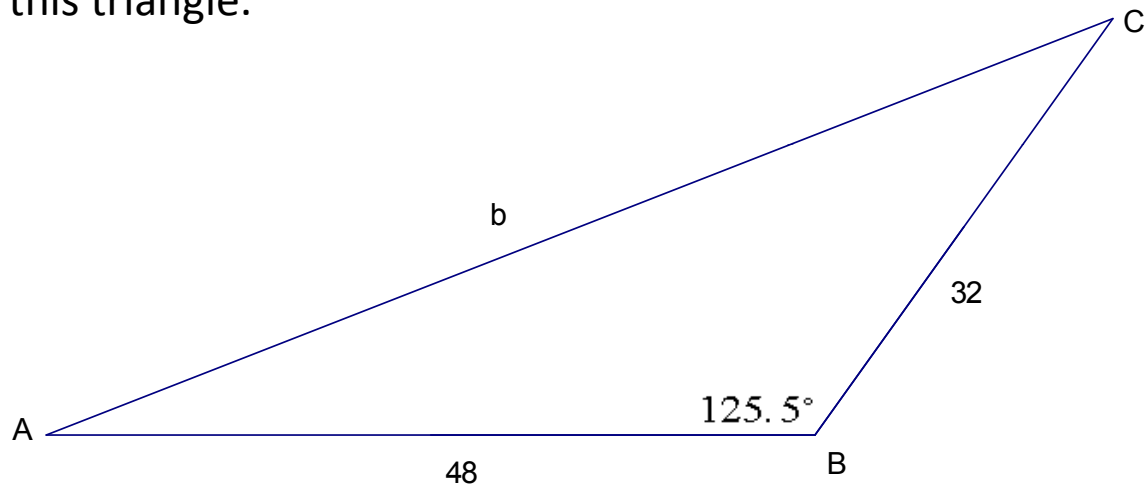
# The Law of Cosines



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

# Example

Solve this triangle.



# Example

$$R = ? \quad r = 3.5$$

$$S = ? \quad s = 4.7$$

$$T = ? \quad t = 2.8$$

# Example

$$A = ? \quad a = 23.78$$

$$B = 72.66^\circ \quad b = ?$$

$$C = ? \quad c = 25.74$$