Section 8.1 Learning Objectives:

- Video 1: The Law of Sines (8:02)
  - State the law of sines.
  - Determine the unknown sides and angles of a triangle using the law of sines when two angles and one side are known.
- Video 2: The Ambiguous Case (13:01)
  - Determine both possibilities for the unknown sides and angles of a triangle using the law of sines in the ambiguous case.
- Video 3: The Law of Cosines (8:42)
  - State the law of cosines.
  - Determine the unknown sides and angles of a triangle using the law of cosines.
- Video 4: Applications (11:08)
  - Apply the law of sines and the law of cosines to geometric word problems.

Individual Learning Objective Binder Check: Before class, you should have completed the Learning Objective Worksheet for each of the learning objectives in the video. These should have been placed in a binder in an organized manner so that it can be quickly checked by the instructor. If you have specific questions, this is a good time to ask the professor about them. While you are waiting for the professor to make their way around the room, you can work on the rest of the activities.

Group Practice Problems: In a group of no more than 3 students, work on the following problems. While everyone in the group should work together, each student should write out their work for themselves. This work can prove to be helpful when working on the homework assignment. If questions arise as you're working on these problems, feel free to seek help from the instructor or other groups of students.

Group Practice Problems #1 - The Law of Sines: Solve the triangle. Assume that the sides and angles are labeled following the convention. There should only be one solution.

- $\alpha = 40°$, $a = 7$, $\beta = 35°$
- $\alpha = 60°$, $\beta = 50°$, $c = 10$

Group Practice Problems #2 - The Ambiguous Case: Solve the triangle. Assume that the sides and angles are labeled following the convention. There may be zero, one, or two solutions.

- $a = 46$, $b = 24$, $\alpha = 110°$
- $a = 16$, $b = 17$, $\alpha = 70°$

Group Practice Problems #3 - Studying the Ambiguous Case: In order to study the ambiguous case more deeply, we're going to focus on a sequence of problems where we are changing only a single variable in the problem. We will keep the angle and one of the side lengths fixed, and run through a set of different values for the second side. Write a sentence that explains how your work shows you the number of solutions. (You may find it helpful to try to sketch an accurate picture.)

- $a = 2$, $b = 10$, $\alpha = 30°$

- $a = 5$, $b = 10$, $\alpha = 30°$
- $a = 6$, $b = 10$, $\alpha = 30°$
- $a = 11$, $b = 10$, $\alpha = 30°$

Group Practice Problems #4 - The Law of Cosines: Solve the triangle. Assume that the sides and angles are labeled following the convention.

- $a = 27$, $b = 16$, $\gamma = 112°$
- $a = 32$, $b = 25$, $c = 36$

Group Practice Problems #5 - Word Problems: Solve the word problem. Draw an accurate sketch of the problem and explain your steps.

- To measure the height of a hill, a woman measures the angle of elevation to the top of the hill to be 24°. She then moves back 200 feet and measures the angle of elevation to be 22°. Find the height of the hill.
- The path of a satellite orbiting the earth causes it to pass directly over two tracking stations A and B, which are 70 miles apart. When the satellite is on the same side of both stations, the angles of elevation at A and B are measured to be 86.2° and 83.9°, respectively. How far is the satellite from station A and how high is the satellite above the ground? (For this problem, we are ignoring the earth's curvature.)

Group Work Check: Present your work for the practice problems to the instructor for approval. The work will not be graded deeply, but simply graded on whether it appears that you have put in a good faith effort to do the work. If you are not confident about particular problems, this is a good time to ask about them.

Section 8.1 Homework:

- 8.1 (General Problems): #1, 5, 9, 13, 17, 19
- 8.1 (Write-Up): #26 (Hint: $A = \frac{1}{2} \cdot (\text{base}) \cdot (\text{height})$), 39