

SUPPLEMENTAL LESSONS

**Mathematics Grade 9
4th Quarter**



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4th Quarter Grade 9 Supplemental Lesson Plan

Solving Oblique Triangles using Laws of Sines and Cosines

Introduction

Elicits students' prior knowledge on solving non-right triangle using a diagram of triangle ABC drawn on the chalkboard or overhead projector. To make the discussion concrete, add the following measurements to the diagram: $a = 7$ cm, $\angle B = 45^\circ$, and $\angle C = 75^\circ$.

Ask the following questions to the students:

- Is there a unique triangle with a given angle and side measures? Explain.
- How will you determine the measures of the missing angle and sides?
- How do trigonometric functions model real-world problems and their solutions?

Body

1. Present to class the concept of oblique triangles. Then introduce the Law of Sines as a way to solve problems involving oblique triangles.
2. Show to the class the derivation of the Law of Sines (Getting Ready activity on p. 356 of e-Math IV may be used as an activity for students for derivation.)
3. Demonstrate how to use the Law of Sines in solving oblique triangles. Alternative activities such as video presentations and solved problems are available online. (Sample site: <http://www.mathwarehouse.com/trigonometry/law-of-sines/formula-and-practice-problems.php>)

Knowledge

Laws of Sines and Cosines

Learning Competencies

M9GE-IVf-g-1

- Illustrates laws of sines and cosines

M9GE-IVh-j-1

- Solves problems involving oblique triangles

KU

Real-life objects can be modeled geometrically

KQ

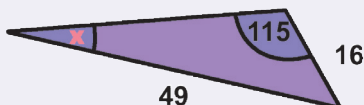
How does geometry model the real world?

When to use the law of sines formula:

You should use the law of sines when you know 2 sides and an angle (case 1 in the picture below) and you want to find the measure an angle opposite a known side. Or when you know 2 angles and 1 side and want to get the side opposite a known angle (case 2 in picture below). In both cases, you must already know a side and an angle that are opposite of each other.

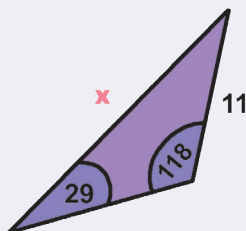
Case 1) 2 sides and 1 angle

*Trying to get:
angle opposite a known side*

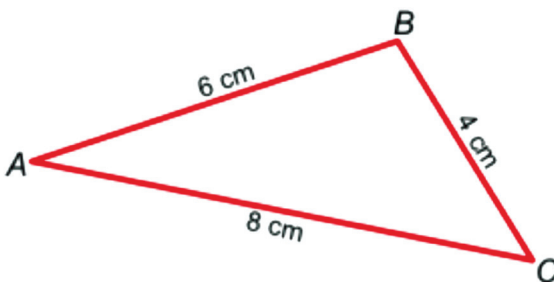
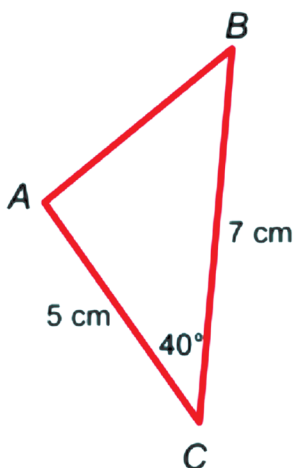


Case 2) 1 side and 2 angles

*Trying to get:
side opposite a known angle*



4. After the demonstration, ask the students to form pairs and answer the following questions:
 - a. What is the Law of Sine?
 - b. In what cases or conditions do we apply the Law of Sine?
 - c. Suppose you are given AAS information for a triangle. Explain how would you find the lengths of the two other sides and the measurement of the third angle.
 - d. How important is critical thinking skills in solving oblique triangles using the Law of Sine?
5. Introduce the lesson with diagrams such as the following: (Images retrieved from: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L704>)



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6. Pose these questions to the students:
Can the Law of Sine be used to determine the measures of the missing angles and/or sides? Why no/yes?
7. Instruct the students to think about the questions individually. Then discuss the students' prior knowledge about the questions with the whole group.
8. Introduce the Law of Cosines. Have the students perform an activity from <http://illuminations.nctm.org/LessonDetail.aspx?ID=L704>.
9. After the students complete the Law of Cosine activity sheet, have them use the Law of Cosine to determine the measures of the missing sides and angles in the triangles discussed in the preliminary activity.
10. Conduct a whole-class discussion on the Law of Cosines.
11. Give the students practice exercises on solving problems involving oblique triangles using law of sines or law of cosines.
12. For more practice, let the students answer the downloadable activity worksheets on laws of sines and cosines from www.rexinteractive.com.

Conclusion

Let the students answer the *Exit Sheet* (Lujan, 2011) on a separate sheet of paper. Call on volunteers to share his/her answers.

I Understand	I Need Help
I learned...	I need help with...
The lesson helped me...	I have a question: _____
I Need Practice	I Want More
I am still confused about...	I could use this information...
I need to practice...	I wish I could...