

LESSON PLAN TEMPLATE

Lesson Title	Mastering the Law of Cosines in Oblique Triangles
Learning Area/s	Mathematics
Name of Teacher/s	DEPED TAMBAYAN PH (www.depedtambayanph.net)
Grade Level and Section	Grade 10
No. of Sessions	4 Sessions
References	None specified
Declaration of AI use	This lesson plan was co-created using Gemini AI to assist with unpacking competencies into a 4-session learning design, structuring activities, and assessment formulation.

Intentions.

Meaningful learning experiences are anchored in how we frame them. Start by deciding what you want learners to master by the end of the lesson – keep it clear and simple.

Learning Competency and Curriculum Standards:

Learning Competency:

Apply laws of cosines in solving oblique triangles.

Content Standards:

The learners should have knowledge and understanding of... • the laws of sines and the laws of cosines • translations, reflections, and rotations, in the Cartesian plane • quadratic inequalities in one variable and in two variables • absolute value equations and inequalities in one variable and their graphs • box - and - whisker plots, and cumulative frequency histograms and polygons • quartiles, deciles, and percentiles; interquartile range, and outliers

Performance Standards:

By the end of the term, the learners are able to... • find sides and angles in oblique triangles using the laws of sines and the laws of cosines. • describe translations, reflections, and rotations in the Cartesian plane. • solve and graph the solutions of quadratic inequalities in one variable and in two variables. • solve absolute value equations in one variable and absolute value inequalities in one variable, and graph the solutions. • construct and interpret box - and - whisker plots, and cumulative frequency histograms and polygons. • calculate quartiles, deciles, and percentiles; interquartile range, and outliers.

	Session 1	Session 2	Session 3	Session 4
Learning Objectives:	- Identify the conditions (SAS and SSS) under which the Law of Cosines is applicable for solving oblique triangles. - Relate the Law of Cosines to the Pythagorean Theorem as a specialized case. - State the different forms of the Law of Cosines for finding side lengths.	- Apply the Law of Cosines to calculate the length of the third side in an oblique triangle given two sides and the included angle (SAS). - Solve routine problems involving SAS cases in the context of local architecture.	- Manipulate the Law of Cosines formula to solve for a missing angle when three sides are known (SSS). - Determine all angles of an oblique triangle given all side lengths.	- Solve real-world problems involving oblique triangles using the Law of Cosines. - Communicate mathematical solutions clearly within a contextualized Philippine scenario. - Choose the appropriate mathematical tool (Sines vs. Cosines) for a given situational problem.
Learner Context:	The class exhibits mixed readiness levels, with some learners still struggling to distinguish between right and oblique triangles. Many students show high engagement during visual demonstrations but find abstract algebraic manipulation challenging. There is a strong interest in practical, local examples such as	Learners have shown proficiency in basic calculator operations but occasionally struggle with the order of operations (PEMDAS) when computing squared terms and cosine values. They respond well to hands-on tasks. Some learners require additional support in rounding off decimal values correctly to the nearest hundredths.	Students often find literal equations (isolating the cosine variable) difficult. However, they are highly collaborative and benefit from peer tutoring. Visual learners prefer seeing the algebraic steps color-coded on the board. A small group of learners still struggles with inverse trigonometric functions on their calculators.	Learners show high motivation when problems are framed as 'quests' or real-life missions. They have improved in their technical skills over the last three sessions but need practice in translating word problems into mathematical diagrams. Some students with reading comprehension barriers may need simplified text or

	construction and navigation. A few learners experience anxiety when presented with complex formulas without clear derivation.			visual prompts.
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Learning Experience.

A learning experience is like a thoughtfully designed journey. Each activity and interaction builds towards meaningful understanding and growth. Identify activities and interactions to help learners gain knowledge, skills, or understanding in a purposeful way.

Pre-Lesson:	- Review of the Pythagorean Theorem using a 'Right or Not?' flashcard activity featuring shapes of local triangular banners (banderitas). - Recall of the Law of Sines and its limitations when given SAS or SSS cases.	'Calculator Drill': A quick race to compute various cosine values and squares of numbers commonly found in oblique triangle problems.	Algebraic Warm-up: Solving for 'x' in equations like $10 = 25 + 16 - 40x$ to prepare for isolating Cosine.	'Choose Your Weapon': Display three triangle scenarios; students hold up cards labeled 'SINE' or 'COSINE' to decide which law to use.
Flow:	1. Inquiry (Scaffolding): Present a non-right triangle representing a plot of land in a local barangay where the Law of Sines cannot be used. Ask: 'How can we	1. Modeling: Demonstrate solving for the missing side of a triangular roof truss (inspired by a Bahay Kubo) given two rafters and the peak angle. 2. Scaffolded	1. Explicit Instruction: Guide the class through the step-by-step algebraic manipulation of $c^2 = a^2 + b^2 - 2ab \cos C$ to isolate $\cos C$. 2. Guided Practice: Solving	1. Scenario-Based Learning: Present the 'Bangka Navigation Challenge': Two fishing boats leave a port in Cebu at different angles. Find the distance

	find the missing boundary?' 2. Direct Instruction: Derive the Law of Cosines by dropping an altitude to create right triangles, connecting it back to the Pythagorean Theorem. Use color-coded labels for sides and angles. 3. Check for Understanding: Use 'Thumb-O-Meter' to gauge students' grasp of the formula derivation. 4. Social Learning: In pairs, students sort various triangle diagrams into 'Law of Sines' or 'Law of Cosines' categories based on given parts.	Practice: Students work on a 'Fill-in-the-Blanks' worksheet where the Law of Cosines steps are partially outlined. 3. Active Retrieval: 'Pass the Chalk' activity where one student writes the formula, the next plugs in values, and the third computes the final answer. 4. Social Learning: Small groups solve a problem involving the distance between two local landmarks on a map given their distances from a central school building.	for the largest angle in a triangle with sides 7, 8, and 12 units. Explain why finding the largest angle first is a good strategy. 3. Checks for Understanding: 'Error Analysis' activity—present a pre-solved SSS problem with a common mistake and have students identify and fix it. 4. Peer Tutoring: Students work in 'Triads' where one is the 'Isolator' (manipulates formula), one is the 'Computer' (calculator work), and one is the 'Verifier' (checks the steps).	between them after two hours. 2. Collaborative Problem Solving: Groups are assigned different local contexts (e.g., measuring distance between mountain peaks in the Cordilleras, or guy wires for a Philippine telecommunication s tower). 3. Presentation: Groups present their 'Math Maps'—a visual representation of the word problem, the formula used, and the step-by-step solution. 4. Synthesis: Discussion on how technology (GPS) uses these mathematical principles behind the scenes.
Learning Resources:	• Laptop and Projector • PowerPoint Presentation on Triangle Cases • Printed Sorting Cards • Chalkboard	• Scientific Calculators • Worksheet on SAS Cases • Images of Philippine Architectural Trusses • Whiteboard markers	• Scientific Calculators • Error Analysis Task Cards • Projector/Slide Presentation	• Manila Paper and Markers • Real-world Word Problem sets • Calculators • Compass/Rulers for drawing diagrams
Opportunities for integration:	Integration with History: Discuss how early navigators and land surveyors in the Philippines	Integration with TLE (Drafting/Carpentry): Discussing the importance of accurate	Integration with Art: Discussing the 'Rule of Thirds' and triangular compositions in Filipino paintings	Integration with Geography and Social Studies: Exploring the distance between Philippine islands

	used primitive triangulation methods for maritime travel and land mapping.	measurements in building stable roof structures and minimizing material waste.	(e.g., Amorsolo) and how angles affect visual balance.	and the importance of maritime safety and navigation.
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Assessment.

Assessments reveal what learners have gained and what they still need help with. These are helpful in providing you with information to guide your future instruction throughout the entire session.

Formative Assessment:	• Categorization Activity: Correctly identifying the 3 required parts (SAS or SSS) to use the Law of Cosines. • Exit Ticket: Writing the formula for finding side 'c' if sides 'a' and 'b' and Angle 'C' are known.	• Board Work: Individual solving of SAS problems with immediate teacher feedback. • Self-Correction: Using a provided answer key to check the 'Fill-in-the-Blanks' worksheet.	• Quick Quiz: Solve for one angle given sides of 5cm, 6cm, and 7cm. • Observation Checklist: Monitoring group collaboration and correct use of the Arccos function on calculators.	• Performance Task: Correctness of the 'Math Map' and the accuracy of the group's solution. • Peer Assessment: Each group evaluates another group's diagram for clarity and accuracy.
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Ways Forward.

Meaningful learning can also happen beyond the classroom – for both the learners and the teacher. Pause and reflect on what happened today.

Extended learning opportunities:	Students who finish early will explore the 'Ambiguous Case' in the Law of Sines to contrast it with the stability of the Law of Cosines.	Assign a task to find a triangular object at home, measure two sides and the angle between them (if possible), and calculate the third side.	Provide a challenge problem: 'Can a triangle exist with sides 2, 3, and 10? Why does the Law of Cosines result in an error message?'	Research Project: Look for a career in the Philippines (e.g., Civil Engineering, Coast Guard) that uses trigonometry and write a short paragraph about how they use it.
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Reflections:	Reflection Prompt: Which part of the derivation was most confusing, and what visual aid helped clarify it? How does the formula change if the angle is exactly 90 degrees?	Reflection Prompt: Did the 'Fill-in-the-Blanks' worksheet help you remember the steps better? What common mistake did you notice during the calculator drill?	Reflection Prompt: Which is harder for you: solving for a side or solving for an angle? Why? What algebraic step do you need to practice more?	Reflection Prompt: How did drawing a diagram help you solve the word problem? What is one real-life situation where you could personally use the Law of Cosines?
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