

**MPM 2D 4-4 : Lesson Plan**

<b>Unit 4:</b> Trigonometry – Right-Angled Triangles and Acute Triangles	<b>Lesson 4-4:</b> Acute Problem Solving With Jose	<b>Time:</b> 4 hours
<b>Key Idea:</b> Learn how acute triangles can be used to solve real-world problems		
<div><b>Ministry Expectations</b>  <b>TR2 –</b> Solve Problems Involving the Trigonometry of Right Triangles<ul style="list-style-type: none"><li>Solve real-life problems involving right triangles</li></ul><b>TR3 –</b> Solve Problems Involving the Trigonometry of Acute Triangles<ul style="list-style-type: none"><li>Explore the development of the sine law within acute triangles</li><li>Explore the development of the cosine law within acute triangles</li><li>Determine the sides and angles of acute triangles using the sine and cosine laws</li><li>Solve problems involving the sides and angles in acute triangles</li></ul></div>	<div><b>Learning Goals and Success Criteria</b>  <b>Solve Problems Involving the Trigonometry of Acute Triangles</b><ul style="list-style-type: none"><li>Explore the development of the sine law (TR 3.1)<ul style="list-style-type: none"><li>I can understand how the sine law was made (A)</li></ul></li><li>Explore the development of the cosine law (TR3.2)<ul style="list-style-type: none"><li>I can understand how the cosine law was made (B)</li></ul></li><li>Use the sine and cosine laws with acute triangles (TR3.3)<ul style="list-style-type: none"><li>I can recognize when I can and cannot use the sine law (A)</li><li>I can recognize when I can and cannot use the cosine law (B)</li></ul></li><li>Solve problems involving acute triangles (TR3.4)<ul style="list-style-type: none"><li>I can use the sine law to solve a real-world problem (A)</li><li>I can use the cosine law to solve a real-world problem (B)</li><li>I can use the sine law and cosine law to find the length of all sides of a triangle (C)</li><li>I can use trigonometry with acute triangles to solve a real-world problem (C, D)</li><li>I can recognize when a problem is symmetric (C)</li></ul></li></ul> <b>Solve Problems Involving the Trigonometry of Right Triangles</b><ul style="list-style-type: none"><li>Solve real-life problems involving right triangles (TR2.3)<ul style="list-style-type: none"><li>I can use trigonometry with right-angled triangles to solve a real-world problem (C)</li></ul></li></ul></div>	
<div><b>Materials Required</b><ul style="list-style-type: none"><li>Moodle access &amp; Internet</li><li>Students need electronic device</li></ul></div>	<div><b>Higher Order Thinking Skills (HOTS):</b><ul style="list-style-type: none"><li>Plan how to solve a real-world problem (A, B, C, D)</li><li>Evaluate what formulas are required to solve a problem (C, D)</li><li>Analyze a problem to find information that is not given (A, B, C, D)</li></ul></div>	

<b>Purpose:</b> What's the point?	<b>Learning Activity:</b> What is the teacher doing?	<b>Teaching Scenarios &amp; Instructional Strategies</b> What scenarios & methods are being used? <i>*refer to end of doc for complete list</i>	<b>Higher Order Thinking Skill Development</b> What skills are students developing? <i>*refer to end of doc for complete list</i>
Review and clarify previous lesson's lingering questions  <b>(10 mins)</b>	Use of questioning to check for understanding [Exit Card]: <ul style="list-style-type: none"> <li>Discuss Exit Card responses and provide support as needed.</li> </ul>	Use of questioning to check for understanding <ul style="list-style-type: none"> <li>Exit Card</li> </ul>	Processing skills <ul style="list-style-type: none"> <li>Reflecting on the lesson</li> </ul> Reasoning skills <ul style="list-style-type: none"> <li>Offering opinions with reasons</li> </ul>
Hook students  <b>(10 mins)</b>	<b>Introduction</b> Promoting student talk [Brainstorming] <ul style="list-style-type: none"> <li>Read the quotation to the class.               <ul style="list-style-type: none"> <li>Ask students for their opinions about what it means. <i>Prompt: "What does this quotation mean to you?"</i></li> </ul> </li> <li>Give an overview of the main activities in the lesson. (Use Moodle introduction as needed)</li> <li>Write the learning goals on the board.</li> <li>Discuss the learning goals and answer any questions.</li> <li>Transition to first activity.</li> </ul>	Promoting student talk <ul style="list-style-type: none"> <li>Brainstorming</li> </ul>	<ul style="list-style-type: none"> <li>Processing skills</li> <li>Critical/Creative thinking skills</li> </ul>
Understand how the sine law was made  Recognize when I can and cannot use the sine law  Use the sine law to solve a real-world problem  <b>(40 mins)</b>	<b>4-4A: The Sine Law</b>  Provide direct instruction [Visuals]: <ul style="list-style-type: none"> <li>Introduce the section. Use the Moodle introduction.</li> <li>Let the students watch the video on Moodle.</li> </ul> Modelling through demonstration [Teacher completed examples]: <ul style="list-style-type: none"> <li>Draw a triangle on the board as seen in Moodle.</li> <li>Explain how the sine law is written for that triangle.</li> </ul>	Provide direct instruction <ul style="list-style-type: none"> <li>Visuals</li> </ul> Modelling through demonstration <ul style="list-style-type: none"> <li>Teach completed examples</li> </ul>	

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	<p>Promote student talk [Think/Pair/Share]:</p> <ul style="list-style-type: none"> <li>Put forth Jose's problem to the students. Ask students to discuss in pairs.</li> <li>Walk around the class to ensure that the discussion stays on topic.</li> <li>Then have some students share the solution with the class.</li> <li>Use the board to write out the solution.</li> <li>Then ask students to work on the HOT prompt.</li> <li>Repeat the above steps from "walk around the class..."</li> </ul> <p>Promote student talk [Think/Pair/Share]:</p> <ul style="list-style-type: none"> <li>Move to the last section. Draw triangle GHI on the board, as seen on Moodle.</li> <li>Ask students to discuss in pairs whether sine law can be used. Ask them to share their answers with class.</li> <li>Demonstrate on board why sine law can't be used.</li> <li>Discuss More HOT prompts. Ask students to raise their hands to share their answers with the class.</li> </ul> <p>Supporting Student improvement [Review &amp; Practice]:</p> <ul style="list-style-type: none"> <li>Direct students to the online self-check quiz.</li> <li>Walk around the classroom and provide guidance as needed.</li> </ul>	<p>Promote student talk</p> <ul style="list-style-type: none"> <li>Think/Pair/Share</li> </ul> <p>Promote student talk</p> <ul style="list-style-type: none"> <li>Think/Pair/Share</li> </ul> <p>Supporting student improvement</p> <ul style="list-style-type: none"> <li>Review and practice</li> </ul>	<p>Problem-solving skills</p> <ul style="list-style-type: none"> <li>Recognizing relationships</li> <li>Drawing connections</li> </ul> <p>Creative thinking skills</p> <ul style="list-style-type: none"> <li>Analysing</li> <li>Making connections</li> </ul> <p>Problem-solving skills</p> <ul style="list-style-type: none"> <li>Formulating and interpreting the problem</li> </ul>
<p>Understand how the cosine law was made</p> <p>Recognize when I can and cannot use the cosine law</p>	<p><b>4-4B : The Cosine Law</b></p> <p>Provide direct instruction [Visuals]:</p> <ul style="list-style-type: none"> <li>Introduce the section. Use the Moodle introduction.</li> <li>Let the students watch the video on Moodle.</li> </ul> <p>Modelling through demonstration [Teacher completed examples]:</p> <ul style="list-style-type: none"> <li>Draw a triangle on the board as seen in Moodle.</li> <li>Explain how the cosine law is written for that triangle.</li> <li>Ask the class the HOT prompt.</li> </ul>	<p>Provide direct instruction</p> <ul style="list-style-type: none"> <li>Visuals</li> </ul> <p>Modelling through demonstration</p> <ul style="list-style-type: none"> <li>Teach completed examples</li> </ul>	

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Use the cosine law to solve a real-world problem  <b>(40 mins)</b>	Promote student talk [Think/Pair/Share]: <ul style="list-style-type: none"> <li>Put forth Jose's problem to the students. Ask students to discuss in pairs.</li> <li>Walk around the class to ensure that the discussion stays on topic.</li> <li>Then have some students share the solution with the class.</li> <li>Use the board to write out the solution.</li> <li>Then ask students to work on the HOT prompt.</li> <li>Repeat the above steps from "walk around the class..."</li> </ul> Promote student talk [Think/Pair/Share]: <ul style="list-style-type: none"> <li>Move to the last section. Draw the 4 triangles on the board, as seen on Moodle.</li> <li>Ask students to discuss in pairs which triangles can be solved by first using the cosine law. Ask them to share their answers with class.</li> <li>Demonstrate on the board how the cosine law can be used for triangle 4.</li> <li>Discuss More HOT prompts. Ask students to raise their hands to share their answers with the class.</li> </ul> Supporting Student improvement [Review & Practice]: <ul style="list-style-type: none"> <li>Direct students to the online self-check quiz.</li> <li>Walk around the classroom and provide guidance as needed.</li> </ul>	Promote student talk <ul style="list-style-type: none"> <li>Think/Pair/Share</li> </ul> Promote student talk <ul style="list-style-type: none"> <li>Think/Pair/Share</li> </ul> Supporting student improvement <ul style="list-style-type: none"> <li>Review and practice</li> </ul>	Problem-solving skills <ul style="list-style-type: none"> <li>Recognizing relationships</li> <li>Drawing connections</li> </ul> Creative thinking skills <ul style="list-style-type: none"> <li>Analysing</li> <li>Making connections</li> </ul> Problem-solving skills <ul style="list-style-type: none"> <li>Formulating and interpreting the problem</li> </ul>
Use the sine law and cosine law to find the length of all sides of a triangle	<b>4-4C: Bridging It Together</b>  Facilitate collaborative learning in group structure [roles]: <ul style="list-style-type: none"> <li>Introduce the section. Use the Moodle introduction.</li> <li>Divide students into groups of 5. Each student within a group is assigned the role of solving a different triangle, so that the group works towards the common goal of finding the total length of all sides of the triangles on one side of the bridge.</li> </ul>	Facilitate Collaborative Learning in Group Structure <ul style="list-style-type: none"> <li>Roles</li> </ul>	Planning skills <ul style="list-style-type: none"> <li>Generating ideas</li> </ul>

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<p>Use trigonometry with acute triangles to solve a real-world problem</p> <p>Recognize when a problem is symmetric</p> <p><b>(45 mins)</b></p>	<ul style="list-style-type: none"> <li>Within one side of the bridge, there are 5 triangles on either side of the line of symmetry, EF as seen on Moodle. Within each group, assign each student one of these triangles for them to solve.</li> <li>Remind each group to combine their results to find the total length of all sides of triangle on one side of the bridge.</li> <li>Walk around the class to ensure that the discussion stays on topic.</li> <li>Ask different groups for their results.</li> </ul> <p>Promote student talk [Discussion prompts]:</p> <ul style="list-style-type: none"> <li>Draw the triangles on the board that are on the left side of EF, as discussed in Moodle.</li> <li>Use leading questions such as “what side do we need to find?”, “how do we find this side?”, “what laws/formulas do we know?”</li> <li>With each answer from the class, take action on the board to eventually arrive at the solution.</li> <li>Ask students More HOT prompts questions. Ask students to raise their hands to share their answers with the class.</li> </ul> <p>Supporting Student improvement [Review &amp; Practice]:</p> <ul style="list-style-type: none"> <li>Direct students to the online self-check quiz.</li> <li>Walk around the classroom and provide guidance as needed.</li> </ul>	<p>Promote student talk</p> <ul style="list-style-type: none"> <li>Discussion prompts</li> </ul> <p>Supporting student improvement</p> <ul style="list-style-type: none"> <li>Review and practice</li> </ul>	<p>Creative thinking skills</p> <ul style="list-style-type: none"> <li>Analysing</li> <li>Making connections</li> </ul> <p>Processing skills</p> <ul style="list-style-type: none"> <li>Carrying out a plan</li> </ul> <p>Problem-solving skills</p> <ul style="list-style-type: none"> <li>Recognizing relationships</li> <li>Drawing connections</li> </ul> <p>Reasoning skills</p> <ul style="list-style-type: none"> <li>Offering opinion with reasons</li> <li>Making judgments</li> </ul> <p>Problem-solving skills</p> <ul style="list-style-type: none"> <li>Formulating and interpreting the problem</li> </ul>
<p>Reinforce concepts of this unit through a game of Pictionary</p> <p><b>(15 mins)</b></p>	<p><b>4-4: Trigonometry Pictionary – CA</b></p> <p>Facilitate collaborative learning in group structure [teamwork skills]:</p> <ul style="list-style-type: none"> <li>Follow Moodle instructions that state how to divide the students into groups.</li> </ul>	<p>Facilitate collaborative learning</p> <ul style="list-style-type: none"> <li>Teamwork skills</li> </ul>	<p>Presentation skills</p> <ul style="list-style-type: none"> <li>Expressing ideas</li> <li>Graphic modes of representation</li> </ul>

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	<ul style="list-style-type: none"> <li>Prepare the game cards in advance so that they can be distributed to all groups. Each group should have a whole set of cards that are available in the Game Sheet link on the Moodle page.</li> <li>Explain the rules to the students as stated on Moodle.</li> <li>As students play the game, walk around to ensure that the game stays on point but let students have some fun.</li> </ul>		
Use trigonometric ratios to solve general real-world problems  <b>(60 mins)</b>	<b>4-4D: Trigonometry Around Me [MAM]</b>  Modelling [Demonstration and Use of Examples]: <ul style="list-style-type: none"> <li>Introduce the forum.</li> <li>Discuss rubric expectations.</li> <li>Present the sample post &amp; response.</li> <li>Clarify doubts and allow student questions.</li> </ul> Supporting Student Improvement [Track Student Achievement]: <ul style="list-style-type: none"> <li>Instruct students to complete their forum post and response.</li> <li>Walk around to provide guidance to students.</li> </ul>	Modelling <ul style="list-style-type: none"> <li>Demonstration</li> <li>Use of Examples</li> </ul> Supporting Student Improvement <ul style="list-style-type: none"> <li>Track Student Achievement</li> </ul>	Research skills <ul style="list-style-type: none"> <li>Formulating questions</li> </ul> Problem-solving skills <ul style="list-style-type: none"> <li>Formulating and interpreting the problem</li> </ul> Reasoning skills <ul style="list-style-type: none"> <li>Offering opinion with reasons</li> <li>Making judgments</li> </ul> Critical/creative thinking skills <ul style="list-style-type: none"> <li>Analysing, interpreting, evaluating</li> </ul>
Students recap the learning session  <b>(10 mins)</b>	<b>4-4E: Wrap up &amp; Reflection</b>  Supporting Student Improvement [Review]: <ul style="list-style-type: none"> <li>Go through the academic goals from the beginning of the lesson and jointly affirm the learning.</li> <li>Ask the students if there are any questions.</li> </ul>	Supporting Student Improvement <ul style="list-style-type: none"> <li>Review</li> </ul>	Reasoning skills <ul style="list-style-type: none"> <li>Offering opinions with reasons</li> </ul>
Students reflect on the learning goals and lesson content  <b>(10 mins)</b>	<b>4-4F: Exit Card</b>  Use of questioning to check for understanding [Exit Card]: <ul style="list-style-type: none"> <li>Instruct students to fill out the Exit Card.</li> </ul>	Use of questioning to check for understanding <ul style="list-style-type: none"> <li>Exit Card</li> </ul>	Reflecting skills <ul style="list-style-type: none"> <li>Reflecting on and assessing progress</li> </ul>

*Teaching Scenarios & Instructional Strategies		*Higher Order Thinking Skills:
<p><b>Providing Direct Instruction</b></p> <ul style="list-style-type: none"> <li>▪ Lecture: <ul style="list-style-type: none"> <li>○ Think/Pair/Share</li> <li>○ Visuals</li> <li>○ Anchor Charts</li> <li>○ Notetaking</li> </ul> </li> </ul> <p><b>Providing Overt Instruction Through Text</b></p> <ul style="list-style-type: none"> <li>▪ Text Reading Skills <ul style="list-style-type: none"> <li>○ Skimming and Scanning</li> <li>○ Summarization</li> <li>○ Reading Between the Lines</li> <li>○ Sorting Ideas with Concept Mapping</li> <li>○ Organizational patterns (sequencing, compare/contrast, cause/effect, order of importance, classification, pros/cons)</li> <li>○ Identifying signal words</li> <li>○ Using context to find meaning</li> <li>○ Tips for reading graphical text</li> </ul> </li> </ul> <p><b>Modelling</b></p> <ul style="list-style-type: none"> <li>▪ Demonstration <ul style="list-style-type: none"> <li>○ Teacher completed examples</li> <li>○ Teacher think and read aloud</li> <li>○ My Favourite No</li> </ul> </li> <li>▪ Use of Examples <ul style="list-style-type: none"> <li>○ Visuals/Anchor Charts</li> <li>○ Provide weak and strong exemplars</li> </ul> </li> </ul> <p><b>Promoting Student Talk</b></p> <ul style="list-style-type: none"> <li>▪ Respectful talk <ul style="list-style-type: none"> <li>○ Discussion prompts</li> <li>○ Sentence Starters</li> </ul> </li> <li>▪ Talk Strategies <ul style="list-style-type: none"> <li>○ Brainstorming</li> <li>○ Think/Pair/Share</li> <li>○ Active Listening</li> <li>○ Inside/Outside Circle</li> <li>○ Slide the Line</li> <li>○ Stand Up Game</li> <li>○ Four Corners</li> <li>○ Take Five</li> <li>○ Timed Retell</li> </ul> </li> </ul>	<p><b>Facilitating Collaborative Learning</b></p> <ul style="list-style-type: none"> <li>▪ Group Structure <ul style="list-style-type: none"> <li>○ Roles</li> <li>○ Teamwork skills</li> </ul> </li> <li>▪ Group Strategies <ul style="list-style-type: none"> <li>○ Round Robin</li> <li>○ Numbered Heads</li> <li>○ Placemat</li> <li>○ Shared Reading/Jigsaw</li> </ul> </li> </ul> <p><b>Use of Questioning</b></p> <ul style="list-style-type: none"> <li>▪ To activate prior knowledge <ul style="list-style-type: none"> <li>○ Diagnostic quiz</li> <li>○ Anticipation Guide</li> </ul> </li> <li>▪ To check for understanding <ul style="list-style-type: none"> <li>○ Thumbs Up</li> <li>○ Individual Whiteboards</li> <li>○ Red, Yellow, Green Light</li> <li>○ Exit Cards</li> </ul> </li> <li>▪ To prompt deeper thinking <ul style="list-style-type: none"> <li>○ Critical Thinking Routines</li> <li>○ Drawing Conclusions</li> <li>○ Making Judgements</li> </ul> </li> </ul> <p><b>Providing Formative Feedback</b></p> <ul style="list-style-type: none"> <li>▪ Feedback structure <ul style="list-style-type: none"> <li>○ What has been done well</li> <li>○ What needs improvement</li> <li>○ How to improve</li> </ul> </li> <li>▪ Evaluative vs Descriptive Feedback</li> </ul> <p><b>Supporting Student Improvement</b></p> <ul style="list-style-type: none"> <li>▪ Track Student Achievement</li> <li>▪ Break down learning <ul style="list-style-type: none"> <li>○ Chunking</li> <li>○ Scaffolding</li> </ul> </li> <li>▪ Review and Practice</li> <li>▪ Differentiate Instruction and Resources</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Research skills:</b> formulating questions, gathering information, brainstorming, investigating, etc.</li> <li>▪ <b>Problem-solving skills:</b> formulating and interpreting the problem, drawing connections, estimating, classifying, recognizing relationships, hypothesizing, etc.</li> <li>▪ <b>Planning skills:</b> generating ideas, gathering information, organizing information, making a plan for solving the problem</li> <li>▪ <b>Processing skills:</b> carrying out a plan; reflecting on the solution; recording results; gathering evidence and data; observing; manipulating materials and equipment, etc.</li> <li>▪ <b>Reasoning skills:</b> offering opinions with reasons; evaluating results; making judgements and conclusions, etc.</li> <li>▪ <b>Presentation skills:</b> expressing ideas; using appropriate linguistic, numeric, symbolic, and graphic modes of representation; conveying meaning through various text form, etc.</li> <li>▪ <b>Critical/Creative thinking skills:</b> analysing, interpreting, evaluating, making connections, etc.</li> <li>▪ <b>Reflecting skills:</b> setting goals; reflecting on and assessing progress, etc.</li> </ul>