EDCP 342A Unit planning: Rationale and overview for planning a unit of work in secondary school mathematics

Your name:
School, grade & course:
Topic of unit (NOTE: This should be a unit you will actually be teaching on practicum!):

Preplanning questions:

(1) *Why* do we teach this unit to secondary school students? Research and talk about the following: Why is this topic included in the curriculum? Why is it important that students learn it? What learning do you hope they will take with them from this? What is intrinsically interesting, useful, beautiful about this topic? (150 words)

Trigonometry is an important part of the secondary school curriculum as it helps students connect math to real-world problems. It is a key tool for solving questions about angles, distances, and shapes, which are useful in fields like construction, navigation, and engineering.

By learning trigonometry, students develop problem-solving and critical thinking skills, which are valuable in everyday life and future careers. It also prepares them for advanced math topics, like calculus and physics, by building a strong foundation.

Trigonometry is practical, as it explains concepts like angles of elevation and depression, which are used to solve real-life challenges. Beyond its usefulness, trigonometry has a natural beauty, showing patterns and relationships in geometry that help students appreciate how math works. By learning trigonometry, students gain confidence in math and see how it connects to other areas of learning and the world around them.

(2) A mathematics project connected to this unit: Plan and describe a student mathematics project that will form part of this unit. Describe the topic, aims, process and timing, and what the students will be asked to produce, and how you will assess the project. (250 words)

Project: Designing a Functional Ramp
Topic: Applying trigonometric concepts to design a practical structure.
Aims: This project aims to help students apply their understanding of trigonometry to a real-world scenario, fostering problem-solving, creativity, and collaboration. Students will learn how trigonometric ratios can be used in construction and design.
Process and Timing:

- **Week 1:** Introduction (1 day) – Students are introduced to the project and given an overview of ramp specifications (e.g., height, length, and safety regulations).
- **Week 2:** Planning (2 days) – Students work in groups to determine the measurements and angles using trigonometric ratios (sine, cosine, tangent). They draw scaled diagrams of their designs.
- **Week 3:** Presentation (1 day) – Groups present their designs, explaining how they applied trigonometric concepts.

What Students Will Produce: Students will create:

1. A scale drawing of their ramp design, showing all relevant measurements and calculations.
2. A written explanation detailing the mathematical process, including how they used trigonometric ratios and addressed real-world considerations like accessibility and safety.
3. A group presentation demonstrating their understanding and creativity.

Assessment:
The assessment for this project focuses on understanding and thinking processes. Students will be evaluated on how well they apply trigonometric concepts and explain their reasoning clearly. Their problem-solving skills will also be observed, particularly how they handle challenges like adjusting for new angles or limitations.

Teamwork will be evaluated, looking at how effectively students work together, share ideas, and build on each other's contributions. Additionally, the project will assess whether students consider real-world factors, such as making the ramp practical, usable, ideal lengths, and safe. Finally, students will reflect on what they learned and how they used mathematical thinking throughout the project. This approach ensures their learning journey is taken into account, not just their final results.

(3) Assessment and evaluation: How will you build a fair and well-rounded assessment and evaluation plan for this unit? Include formative and summative, informal/ observational and more formal assessment modes. (100 words)

The assessment plan for this trigonometry unit will include a mix of formative and summative approaches to ensure fairness and support student growth. Formative assessments will include informal observations during group work, class discussions, and problem-solving activities to monitor understanding and provide feedback. Formal assessments, such as quizzes, worksheets, and a unit test, will evaluate individual knowledge and skills. The student project on designing a ramp will serve as a summative assessment, emphasizing real-world application and critical thinking. Peer and self-assessments will also encourage reflection. Overall, the focus will be on how their understanding has developed, not only thei

Elements of your unit plan:

a) Give a numbered list of the topics of the 10-12 lessons in this unit in the order you would teach them.

Lesson	Topic

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
(11)	
(12)	

b) Write a detailed lesson plan for *three* of the lessons which will *not* be in a traditional lecture/ exercise/ homework format. These three lessons should include at least three of the following six elements related to your mathematical topic. (And of course, you could include more than three!)

These elements should be thoroughly integrated into the lessons (i.e. not an add-on that the teacher just tells!)
a) History of this mathematics
b) Arts and mathematics
c) Indigenous perspectives and cultures
d) Social/environmental justice
e) Open-ended problem solving in groups at vertical erasable surfaces ("thinking classroom")
f) Telling only what is arbitrary, and having students work on what is logically 'necessary'

Be sure to include your pedagogical goals, topic of the lesson, preparation and materials, approximate timings, an account of what the students and teacher will be doing throughout the lesson, and ways that you will assess students' background knowledge, student learning and the overall effectiveness of the lesson. Please use a template that you find helpful, and that includes all these elements.

MATH WP 10: UNIT 3 TRIGONOMETRY

OVERVIEW		
Scope	**Theme**	**Context**
This unit on trigonometry consists of **13 lessons**. Each lesson builds foundational knowledge and progresses to advanced applications of trigonometry, culminating in assessments to evaluate student understanding.	The overarching theme is **"Connecting Mathematical Theories to Real-World Applications"**. Each topic focuses on exploring the relationships between angles, sides, and trigonometric ratios, emphasizing their practical relevance in navigation, architecture, and problem-solving.	Lessons employ a variety of teaching methods, including **group work**, **hands-on activities (e.g., using clinometers and protractors)**, **problem-solving scenarios**, and **peer teaching**. These methods are designed to engage students actively and foster collaboration and helping them clearly understand the concepts. The unit also incorporates periodic assessments and real-world applications to reinforce learning.
Unit Summary		
This trigonometry unit begins with fundamental concepts such as triangle labeling and the Pythagorean theorem, forming a base for understanding trigonometric ratios. The progression to topics like SOHCAHTOA and angle calculations allows students to explore how these principles are applied to solve problems. Practical applications, including angles of elevation and depression, connect the theory to real-life scenarios, helping gain students' interests. In addition, collaborative activities and group discussions throughout the unit help students develop their critical thinking skills. By the end, students are hoped to have mastered the concepts, allowing them to apply trigonometry confidently in real-world contexts.		

EDCP342A Unit Planning Assignment

13-Day Trigonometry Unit Plan for Workplace Mathematics 10

BREAKDOWN

Lesson	Concepts	Big Ideas	Curricular Competencies	Content	Activity	Worksheet /Assessment
1	1- Triangles: Labelling & Classifying	3D objects can be examined mathematically.	Understanding & Solving: Develop, demonstrate, and apply conceptual understanding of mathematical ideas through play, story, inquiry, and problem-solving.	Types of triangles, labelling conventions, identifying hypotenuse and legs in right triangles	**Triangle Exploration:** Students work in groups to sort and classify different types of triangles. They then practice labelling triangles according to the conventions outlined.	**Worksheet 1:** Labelling Triangles

2	2-Pythagorean Theorem	Flexibility with number builds meaning, understanding, and confidence.	Reasoning & Modelling: Explore, analyze, and apply mathematical ideas using reason, technology, and other tools.	Pythagorean Theorem, finding the hypotenuse, solving for a leg	**Building Right Triangles:** Students use manipulatives like straws or string to create right triangles and measure the sides. They then apply the Pythagorean Theorem to calculate the hypotenuse and verify their measurements.	**Worksheet 2:** Applying Pythagorean Theorem

3	2-Pythagorean Theorem: Applications	3D objects can be examined mathematically.	Understanding & Solving: Visualize to explore and illustrate mathematical concepts and relationships.	Applying Pythagorean Theorem to real-world problems	**Real-World Problem Solving:** Students work in pairs to solve word problems that involve applying the Pythagorean Theorem to real-world scenarios like finding the length of a ladder or the distance across a lake. Encourage students to draw diagrams to visualize the problems.	**Worksheet 3:** Pythagorean Theorem Word Problems

4	3-Pythagorean Triples	Flexibility with number builds meaning, understanding, and confidence.	Reasoning & Modelling: Develop thinking strategies to solve puzzles and play games.	Identifying Pythagorean Triples, verifying right triangles	**Pythagorean Triple Puzzles:** Students work individually or in pairs to solve puzzles that involve identifying Pythagorean Triples and determining if given sets of numbers form right triangles.	**Quiz 1:** Covering concepts from Lessons 1-4

5	4-Intro to Trigonometry	Representing and analyzing data allows us to notice and wonder about relationships.	Connecting & Reflecting: Connect mathematical concepts with each other, other areas, and personal interests.	Basic trigonometric ratios: Sine, Cosine, Tangent (SOH CAH TOA)	**Trigonometry Ratios Exploration:** Introduce the concept of trigonometry and its applications. Students explore the sine, cosine, and tangent ratios using interactive tools or physical models of right triangles. Encourage students to notice patterns and relationships between the sides and angles.	**Worksheet 4:** Introduction to Trigonometric Ratios

6	5-Trigonometric Ratios (Sin, Cos,Tan): Calculations	Proportional reasoning is used to make sense of multiplicative relationships.	Understanding & Solving: Apply flexible and strategic approaches to solve problems.	Calculating sine, cosine, and tangent ratios using a calculator	**Triangle Measurement and Calculation:** Provide students with different right triangles. They measure the sides, identify the angle of interest, and use a calculator to determine the sine, cosine, and tangent ratios for the given angle.	**Worksheet 5:** Calculating Trigonometric Ratios

7	6- Choosing the Right Trigonometric Ratio (SOH CAH TOA)	3D objects can be examined mathematically.	Understanding & Solving: Apply flexible and strategic approaches to solve problems.	Identifying the appropriate trigonometric ratio based on the given information	**Trigonometry Ratio Matching:** Students work in groups and are given a set of right triangle problems with different sides and angles labelled. They need to match each problem with the correct trigonometric ratio (sine, cosine, or tangent) that would be used to solve for the unknown side or angle.	**Worksheet 6:** Identifying the Correct Trigonometric Ratio

8	7- Using Sin, Cos, Tan, to solve for Sides in Right Triangles	Proportional reasoning is used to make sense of multiplicative relationships.	Understanding & Solving: Apply flexible and strategic approaches to solve problems.	Using trigonometric ratios to solve for missing side lengths in right triangles	**Triangle Puzzles:** Provide students with puzzles where they need to use trigonometric ratios to solve for missing side lengths in right triangles. Puzzles can be presented in various formats, such as missing side lengths on a triangle diagram or word problems that describe a real-world scenario.	**Worksheet 7:** Solving for Sides using Trigonometric Ratios

9	8- Angles of Elevation and Depression	Representing and analyzing data allows us to notice and wonder about relationships.	Communicating & Representing: Explain and justify mathematical ideas and decisions in many ways.	Defining angles of elevation and depression, applying trigonometric ratios in real-world scenarios	**Visualizing Angles of Elevation & Depression:** Use real-world examples (e.g., looking up at a building, looking down from a hill) and visual aids (e.g., diagrams, props) to explain the concepts of angle of elevation and angle of depression. Have students practice identifying these angles in different scenarios.	**Worksheet 8:** Angles of Elevation and Depression

10	8-Applications: Word Problems	Proportional reasoning is used to make sense of multiplicative relationships.	Understanding & Solving: Engage in problem-solving experiences connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures.	Solving real-world problems involving trigonometric ratios, angles of elevation, and depression	**Project: Design a Ramp:** Students work in teams to design a ramp that meets specific requirements (e.g., angle of elevation, height, length). They apply trigonometric ratios and problem-solving skills to create a scale drawing and calculations for their ramp design. Encourage creativity and real-world considerations like safety and accessibility.	**Worksheet 9:** Trigonometry Word Problems

11	9- Finding Angles in Right Triangles	3D objects can be examined mathematically.	Understanding & Solving: Apply flexible and strategic approaches to solve problems.	Using inverse trigonometric functions to solve for missing angles in right triangles	**Angle Calculation Challenge:** Provide students with a variety of right triangles with known side lengths. They need to use inverse trigonometric functions ($\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$) on their calculators to determine the missing angles in the triangles.	**Worksheet 10:** Finding Angles using Inverse Trigonometric Functions

12	9-Applications: Finding Angles in Context	3D objects can be examined mathematically.	Understanding & Solving: Engage in problem-solving experiences connected with place, story, cultural practices, and perspectives relevant to local First Peoples communities, the local community, and other cultures.	Applying inverse trigonometric functions to solve for angles in real-world situations	**Real-World Angle Problems:** Present students with real-world scenarios where they need to calculate angles using inverse trigonometric functions (e.g., determining the angle of a ladder leaning against a wall, finding the angle of elevation of a kite). Encourage students to draw diagrams and apply the appropriate trigonometric concepts.	**Worksheet 11:** Real-World Applications of Inverse Trigonometric Functions

13	Review and Assessment	Proportional reasoning is used to make sense of multiplicative relationships. 3D objects can be examined mathematically. Flexibility with number builds meaning, understanding, and confidence. Representing and analyzing data allows us to notice and wonder about relationships.	Reasoning & Modelling, Understanding & Solving, Communicating & Representing, Connecting & Reflecting	Review key concepts and problem-solving strategies for the unit.	**Jeopardy Review:** Divide the class into teams and conduct a Jeopardy-style review game covering the main concepts of the unit, including Pythagorean Theorem, trigonometric ratios, angles of elevation and depression, and solving for sides and angles in right triangles.	**Unit Test:** Comprehensive assessment covering all concepts from the unit.

Lesson Plan: Workplace Math 10 –

Lesson 1: Introduction to Triangles

Grade/Class	Workplace Math 10	Unit: 3-Trigonometry
Duration	70 minutes	
Big Ideas	**Curricular Competencies**	**Learning Objectives**
3D objects can be examined mathematically.	Understanding and solving: Students will develop a conceptual understanding of the relationship between the sides of a right triangle.	Students will be able to correctly label the sides and angles of a right triangle.
Materials	-Rulers, Protractors, -Handout with triangle diagrams for practice problems,	

Hook **(20 min)** **Intro to Triangles Activity**	**Show students images of real-world structures that use triangles in their design (e.g., bridges, buildings, towers).** Ask: "What shapes do you see repeating in these structures? Why do you think triangles are used so often in construction?" **Lead a discussion on the strength and stability of triangles.**
Lesson **(10 min)**	1. **Introduction to Labelling Triangles:** Review basic facts about triangles, including the number of sides and angles, the sum of interior angles, and labeling conventions for vertices and sides. - Emphasize clear labeling to avoid confusion, especially with letters like C and c.
Group Activity **(20 min)**	**Divide students into groups of 3-4. Provide each group with a set of triangle problems (from Handout) that require them to label the missing sides. Encourage collaboration and discussion within groups.** After the activity, have each group present one problem and its solution to the class.
Individual Practice **(15 min)**	**Distribute a worksheet with problems involving the triangles and labelling the sides, including word problems that require applying the concept to real-world scenarios.** Allow students to work independently, providing support as needed.

Wrap Up (5 min)	Summarize key concepts: Labeling triangles. Address any remaining questions.
Assessment	-Collect and review student work from the group activity and individual practice to assess understanding. -Observe student participation and engagement during the lesson. [Optional] Short exit ticket with a problem involving the Pythagorean Theorem.

Post-Lesson Notes/Feedback

Workplace Math 10 –

Lesson 5: Introduction to Trigonometry

Grade/Class	Workplace Math 10	Unit: 3-Trigonometry
Duration	70 minutes	
Big Ideas	**Curricular Competencies**	**Learning Objectives**
Representing and analyzing data allows us to notice and wonder about relationships.	Connecting & Reflecting: Connect mathematical concepts with each other, other areas, and personal interests.	-Students will be able to define trigonometry and explain its applications. -Students will be able to understand the basic trigonometric ratios: Sine, Cosine, and Tangent (SOH CAH TOA).
Materials	-Handout with right triangle diagrams for practice problems (Worksheet 4: Introduction to Trigonometric Ratios) -Interactive tools or physical models of right triangles	

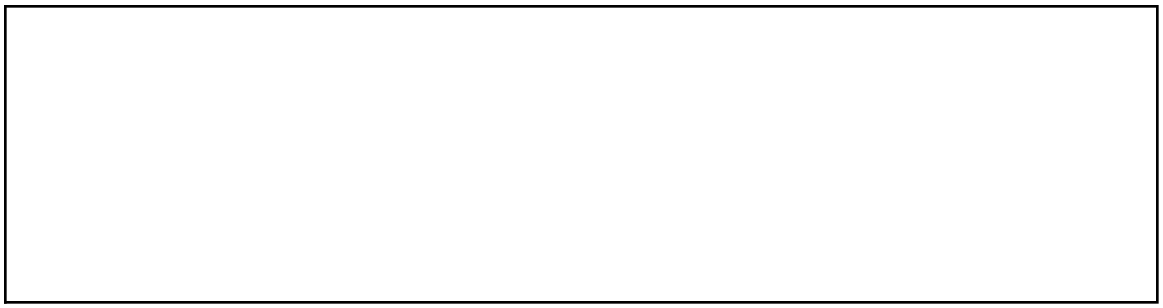
Content

Activity	**Details**
Hook (5 min)	1. **Display images of real-world applications of trigonometry**, such as measuring the height of a tree, the distance across a canyon, or the angle of a roof. 2. **Ask students to identify what these scenarios have in common** and how they might use math to solve problems in these situations. 3. **Guide the discussion towards the idea of using triangles and angles to measure distances and heights indirectly**, introducing the concept of trigonometry.

Lesson (25 min)	1. **Define Trigonometry:** Explain that trigonometry is the study of the relationships between the sides and angles of triangles, specifically right triangles. 2. **Right Triangle Review:** Review the key elements of a right triangle, emphasizing the hypotenuse, opposite side, and adjacent side in relation to a given angle (using the Greek letter theta, θ, to represent the angle). Use clear diagrams to label and differentiate these sides. 3. **Introduce Trigonometric Ratios:** Introduce the three basic trigonometric ratios: Sine (SOH), Cosine (CAH), and Tangent (TOA). **Explain that each ratio represents a specific relationship between two sides of a right triangle and a given angle.** For example, the sine of an angle is the ratio of the opposite side to the hypotenuse. **Use the acronym SOH CAH TOA** as a mnemonic device to help students remember the ratios and the corresponding sides. **Provide clear definitions and formulas for each ratio, ensuring students understand the meaning of each abbreviation (SOH, CAH, TOA).** **Emphasize that these ratios are constant for a given angle**, regardless of the size of the right triangle. 4. **Worked Examples:** Work through several examples, calculating the sine, cosine, and tangent ratios for different angles in right triangles. Start with simple examples using whole numbers and gradually introduce more complex problems with decimals.

Group Activity: Trigonometry Ratios Exploration (20 min)	1. **Exploration:** Students work in groups and are given a set of right triangles with different side lengths and angles labeled. 2. **Calculating Ratios:** Students will measure the sides of their triangles and use their measurements to calculate the sine, cosine, and tangent ratios for specific angles. 3. **Observations:** Encourage students to notice patterns and relationships between the sides and angles. For example, how do the ratios change as the angle increases or decreases?
Individual Practice (15 min)	1. Distribute Worksheet 4, which includes a variety of problems involving identifying the opposite, adjacent, and hypotenuse, and calculating the sine, cosine, and tangent ratios for given angles in right triangles. 2. Ensure a mix of difficulty levels to cater to different learning paces.
Wrap Up (5 min)	1. Review the definitions of trigonometry and the three basic trigonometric ratios (SOH CAH TOA). 2. Highlight the importance of correctly identifying the opposite, adjacent, and hypotenuse in relation to the given angle. 3. Summarize the patterns and relationships observed in the group activity. 4. Address any remaining questions and clarify any misconceptions.
Assessment	● Observe student participation and collaboration during the group activity. ● Collect and review student work from the individual practice to assess understanding.

Post-Lesson Notes/Feedback



Workplace Math 10 –

Lesson 8: Applications of Trigonometry: Angles of Elevation & Depression

Grade/Class	Workplace Math 10	Unit: 3-Trigonometry
Duration	70 minutes	
Big Ideas	**Curricular Competencies**	**Learning Objectives**
Proportional reasoning is used to make sense of multiplicative relationships.	Communicating & Representing: Explain and justify mathematical ideas and decisions in many ways.	-Students will be able to define and identify angles of elevation and depression. -Students will be able to apply trigonometric ratios to solve real-world problems involving angles of elevation and depression.
Materials	- Protractors - Clinometers (if available) - Handout with word problems involving angles of elevation and depression (Worksheet 8)	

Content

Activity	**Details**
Hook (10 min)	1. **Real-World Examples:** Show students pictures or videos of scenarios involving angles of elevation and depression, such as someone looking up at a tall building, an airplane taking off, or a person looking down from a mountain. 2. **Discussion:** Ask students to describe the angles they see in the pictures/videos and what they think those angles might be used for.

Lesson: Visualizing Angles of Elevation & Depression (20 min)	1. **Definitions:** Define angles of elevation and depression, emphasizing the horizontal line of sight and the relationship between the observer and the object being viewed. 2. **Diagrams:** Draw clear diagrams on the board, illustrating the angles of elevation and depression in different scenarios. Label the horizontal line, line of sight, angle of elevation, and angle of depression. 3. **Explanation:** Explain how to identify the angle of elevation and depression in different situations, emphasizing the importance of the observer's position and the direction they are looking.
Activity: Identifying Angles of Elevation & Depression (15 min)	1. **Scenarios:** Provide students with various real-world scenarios involving angles of elevation and depression, such as: A birdwatcher looking at a bird in a tree, or A surveyor measuring the height of a building , or A pilot landing a plane 2. **Identification:** Have students work in pairs or small groups to identify the angle of elevation and depression in each scenario and draw diagrams to represent the situations.
Lesson: Applying Trigonometric Ratios (15 min)	1. **Connection:** Explain how the trigonometric ratios (SOH CAH TOA) can be used to solve problems involving angles of elevation and depression. 2. **Examples:** Work through examples on the board, demonstrating how to set up and solve problems involving angles of elevation and depression using trigonometric ratios. Emphasize the importance of choosing the correct trigonometric ratio based on the given information and the unknown value.
Group Activity (10 min)	1. **Word problems:** Divide the class into groups and provide each group with a set of word problems involving angles of elevation and depression (Worksheet 8). 2. **Collaboration and Problem-solving:** Have students work collaboratively to solve the problems, applying the concepts learned in the lesson. 3. **Discussion and Presentation:** Encourage groups to discuss their problem-solving strategies and, if time remains, present their solutions to the class.

Assessment	• **Observe student participation** during class discussions and group activities, noting their understanding of the concepts and ability to apply them to problem-solving. • **Collect and review student work** from the group activity, assessing their ability to identify angles of elevation and depression, draw accurate diagrams, and apply trigonometric ratios to solve problems.

Post-Lesson Notes/Feedback