

Grade 10 Mathematics Presentation Script

Trigonometry Using Tables and Calculators

Pre-Class Preparation

Materials Checklist:

- Scientific calculators (one per pair)
- Worksheets with tables (one per pair)
- Protractors and rulers (optional, for verification)
- Chart paper for recording key takeaways
- Markers
- Calculator instruction cards (for struggling learners)

Room Setup:

- Arrange desks for pair work
- Prepare board space for key instructions and worked examples
- Test all calculators to ensure they work and have batteries
- Have extra calculators available in case of technical issues

Phase 1: Problem-Solving and Discovery (15 minutes)

Opening Hook (2 minutes)

[DO] Hold up a scientific calculator.

[SAY] "We have learned how to find sine, cosine, and tangent using formulas and triangles. But what if we need to find $\sin 37^\circ$ or $\cos 52^\circ$? Drawing a triangle for every angle would take forever!"

[ASK] "What tool can help us find trigonometric ratios quickly and accurately?"

[WAIT] Expected: "A calculator!" "Tables!"

[SAY] "Exactly! Today we will learn how to use scientific calculators to find trigonometric ratios for any acute angle. This is the tool that engineers, architects, and scientists use every day."

[SAY] "Let us discover how to use this powerful tool."

Anchor Activity Launch (3 minutes)

[DO] Distribute calculators and worksheets to each pair.

[SAY] "Here is your challenge: You will use your calculator to find sine, cosine, and tangent values for different angles, and discover patterns in how these values change."

[SAY] "Here is what you will do:"

[SAY] "Step 1: Turn on your scientific calculator."

[SAY] "Step 2: Ensure your calculator is set to degree mode, not radians. Look for DEG on the display."

[SAY] "Step 3: For each angle in the table (0° , 25° , 30° , 45° , 60° , 75° , 90°), press the sin button, then the angle, then equals. Write down the value."

[SAY] "Step 4: Do the same for cos and tan."

[SAY] "Step 5: Observe the patterns: Do sine values increase or decrease? What about cosine? Why does $\tan 90^\circ$ give an error?"

[SAY] "Step 6: Discuss your findings with your partner."

[SAY] "Work with your partner. You have 8 minutes."

Student Work Time (8 minutes)

[DO] Circulate among pairs.

[ASK] To a pair struggling with the calculator: "Is your calculator in degree mode? Look for DEG on the display."

[WAIT] Expected: "Yes!" or "How do we change it?"

[SAY] "Press the MODE button and select DEG."

[ASK] To another pair: "What do you notice about the sine values as the angle increases?"

[WAIT] Expected: "They increase!" "They go from 0 to 1."

[SAY] "Excellent! What about the cosine values?"

[WAIT] Expected: "They decrease!" "They go from 1 to 0."

[SAY] "Very good! You are discovering important patterns."

[ASK] "What happens when you try to find $\tan 90^\circ$?"

[WAIT] Expected: "It gives an error!" "It says syntax error or math error."

[SAY] "Exactly! $\tan 90^\circ$ is undefined. We will discuss why in a moment."

[DO] For struggling pairs: "Let us try $\sin 30^\circ$ together. Press sin, then 30, then equals. What do you get?"

[DO] For early finishers: "Compare $\sin 30^\circ$ and $\cos 60^\circ$. What do you notice? Try other pairs like $\sin 20^\circ$ and $\cos 70^\circ$."

Class Discussion (2 minutes)

[DO] Call on 2-3 pairs to share their findings.

[ASK] "What did you discover about sine values as angles increase?"

[WAIT] Expected: "They increase." "They go from 0 to 1."

[SAY] "Yes! Sine values increase from 0 at 0° to 1 at 90° ."

[ASK] "What about cosine values?"

[WAIT] Expected: "They decrease." "They go from 1 to 0."

[SAY] "Correct! Cosine values decrease from 1 at 0° to 0 at 90° ."

[ASK] "What about tangent values?"

[WAIT] Expected: "They increase rapidly." " $\tan 90^\circ$ gives an error."

[SAY] "Exactly! Tangent values increase rapidly, and $\tan 90^\circ$ is undefined because it would involve dividing by zero."

[ASK] "Did anyone notice a relationship between sine and cosine?"

[WAIT] Expected: " $\sin 30^\circ = \cos 60^\circ$!" "They are related!"

[SAY] "Excellent observation! This is called the complementary angle relationship: $\sin \theta = \cos(90^\circ - \theta)$."

Phase 2: Structured Instruction (10 minutes)

Formalizing Calculator Usage (5 minutes)

[SAY] "Now that you have explored trigonometric ratios using calculators, let us formalize the process."

[WRITE] On the board: "Key Takeaway"

[SAY] "When given an acute angle, a calculator can be used to determine these ratios accurately."

[WRITE] "How to Determine Trigonometric Ratios Using a Calculator"

[SAY] "Step 1: Ensure the calculator is in degree mode."

[WRITE] "Press MODE and select DEG"

[SAY] "Step 2: Enter the angle value."

[WRITE] "For example, to find $\sin 30^\circ$: Press $\sin \rightarrow$ Press 30 \rightarrow Press $=$ "

[SAY] "The calculator should display 0.5 or some calculators will display $1/2$."

[DO] Demonstrate on your own calculator while projecting or showing to the class.

[SAY] "Let us try this together. Everyone find $\sin 45^\circ$ on your calculator."

[WAIT] Students work on their calculators.

[ASK] "What did you get?"

[WAIT] Expected: "0.7071" or similar.

[SAY] "Correct! $\sin 45^\circ$ is approximately 0.7071."

Important Notes (5 minutes)

[SAY] "Let me highlight some important points:"

[WRITE] "Important Notes"

[SAY] "1. Always check that your calculator is in degree mode (DEG), not radian mode (RAD)."

[SAY] "2. Round your answers to the required number of decimal places, usually 4 decimal places."

[SAY] "3. $\tan 90^\circ$ is undefined because it would require division by zero. Your calculator will show an error."

[SAY] "4. Complementary angles have a special relationship: $\sin \theta = \cos(90^\circ - \theta)$."

[ASK] "What is the most important thing to check before using your calculator?"

[WAIT] Expected: "Degree mode!" "Make sure it is in DEG!"

[SAY] "Correct! Always check degree mode first."

Addressing Misconceptions:

[SAY] "Let me address some common mistakes:"

[SAY] "Mistake 1: Calculator is in radian mode. Always check for DEG on the display."

[SAY] "Mistake 2: Thinking $\tan 90^\circ$ should have a value. No, it is undefined."

[SAY] "Mistake 3: Trying to memorize all values. You do not need to memorize. Learn to use the calculator."

[SAY] "Mistake 4: Thinking sine and cosine can be greater than 1. No, they always range from 0 to 1 for acute angles."

[ASK] "Does everyone understand how to use the calculator?"

[WAIT] Check for nods or questions.

Phase 3: Practice and Application (10 minutes)

Worked Example 1 (5 minutes)

[SAY] "Let us work through an example together."

[WRITE] "Example 1: Use calculator to find the following (write your answer to 4 decimal places): $\sin 40^\circ$, $\cos 40^\circ$, $\tan 40^\circ$ "

[SAY] "First, ensure the calculator is in degree mode."

[SAY] "Let us find $\sin 40^\circ$."

[DO] Demonstrate: Press $\sin \rightarrow$ Press 40 \rightarrow Press =

[WRITE] " $\sin 40^\circ = 0.6428$ "

[SAY] "Now let us find $\cos 40^\circ$."

[DO] Demonstrate: Press $\cos \rightarrow$ Press 40 \rightarrow Press =

[WRITE] " $\cos 40^\circ = 0.7660$ "

[SAY] "Finally, let us find $\tan 40^\circ$."

[DO] Demonstrate: Press tan → Press 40 → Press =

[WRITE] " $\tan 40^\circ = 0.8391$ "

[SAY] "Notice that we rounded to 4 decimal places."

[ASK] "Does everyone understand?"

[WAIT] Check for understanding.

Worked Example 2 (5 minutes)

[SAY] "Let us try another example."

[WRITE] "Example 2: Find $\sin 25^\circ$, $\cos 25^\circ$, $\tan 25^\circ$ using calculator."

[SAY] "This time, I want you to try it on your own first, then we will check together."

[WAIT] Give students 1 minute to work.

[ASK] "What did you get for $\sin 25^\circ$?"

[WAIT] Expected: "0.4226"

[WRITE] " $\sin 25^\circ = 0.4226$ "

[ASK] "What about $\cos 25^\circ$?"

[WAIT] Expected: "0.9063"

[WRITE] " $\cos 25^\circ = 0.9063$ "

[ASK] "And $\tan 25^\circ$?"

[WAIT] Expected: "0.4663"

[WRITE] " $\tan 25^\circ = 0.4663$ "

[SAY] "Excellent work! You are becoming proficient with the calculator."

Phase 4: Assessment (5 minutes)

Exit Ticket

[SAY] "Before we finish, I want to check your understanding. Please complete the exit ticket individually using your calculators."

[DO] Display questions on the board or distribute exit ticket.

[SAY] "You have 5 minutes to complete the four questions."

Exit Ticket Questions:

Use a calculator to determine the following trigonometric ratios:

1. Find $\sin 35^\circ$, $\cos 35^\circ$, $\tan 35^\circ$
2. Find $\sin 50^\circ$, $\cos 50^\circ$, $\tan 50^\circ$
3. Find $\sin 15^\circ$, $\cos 15^\circ$, $\tan 15^\circ$
4. Find $\sin 75^\circ$, $\cos 75^\circ$, $\tan 75^\circ$

Answer Key:

1. $\sin 35^\circ = 0.574$, $\cos 35^\circ = 0.8192$, $\tan 35^\circ = 0.7002$
2. $\sin 50^\circ = 0.7660$, $\cos 50^\circ = 0.6428$, $\tan 50^\circ = 1.1918$
3. $\sin 15^\circ = 0.2588$, $\cos 15^\circ = 0.9659$, $\tan 15^\circ = 0.2679$
4. $\sin 75^\circ = 0.9659$, $\cos 75^\circ = 0.2588$, $\tan 75^\circ = 3.7321$

Differentiation Notes

For Struggling Learners:

- Provide step-by-step calculator instruction cards.
- Use calculators with larger displays.
- Start with special angles (30° , 45° , 60°).
- Pair with confident calculator users.

For Advanced Learners:

- Challenge to find angles from ratios (inverse functions).
- Explore degrees vs. radians.
- Investigate trigonometric identities.

Post-Lesson Reflection Prompts

- Did students successfully set their calculators to degree mode?

- Were students able to observe the patterns in trigonometric values?
- What misconceptions emerged, and how were they addressed?
- Did students understand why $\tan 90^\circ$ is undefined?
- What adjustments would improve this lesson?