MATHEMATICS ADVANCED YEAR 11 - MODULE 2 - LESSON 7

Pythagorean Identities

Use this worksheet after reading the lesson to practise the key ideas and prove you can meet the success criteria.

Name _____

Date _____

Class _____

1. Key Ideas

The Pythagorean theorem is one of the most famous results in mathematics. But did you know it hides inside every trigonometric function? In this lesson, you will discover the three Pythagorean identities that connect sine, cosine, tangent, and their reciprocals — identities so powerful they appear in almost every trigonometry problem you will ever solve.

- The three Pythagorean identities
- Why all three identities come from the unit circle

2. Success Criteria

By the end, you should be able to:

- The three Pythagorean identities
- How to derive the tangent-secant and cotangent-cosecant identities
- Common rearrangements of each identity

3. Key Terms

The Pythagorean theorem
one of the most famous results in mathematics

second and third identities
derived by dividing the first identity by $\cos^2 \theta$ and $\sin^2 \theta$ respectively

All three
true for every value of θ where the functions are defined

The period
affected by horizontal dilation; y = sin(nx) has period 360°/n, not 360°

This
the fundamental identity, derived directly from the unit circle equation $x^2 + y^2 = 1$:

energy
often split into "kinetic" and "potential" components

4. Activity: Build the Lesson Map

Use the lesson to complete the table. Keep answers brief but specific.

Prompt	Your answer
Main concept	
Important example	
Common mistake to avoid	
How this links to the next lesson	

5. Short Answer Questions

1. Explain this lesson goal in your own words: "The three Pythagorean identities". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "How to derive the tangent-secant and cotangent-cosecant identities". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Pythagorean Identities: "Common rearrangements of each identity".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Pythagorean Identities but does not use evidence or reasoning.

Improve the answer by writing a stronger response that uses accurate terminology, a relevant example and a clear explanation.

7. Multiple Choice

1. What is the best first step when answering a question about Pythagorean Identities?

☐ A. Identify the key concept being tested

☐ B. Write every fact from memory

☐ C. Ignore the command word

☐ D. Skip examples and evidence

2. Which answer would show stronger understanding of Pythagorean Identities?

☐ A. An answer with accurate terms and reasoning

☐ B. A copied definition only

☐ C. A single-word response

☐ D. An answer with no example

3. What should you do if a question asks you to explain?

☐ A. Link the idea to a reason or cause

☐ B. List unrelated facts

☐ C. Only draw a diagram

☐ D. Write the shortest possible answer

8. Success Criteria Proof

Finish with evidence that you can do each success criterion.

SUCCESS CRITERION 1

Prove that you can: The three Pythagorean identities

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: How to derive the tangent-secant and cotangent-cosecant identities

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: Common rearrangements of each identity

BAND 5 4 MARKS

One thing I still need help with: