MATHEMATICS ADVANCED YEAR 11 - MODULE 3 - LESSON 1

Average and Instantaneous Rates of Change

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 fastest 100m sprint ever was 9.58 seconds. But the runner was not running at 10.44 m/s for the entire race. His speed varied: slow at the start, explosive in the middle, then a slight fade at the end. In this lesson, you will learn how to measure average speed over an interval — and glimpse how calculus will let us find his exact speed at any single instant.

- The formula for average rate of change
- Why average speed smooths out variation over an interval

2. Success Criteria

By the end, you should be able to:

- The formula for average rate of change
- That average rate of change equals the gradient of a secant
- The distinction between average and instantaneous rates

3. Key Terms

Derivative
The rate of change of a function at a point; the gradient of the tangent.

Differentiation
The process of finding the derivative of a function.

Stationary Point
A point where the derivative equals zero.

Chain Rule
A rule for differentiating composite functions: $dy/dx = dy/du \times du/dx$.

Product Rule
A rule for differentiating products: $d(uv)/dx = u(dv/dx) + v(du/dx)$.

Rate of Change
How much a quantity changes per unit of another quantity; the gradient of a secant or tangent.

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 formula for average rate of change". Use one specific example from the lesson.

BAND 3 2 MARKS

2. Apply this idea to a new example: "That average rate of change equals the gradient of a secant". Show your reasoning clearly.

BAND 4 3 MARKS

3. Analyse why this idea matters for understanding Average and Instantaneous Rates of Change: "The distinction between average and instantaneous rates".

BAND 5 4 MARKS

6. Extend: Apply the Idea

BAND 5/6 5 MARKS

A student gives a memorised answer about Average and Instantaneous Rates of Change 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 Average and Instantaneous Rates of Change?

☐ 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 Average and Instantaneous Rates of Change?

☐ 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 formula for average rate of change

BAND 3 2 MARKS

SUCCESS CRITERION 2

Prove that you can: That average rate of change equals the gradient of a secant

BAND 4 3 MARKS

SUCCESS CRITERION 3

Prove that you can: The distinction between average and instantaneous rates

BAND 5 4 MARKS

One thing I still need help with: