**Stage 2 Essential Mathematics**

**Assessment Type 2: Folio**

**Geometry and Measurement Investigation:**

**“The Secret Island”**



A secret island has recently been discovered in the waters off the coast of Australia. Researchers are working to understand information about the island including its location, size and natural resources.

**Part 1: Location of the Island**

Determine a location for your Island. Use scale and bearings to describe the location of your Island in relation to at least three other given landmarks on the map provided.

**Part 2: Drawing a map of your island and estimating its area.**

Draw a fully labelled, scaled map of your irregularly shaped island. Check the scale with your teacher before proceeding. You will need to make several copies of this for the following sections of this assignment.

To help estimate the area of the island, use carefully drawn regular shapes, for example polygons, circles and compound shapes. Make at least two estimates using two different shapes. These measurements should be consistent with the scale of the island i.e. distances in metres or kilometres.

Justify which model gives the closest estimate providing reasons, such as whether they provide an underestimate or an overestimate of the exact area of your island. Trial alternative methods that could be used to further refine the estimate of the area and consider the reasonableness of the estimations made.

**Part 3: Developing further models to estimate the area**

Use Simpson’s Rule to estimate the area of your island. Show all calculations. Briefly discuss the accuracy and reasonableness of your calculations. You could also consider and demonstrate techniques to improve the accuracy of your estimation.

Triangles radiating from a central point could also be used to estimate the area of the island. Explain carefully how you determined the central point and demonstrate the use of the included angle area formula ($A=\frac{1}{2}abSinC)$ for triangles with no given height measurement to estimate the area of your island. Show calculations for two or three triangles and consider trialling alternative methods to further refine the estimate of the area. Repetitive calculations for the rest of the triangles can be included in the appendix with a summary table of results provided in the report. Consideration should be made as to whether the models developed over or underestimate the area.

The evidence for each investigation, excluding bibliography and appendices, must be a maximum of 12 A4 pages. The headings below can provide a guideline for the structure of writing a mathematical investigation.

Introduction

* -Explain the problem that is to be solved.
* -Briefly describe the mathematics that will be used to solve the problem (strategies, formulas, technology etc.).
* Application:
* -Summarise any relevant data or information that has been collected or provided and will be used to solve the problem/s.
* -Include all mathematical calculations/working and results. Use appropriate representations (e.g. symbols/notation, tables, graphs, diagrams, images).
* Interpret the results and highlight any trends or findings. Always interpret and discuss the results in the context of the original problem.
* Discussion:
* -Evaluate the accuracy of any predications made.
* -Discuss the reasonableness of the results obtained (are the results as expected? do they seem correct/consistent with other information? What other strategies or methods could be used to confirm the results?)
* -Discuss which method provided the most accurate estimate
* -Discuss any assumptions made throughout the investigation
* -Discuss any limitations such as exceptions that might not fit with the findings

Conclusion

* -Briefly summarise the results and relate them back to the original problem. Outline the conclusions that have been made and what has been discovered by completing this investigation.

Bibliography

* -Using the Harvard system, reference any sources (websites, books etc.) used in writing the investigation.

Appendices

-Include if appropriate e.g. repetitive calculations or spreadsheets/tables too large to fit into Section B of the report.

**Performance Standards for Stage 2 Essential Mathematics**

| - | **Concepts and Techniques** | **Reasoning and Communication** |
| --- | --- | --- |
| **A** | Comprehensive knowledge and understanding of concepts and relationships.Highly effective selection and application of mathematical techniques and algorithms to find efficient and accurate solutions to routine and complex problems in a variety of contexts.Successful development and application of mathematical models to find concise and accurate solutions.Appropriate and effective use of electronic technology to find accurate solutions to routine and complex problems. | Comprehensive interpretation of mathematical results in the context of the problem.Drawing logical conclusions from mathematical results, with a comprehensive understanding of their reasonableness and limitations.Proficient and accurate use of appropriate mathematical notation, representations, and terminology.Highly effective communication of mathematical ideas and reasoning to develop logical and concise arguments.Formation and testing of appropriate predictions, using sound mathematical evidence. |
| **B** | Some depth of knowledge and understanding of concepts and relationships.Mostly effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine and some complex problems in a variety of contexts.Attempted development and successful application of mathematical models to find mostly accurate solutions.Mostly appropriate and effective use of electronic technology to find mostly accurate solutions to routine and some complex problems. | Mostly appropriate interpretation of mathematical results in the context of the problem.Drawing mostly logical conclusions from mathematical results, with some depth of understanding of their reasonableness and limitations.Mostly accurate use of appropriate mathematical notation, representations, and terminology.Mostly effective communication of mathematical ideas and reasoning to develop mostly logical arguments.Formation and testing of mostly appropriate predictions, using some mathematical evidence. |
| **C** | Generally competent knowledge and understanding of concepts and relationships.Generally effective selection and application of mathematical techniques and algorithms to find mostly accurate solutions to routine problems in different contexts.Successful application of mathematical models to find generally accurate solutions.Generally appropriate and effective use of electronic technology to find mostly accurate solutions to routine problems. | Generally appropriate interpretation of mathematical results in the context of the problem.Drawing some logical conclusions from mathematical results, with some understanding of their reasonableness and limitations.Generally appropriate use of mathematical notation, representations, and terminology, with reasonable accuracy.Generally effective communication of mathematical ideas and reasoning to develop some logical arguments.Formation of an appropriate prediction and some attempt to test it using mathematical evidence. |
| **D** | Basic knowledge and some understanding of concepts and relationships.Some selection and application of mathematical techniques and algorithms to find some accurate solutions to routine problems in some contexts.Some application of mathematical models to find some accurate or partially accurate solutions.Some appropriate use of electronic technology to find some accurate solutions to routine problems. | Some interpretation of mathematical results.Drawing some conclusions from mathematical results, with some awareness of their reasonableness.Some appropriate use of mathematical notation, representations, and terminology, with some accuracy.Some communication of mathematical ideas, with attempted reasoning and/or arguments.Attempted formation of a prediction with limited attempt to test it using mathematical evidence. |
| **E** | Limited knowledge or understanding of concepts and relationships.Attempted selection and limited application of mathematical techniques or algorithms, with limited accuracy in solving routine problems.Attempted application of mathematical models, with limited accuracy.Attempted use of electronic technology, with limited accuracy in solving routine problems. | Limited interpretation of mathematical results.Limited understanding of the meaning of mathematical results, their reasonableness or limitations.Limited use of appropriate mathematical notation, representations, or terminology, with limited accuracy.Attempted communication of mathematical ideas, with limited reasoning.Limited attempt to form or test a prediction. |