

Year 11

Stage One : Mathematical Investigation

General Mathematics –

Topic **Measurement**

Name of Task **Mini - Box of Chocolates**

Student Name _____

SACE Number _____

Teacher

Student Declaration

I declare that the folio task submitted is my own, original work. Where content has been borrowed from other sources, I have acknowledged those sources.

Student Signature _____

Teacher Signature _____

Performance Standards for Stage 1 General Mathematics

ON BALANCE GRADE

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

Stage 1 General Mathematics
Assessment Type 2: Mathematical Investigation

Topic 1: MEASUREMENT – Mini-box of Chocolates



Your task is to design three pieces of chocolate and the packaging.

You need to design three separate pieces – one can be a simple standard shape, the other two complex solid shapes.

You might like to have a look at designs that other people have used before you make your own design. There are plenty of chocolate piece images on the internet for you to get some inspiration from.

Your chocolates are required to be composed of mathematical solid shapes.

These can be as simple or as complex as you like but the design must utilise two types of shape (see below):

- *planar faces*
- and *curved surfaces*

The complexity of the shapes you use in your design will determine the level of complexity in the calculations you have to carry out. Using only simple shapes may lead to calculations that are all routine in nature. Your three chocolate pieces must show pleasing proportions and fit comfortably into a rectangular 'packaging' **170mm (length) x 80mm (width) x 50mm (height)** dimensions.

Part One – The Design

Create 3 chocolate piece designs following the guidelines above. Draw a reasonable sketch of what your three pieces will look like and include the **relevant** measurements (no calculations are needed at this point).

Part Two – Estimating and Calculating Volume

- a) Consider what kind of simple solid would have approximately the same volume as your chocolate pieces design. Using a few appropriate measurements from your design and your chosen approximate shapes, find an estimate of the separate volumes of them. Show the process you use to do this.
- b) Carry out all the calculations needed to find the *actual* volume of chocolate that would be needed to manufacture your three chocolate pieces. You must show all working, formulas used, and measurement units. Set the calculations out clearly.
- c) Compare your answers for parts a) and b) and discuss how accurate your prediction was. Are there any ways that you could make a more accurate prediction without carrying out the full calculations? Also comment on how the wastage could affect production costs, businesses must consider how their costs can be reduced.

Part Three – Calculating Surface Area

Carry out all the calculations needed to find the **surface area** of a plastic tray that would need to be made to protect and hold the three chocolate pieces inside the box (this area includes all surfaces that 'hold' each of the three chocolate pieces). You will also need to calculate the surface area of the packaging box.

Please provide a net diagram for each chocolate piece. As in *Part Two*, you must show all working, formulas used and measurement units, and set the calculations out clearly.



Part Four – Calculating Cost

The chocolate has a cost **\$20.50** for a 1kg bag. The special ‘chocolate holder tray’ is **\$4.30** per square metre. The cardboard packaging costs **\$2.80** per square metre. Use the information above to calculate the **cost** of making your chess piece. Show all your calculations clearly.

Part Five – The Report

- Write an **introduction** which explains in your own words what this project is about and how it has been presented (i.e. brief description of the layout of your document).
- Include the 3D sketch of your designs from **Part 1** (this can be done with or without the use of technology) and a **scaled** diagram of **one chocolate piece** showing the measurements.
- Provide all calculations and any discussion from **Parts 2 to 4**.
- A **conclusion** summarising your results, and a discussion of any assumptions that you have made and limitations to your results for this task.

Your report on the mathematical investigation should include the following:



- an introduction outlining the task
- the responses for Part 1 through to Part 4
- conclusions in the context of the problem
- a bibliography and appendices, as appropriate.

Word – Page limit:

How you tackle this investigation is up to you but be **VERY CLEAR** as to where your figures have come from and how your calculations have been done. Keep figures concise (2dp) and if assumptions have been made say so. Where you have had to check sources for certain information or figures supply evidence of your discovery or at least state where you obtained the figures.

This investigation should be **NO MORE THAN 8 PAGES** of clear concise and factual information. An introduction, a series of calculations and a detailed analysis and conclusion should be included. The conclusion is a most significant part of the investigation and should be a minimum of 250 words, where appropriate you should try to use summary tables. Your conclusion should also briefly point out any issues you can see with the rules that have been set out for you.