

# PICTON HIGH SCHOOL

Creating Opportunities Achieving Success



## YEAR 12 HSC Mathematics Standard 1 and Set

### Assessment Task 1

<b>Due Date:</b> Wednesday 13 <sup>th</sup> March 2019 Week 7	<b>Assessment Name:</b> Applications of Finance and Networks
<b>Mark:</b> /50	<b>Weighting:</b> 30 %

#### SYLLABUS OUTCOMES TO BE ASSESSED:

MS11-2	<b>represents</b> information in symbolic, graphical and tabular form
MS11-5	<b>models</b> relevant financial situations using appropriate tools
MS11-6	<b>makes predictions</b> about everyday situations based on simple mathematical models
MS11-9	<b>uses</b> appropriate technology to <b>investigate, organise</b> and <b>interpret</b> information in a range of contexts
MS11-10	<b>justifies</b> a response to a given problem using appropriate mathematical terminology and/or calculations
MS1-12-5	<b>makes</b> informed decisions about financial situations likely to be encountered post-school
MS1-12-8	<b>applies</b> network techniques to solve network problems
MS1-12-9	<b>chooses</b> and <b>uses</b> appropriate technology effectively and <b>recognises</b> appropriate times for such use
MS1-12-10	<b>uses</b> mathematical argument and reasoning to <b>evaluate</b> conclusions, <b>communicating</b> a position clearly to others

#### DIRECTIVES TO BE ASSESSED:

**Applies** To use relevant information and skills for a given situation

**Chooses:** to makes the best selection given the information given

**Communicates:** Conveys and imparts knowledge

**Evaluate:** Make a judgement based on criteria; determine the value of

**Interpret:** draw meaning from the mathematical result

**Investigate:** To examine situations using various techniques and in the process of their exploration. develop skills that can be applied to other problems

**Justify:** To provide evidence to support your solution

**Makes:** To produce; cause to exist or happen; bring about

**Model:** To give a representation of mathematical problem obtained

**Organise:** To arrange data or values in order, tables and/or graphs

**Prediction:** Suggest what may happen based on available information

**Recognise:** To identify a mathematical relationship

**Represent:** constitute; amount to.

**Uses:** Utilises skills as a means of accomplishing or achieving an outcome

## TASK DESCRIPTION: PART A

### How Much Board Do You Owe?

Your task is to write a report that justifies how much board you should be paying your parent/s. The principle focus for this task is to calculate costs involved in purchasing/renting houses and units, the costs of household running, maintenance and repair costs. As an occupant you should also consider the costs of appropriate levels of food, water, electricity etc, and ways to reduce household expenditure and minimise wastage.

Your report should address each of these **three** parts.

#### Understanding, Fluency and Communication (14 marks):

##### Housing Affordability

1. Determine the value of the property you live in now (find similar property on a real estate sales website such as realestate.com.au or domain.com.au). Include a copy of the property you **choose**.
2. **Use** a mortgage calculator to **predict** the weekly cost involved in purchasing such a property. Include a copy of the calculation.

##### Consumption and Expenditure

3. Estimate your weekly electricity consumption.
  - a. **Make** a table of the major appliances normally found in a home, and use an online energy consumption calculator such as <http://www.smarterchoicecalculator.com.au/> to determine the weekly running costs for your household's appliances. You also need to make estimates for other electrical items such as lights, computers and hot water.
  - b. **Investigate** your family's electricity consumption and compare with your calculations from Part 2a. You must **communicate** how you determined your weekly figure.
4. **Evaluate** your weekly grocery bill. You can either keep a record of how much your family spends on groceries or create a weekly shopping list on Coles or Woolworths online to help predict your expenses.
5. **Investigate** fees, levies and charges.
  - c. Find out what sort of regular bills your family pays for your residential home, such as insurance, strata levy, water rates, land tax, and telephone. Make estimates and **predictions** for each based on recent bills.

#### Problem Solving, Reasoning and Justification (6 marks):

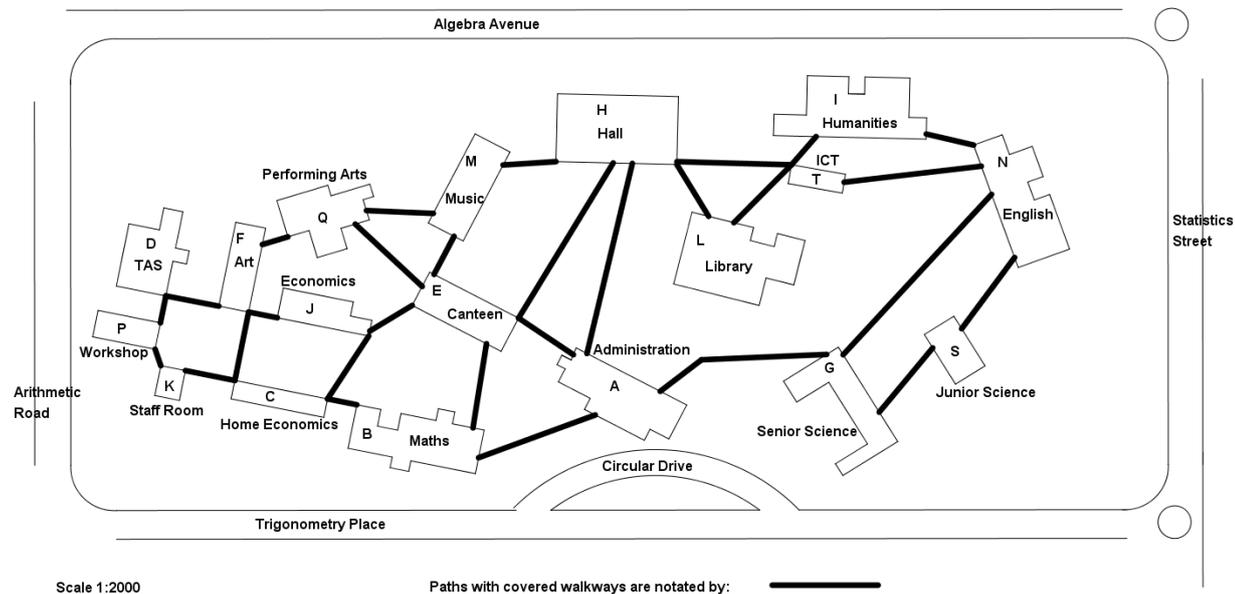
6. **Organise** the information you have collected into a weekly budget table.
7. **Make** a decision about the amount you feel would be fair to pay as 'board' for living at your home. Show how you arrived at the amount.
8. Write a statement of no more than 200 words that **justifies** and **communicates** how you arrived at your figure, and whether you made any adjustments to it (such as, you reduced your contribution because of your limited capacity for income, or you contribute in other ways such as babysitting younger siblings).

NOTE: You *should not* provide copies of your family's bills but you must show how you worked out your calculations. You may wish to simply state that you asked your Mum/Dad and they told you, or you may wish to look at the actual bill and give an approximate figure.

## TASK DESCRIPTION: PART B

### Computer Cable Analysis

The following diagram is a plan of Mathmore High School showing buildings and paths.



Throughout your working, always round all distances off to the nearest whole metre.

#### Understanding, Fluency and Communication (10 marks):

- Using the plan, draw a network diagram of all the buildings connected by covered walkways showing the **actual** distances (to the nearest metre) on your diagram.
  - Each vertex will represent a building, and should be labelled with the appropriate letter.
  - Each edge will represent a covered walkway, and should be labelled with the distance.
- The Department of Education wants to link the outside of each building to a computer network. Cable costs \$45 per metre, and the existing covered walkways are to be used with cable attached to the roof of the walkways.

They ask company A to submit a proposal. Design and cost the most economical cable network for company A. Draw up company A's proposal, explaining your reasoning and justifying your working with calculations and network theory. Include a network diagram in your explanation.

#### Problem Solving, Reasoning and Justification (20 marks):

- In an effort to reduce the costs of cabling the school, the school executive decides that cable will be from Building P to Building N connecting **only those buildings that are on the shortest path**. They ask company B to submit a proposal for this. Find the shortest path from P to N, and cost this new cable network. Draw up company B's proposal, explaining your reasoning and justifying your working with calculations and network theory. Include a diagram in your explanation, and note the buildings that would not be included as part of the computer network in this proposal.
- The school asked company C to consider the issues and submit a proposal for the construction. Company C decides that they will charge \$55 per metre for computing cable if it is laid in trenches which they dig, rather than using the covered walkways. The trenches would use the shortest possible distance between buildings and all buildings would be connected via trenches so they would be connected in the computer network.

Draw up company Cs proposal, including a network diagram of the trenches that would need to be dug, and a costing. Justify your answer with calculations and network theory.

5. Imagine you are on the school executive. Which of the three proposals would you accept and why?

**End of task**

**ASSESSMENT CRITERIA – STUDENT CHECKLIST:**

You will be assessed on your understanding of the focus topics (FSHo1CEC Accommodation costs: buying and renting and FSHo2CEC Costs of running a household, maintenance and repairs) and how these topics relate to real life financial situations.

**Checklist**

- chooses a property similar to the one you live in
- Use mortgage calculator to determine cost
- Create list of appliances and electrical and estimate running costs.
- Compare calculations to actual costs to determine weekly figure
- Estimate the cost of grocery bills
- Estimate the cost of other bills, levies, fees and charges
- Calculate a fair amount of board to pay, with justification
- Write a statement how you arrived at this figure.

**Check your assessment booklet for the PHS Assessment Policy**

**ASSESSMENT MARKING CRITERIA PART A**

Part 1 – Understanding, Fluency and Communication	Marks
Housing affordability	
<ul style="list-style-type: none"> <li>▪ Determines value of current property</li> </ul>	<b>1</b>
<ul style="list-style-type: none"> <li>▪ Presents detailed information about a local property including photo</li> </ul>	<b>2</b>
<ul style="list-style-type: none"> <li>▪ Determines weekly cost of purchasing a similar property</li> </ul>	<b>2</b>
<ul style="list-style-type: none"> <li>▪ Includes fully worked solutions to calculate a weekly mortgage payment on the property, making considerations for loan inclusions or exclusions such as deposits and sales tax.</li> </ul>	<b>2</b>
Consumption and Expenditure	
<ul style="list-style-type: none"> <li>▪ Creates a table of items normally found in the home, and shows their predicted or calculated energy consumption.</li> </ul>	<b>2</b>
<ul style="list-style-type: none"> <li>▪ Interprets and makes realistic and informed comparisons on energy consumption tables, showing full working and justification of how they arrived at their conclusion.</li> </ul>	<b>2</b>
<ul style="list-style-type: none"> <li>▪ Predicts weekly grocery spend</li> </ul>	<b>1</b>
<ul style="list-style-type: none"> <li>▪ Investigates typical ongoing fees, levies and charges and makes informed decisions by providing thorough calculations to determine the weekly cost of these items.</li> </ul>	<b>2</b>
Part 2 - Understanding, Fluency and Communication	

▪ Weekly budget organised in a table	<b>1</b>
▪ Includes an amount for board	<b>1</b>
▪ Includes any necessary calculations	<b>1</b>
▪ Provides a comprehensive justification for their proposed weekly amount and uses accurate and appropriate mathematical applications to communicate and support their mathematical decision	<b>3</b>

## ASSESSMENT MARKING CRITERIA PART B

Part 1 – Understanding, Fluency and Communication	Marks
▪ Measures and converts at least five actual distances from original diagram	<b>1</b>
▪ Displays the vertices on network diagram labelled A to T	<b>1</b>
▪ Represents all edges correctly	<b>1</b>
▪ Displays correct measurements on all edges	<b>1</b>
Part 2 – Understanding, Fluency and Communication	
▪ Indicates the correct costing calculation (for example, network diagram redrawn with costings on edges)	<b>1</b>
▪ Demonstrates a clear attempt at finding the shortest spanning tree	<b>1</b>
▪ Displays a correct shortest spanning tree	<b>1</b>
▪ Indicates the correct minimal cost	<b>1</b>
▪ Communicates clearly the process for finding the shortest spanning tree	<b>1</b>
▪ Communicates the company’s proposal clearly	<b>1</b>

Parts 3 and 4 – Problem Solving, Reasoning and Justification (9 marks each, marked separately)	Marks
A student:	
▪ demonstrates a thorough understanding of the mathematics involved in solving the problem ▪ uses appropriate mathematical processes in solving the problem without error ▪ communicates in a concise and systematic manner and justifies conclusions using appropriate mathematical language, diagrams, notation and symbols	<b>8–9</b>
▪ demonstrates understanding of the mathematics involved with appropriate calculations with either a minor arithmetic or calculation error OR all mathematical calculations have been carried out without error but the final conclusion is incorrect ▪ communicates in a concise and systematic manner and justifies conclusions using some mathematical language, diagrams, notation and symbols	<b>6–7</b>
▪ demonstrates progress towards a solution with some error ▪ demonstrates a developing understanding of what it means to work mathematically with some use of mathematical language, diagrams, notation and symbols	<b>4–5</b>

<ul style="list-style-type: none"> <li>▪ demonstrates a limited understanding of the mathematics involved in solving the problem</li> <li>▪ demonstrates a limited use of mathematical language or diagrams</li> </ul>	<b>1-3</b>
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Comparison of proposals	
Part 5 – Problem Solving, Reasoning and Justification	Marks
<ul style="list-style-type: none"> <li>▪ Makes a correct comment regarding a comparison of cost</li> </ul>	<b>1</b>
<ul style="list-style-type: none"> <li>▪ Makes a correct comment regarding a comparison of meeting the needs of the school</li> </ul>	<b>1</b>