**Stage 2 GENERAL MathematicS**

**Assessment Type 1: Skills and Applications Tasks**

**TOPIC 4: FINANCIAL MODELS (Practice Test)**

**Purpose**

To demonstrate your ability to:

* understand mathematical concepts and relationships from within Topic 4: Financial Models
* select and apply mathematical techniques and algorithms to find solutions to problems
* interpret results, draw conclusions, and consider the reasonableness of solutions in context
* communicate mathematically and present mathematical information.

This assessment allows you to show your skills in understanding and appropriate use of the mathematical concepts, process, and strategies in the following:

1. Subtopic 4.1: Models for saving
2. Subtopic 4.2: Models for borrowing

**Assessment Conditions**

This is a supervised assessment.

This task is conducted in a 90 minute lesson.

**Assessment Design Criteria**

**Concepts and Techniques**

CT 1 Knowledge and understanding of concepts and relationships.

CT 2 Selection and application of mathematical techniques and algorithms to find solutions to problems in a variety of contexts.

CT 4 Use of electronic technology to find solutions to mathematical problems.

**Reasoning and Communication**

RC 1 Interpretation of mathematical results.

RC 2 Drawing conclusions from mathematical results with an understanding of their reasonableness and limitations.

RC 3 Use of appropriate notations representations and terminology.

RC 4 Communication of mathematical ideas and reasoning to develop logical arguments.

**Stage 2 General Mathematics**

**Financial Models – Practice Test**

1. Dimitrios needs $150 000 to set up a new business. He obtains an interest-only loan from a financial institution that charges a flat interest rate of 4.3% per annum, payable half yearly. Dimitrios is setting up a sinking fund that he can use to repay the $150 000 in full in 3 years’ time

(a) Calculate the half-yearly interest payment for the interest-only loan. (1mark)

(b) The sinking fund earns interest of 3.7% per annum, compounded monthly. Show that the amount that Dimitrios must pay into the sinking fund each month in order to save the $150 000 in 3 years is approximately $3940. (2 marks)

(c) Calculate the total cost of the interest-only loan and sinking fund option. (2 marks)

2. Laura is a 23-year-old who is setting up her first superannuation account. Laura’s employer contributes $1235 to her superannuation fund each quarter. Laura’s superannuation fund pays 6.8% interest per annum, compounded quarterly.

(a) (i) Show that when Laura turns 45 she will have approximately $250 000 in her superannuation account. (2 marks)

(ii) Calculate the interest that will have been earned in Laura’s superannuation account when Laura turns 45. (1 mark)

(b) (i) If Laura retires when her superannuation account balance reaches $1 500 000, how old would she be when she retires? (2 marks)

When Laura retires, she decides to invest the $1 500 000 balance of her superannuation account in an annuity. She has identified two options:

• Option A pays 3.75% interest per annum, compounded weekly.

• Option B pays 3.76% interest per annum, compounded monthly.

(c) (i) (1) Calculate the effective interest rate for both options (2 marks)

(d) Laura decides not to invest in Option A or Option B. Instead she invests the $1 500 000 in Option C, which pays 3.78% interest per annum, compounded fortnightly.

Calculate how much Laura will be paid fortnightly in retirement, if she wants her annuity to last 25 years, and wants to have $100 000 remaining in the account at the end of that time. (2 marks)

3. Pia needs to borrow $80 000 to renovate her house. She is aiming to repay the loan over 7 years and is investigating two loan options:

• Option A is a loan with an interest rate of 6.25% per annum, compounded monthly, with no set-up fee or ongoing fees.

• Option B is a loan with an interest rate of 6.15% per annum, compounded monthly, with a $200 set-up fee and a $7 monthly fee.

(a) Determine the comparison rates for option A and option B. (4 marks)

(b) Complete the statement below:

Option \_\_\_\_\_\_\_ is the loan that represents the better value because  
 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ . (1 mark)

(c) State three separate interest minimisation techniques that Pia could use other than choosing the best comparison interest rate. (3 marks)

Only the bank that offers Option A has approved Pia’s loan application. She borrows $80 000 at 6.25% per annum, compounded monthly for 7 years.

(d) Show that her minimum monthly repayment is approximately $1180. (2 marks)

(e) (i) Show that Pia’s outstanding debt 3 months after taking out the loan will be approximately $77 700. (1 mark)

At this time, Pia sells some of her furniture for $4000. She deposits this money in an offset account that is attached to her loan account.

(ii) If Pia continues the minimum monthly repayment in part (d), calculate how long it will take her to repay the loan now that she has $4000 in the offset account. (1 mark)

(iii) Calculate approximately how much interest will be saved by using the offset account. (2 marks)

Performance Standards for Stage 2 General 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.  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 context.  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. |