TOPIC 2

Government of South Australia

SACE Board of SA

External Examination 2011

2011 MATHEMATICAL APPLICATIONS, Semester 2

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RE-MARKED

ATTACH SACE REGISTRATION NUMBER LABEL TO THIS BOX

Graphics calculator ☐

Brand _____

Model _____

Computer software ☐

Friday 4 November: 1.30 p.m.

Time: 1½ hours

Pages: 9
Questions: 4

Topic 2: Investment and Loans

Examination material: two question booklets
two SACE registration number labels

Approved dictionaries, notes, calculators, and computer software may be used.

Instructions to Students

1. You will have 10 minutes to read the question booklets. You must not write in your question booklets or use a calculator during this reading time but you may make notes on the scribbling paper provided.
2. Each of the following five topics is printed in a separate question booklet. ***Tick the boxes by the two topics you have studied in Semester 2***:
   - Topic 1: Applied Geometry ☐
   - Topic 2: Investment and Loans ☐
   - Topic 3: Mathematics and Small Business ☐
   - Topic 6: Share Investments ☐
   - Topic 7: Statistics and Working with Data. ☐
3. The total mark for each topic is 35.
4. Answer ***all*** parts of Questions 1 to 4 in the spaces provided in this question booklet. There is no need to fill all the space provided.
5. Show all working in this booklet. (You are strongly advised ***not*** to use scribbling paper. Work that you consider incorrect should be crossed out with a single line.)
6. Write on page 9 if you need more space. Make sure to label each answer carefully.
7. Use only black or blue pens for all work other than graphs and diagrams, for which you may use a sharp dark pencil.
8. Appropriate steps of logic and correct answers are required.
9. Marks may be deducted if you do not clearly show all steps in the solution of problems, if your answers have an inappropriate number of decimal places, or if you use incorrect units.
10. Diagrams, where given, are not necessarily drawn to scale.
11. Complete the box on the top right-hand side of this page with information about the electronic technology you are using in this examination.
12. Attach one of your SACE registration number labels to the box at the top of this page.
13. At the end of the examination, place one question booklet inside the back cover of the other question booklet.

QUESTION 1

An engineer started her superannuation account when she was 35 years old. She chose a superannuation fund that offered an interest rate of 4.7% per annum, compounded weekly. Her employer contributed $75 per week to the fund.

(a) (i) How many weeks would it take for the superannuation account to reach $50 000?

(2 marks)

(ii) Show that the engineer would be approximately 45 years old when the superannuation account reached $50 000.

(1 mark)

(b) The engineer decides that she would like to retire at the age of 60. She wants to have $300 000 in her superannuation account when she is 60 so that she can live comfortably in her retirement.

What payment will need to be made to the engineer's superannuation account each week for her to achieve this goal? (Assume that she is 45 and has already accumulated the $50 000.)

(2 marks)

(c) When she is 45 the engineer decides that she can afford to contribute only $40 of her own money each week to add to her employer's $75 contribution.

Calculate how much she will now have in her superannuation account at the age of 60 years, assuming she still has a balance of $50 000 at 45.

(2 marks)

(d) Using your answers to parts (a) to (c), outline *two* points about the reasonableness of the engineer achieving her goal of $300 000 by the time she is 60.

(2 marks)

QUESTION 2

A couple wanted to borrow $275 000 so that they could buy a beachside house. They intended to pay the loan off over 30 years. They investigated loan options from two banks.

(a) The fortnightly repayments for a loan from Bank 1 were $950.13.

What annual interest rate, compounded fortnightly, was Bank 1 charging?

(2 marks)

(b) The interest rate for a loan from Bank 2 was 8.25% per annum, compounded monthly.

Calculate the monthly repayments needed to repay this loan over 30 years.

(2 marks)

(c) (i) Using calculations, show which of these loans (from Bank 1 or from Bank 2) had the lower total cost to the couple.

(2 marks)

(ii) What would be the advantage of choosing a loan with more frequent payments? Assume that all other conditions for the loans were the same.

(1 mark)

(d) (i) The couple then discovered that the loan from Bank 2 had an associated monthly account-keeping fee of $25 and an establishment fee of $750.

Determine the effective (comparison) rate for Bank 2.

(4 marks)

(ii) Bank 1 had an effective (comparison) rate of 8.55%.

Which bank would now be the better choice for the couple?

(1 mark)

QUESTION 3

Jaroslav took out a loan so that he could buy a car for $17 990. The finance company offered a loan at 6.75% per annum, compounded monthly.

(a) Calculate the monthly payments that would allow Jaroslav to repay the loan in 5 years.

(2 marks)

(b) Show that, after 2 years, the outstanding balance on the loan was approximately $11 500.

(2 marks)

(c) (i) At the end of the 2 years a financial adviser suggested that Jaroslav should increase his monthly payments by $40.

Calculate how many months Jaroslav would save by making these increased payments.

(3 marks)

(ii) Calculate the amount of interest Jaroslav would save by increasing his monthly payments.

(2 marks)

QUESTION 4

Tammy has received an inheritance of $50 000 and wants to invest it for 4 years. She cannot decide between the following two accounts:

- Account A, with an interest rate of 5.45% per annum, compounded monthly
- Account B, with an interest rate of 5.51% per annum, compounded quarterly.

(a) Calculate the effective (comparison) interest rate for each account and advise Tammy on which of the investment accounts she should choose.

(3 marks)

(b) How would the calculation of effective rates help Tammy to make a decision?

(1 mark)

(c) Tammy decides to invest her $50 000 in Account A, with the interest rate of 5.45% per annum, compounded monthly. She is pleasantly surprised to find that after the 4 years she has earned $12 148.67 in interest.

Calculate Tammy's after-tax return if her marginal tax rate is 37%.

(1 mark)

You may write on this page if you need more space to finish your answers to Topic 2. Make sure to label each answer carefully (e.g. 'Question 2(d)(i) continued').