TOPIC 2

Government of South Australia

SACE Board of SA

External Examination 2011

2011 MATHEMATICAL APPLICATIONS, Semester 1

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RE-MARKED

ATTACH SACE REGISTRATION NUMBER LABEL TO THIS BOX

Graphics calculator ☐

Brand _____

Model _____

Computer software ☐

Thursday 9 June: 9 a.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 1***:

   Topic 2: Investment and Loans ☐
   Topic 4: Matrices ☐
   Topic 5: Optimisation ☐
   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 7 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.

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QUESTION 1

Abbey wants to borrow $10 000 so that she can have her backyard landscaped.

She investigates a number of loan options and narrows her choices down to the following two banks. Each loan will be repaid over 4 years.

Bank A

- A loan with a nominal interest rate of 9.5% per annum, compounded monthly
- A monthly account-keeping fee of $6.

Bank B

- A loan with a nominal interest rate of 9.25% per annum, compounded monthly
- A monthly account-keeping fee of $4 and a set-up fee of $250
- An effective (comparison) interest rate of 11.5%.

(a) Determine the effective (comparison) interest rate for the loan from Bank A.

(4 marks)

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(b) Abbey decides on Bank B for her loan.

Do you agree with her choice? Give a reason for your answer.

(1 mark)

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QUESTION 2

Jake and Amélie would like to give their newborn daughter $10 000 for her eighteenth birthday. They decide to deposit $90 per quarter into an account that pays interest of 3.5% per annum, compounded quarterly.

(a) Determine the amount of money that will have accumulated in the account at the end of 18 years.

(2 marks)

(b) Calculate how many years it would take for Jake and Amélie to have $10 000 in their account, assuming that the account conditions and deposits remain constant.

(2 marks)

(c) Show that Jake and Amélie will need to deposit more than $100 per quarter in the same account if they are to ensure that they will have $10 000 for their daughter's eighteenth birthday.

(2 marks)

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(d) Assume that the average inflation rate is 2.3% per annum for the 18 years.

Calculate how much Jake and Amélie will need to save to maintain the value of the $10 000 in 18 years' time.

(2 marks)

(e) Describe *one* factor that would affect the reasonableness of your results in parts (a) to (d).

(1 mark)

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QUESTION 3

Jai owns a cafe and wants to buy a new coffee-making machine for $8000. He intends to borrow the money and repay it in 3 years' time. He has arranged an interest-only loan. Jai has set up a sinking fund, which he will use to repay the loan in full at the end of the 3 years. The loan incurs interest of 8.95% per annum, and the sinking fund pays interest of 5% per annum, compounded monthly.

(a) Calculate the monthly interest that Jai will need to pay on the loan.

(2 marks)

(b) Calculate the monthly deposit that Jai will need to pay into the sinking fund.

(2 marks)

(c) (i) Show that Jai will save approximately $570 by setting up a sinking fund.

(2 marks)

(ii) Explain how Jai will make this saving.

(1 mark)

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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(c)(i) continued').

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QUESTION 4

Maris takes out a home loan for $328 000, at an interest rate of 7.81% per annum, compounded monthly. The term of the loan is 30 years.

(a) Show that Maris's minimum monthly repayment is approximately $2360.

(2 marks)

(b) State *two* assumptions you made when calculating the monthly repayment in part (a).

(2 marks)

(c) Calculate Maris's outstanding debt after 5 years.

(2 marks)

(d) (i) At the end of the *eighth year* the balance of Maris's home loan is $297 635.

Maris receives a $10 000 inheritance, which he uses to make a lump-sum deposit towards his home loan.

Determine the balance of the loan after this lump-sum deposit.

(1 mark)

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(ii) Calculate how many months it will take Maris to repay the balance of the loan after he has made the lump-sum deposit. Assume that the minimum monthly repayment remains the same for the entire loan period.

(2 marks)

(iii) Calculate the interest Maris will save by making this lump-sum deposit.

(2 marks)

(e) (i) Explain whether or not, for most people, making a lump-sum deposit is a realistic option to save interest on a loan when borrowing money.

(2 marks)

(ii) Suggest another strategy that could be used to minimise interest paid on a loan.

(1 mark)

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