TOPIC 2

Government of South Australia

SACE Board of SA

External Examination 2013

2013 MATHEMATICAL APPLICATIONS, Semester 1

FOR OFFICE USE ONLY

SUPERVISOR CHECK

RE-MARKED

SACE REGISTRATION NUMBER

FIGURES | CHECK LETTER

SEQ | BIN

MATHEMATICAL APPLICATIONS, Semester 1

Graphics calculator

Brand _____

Model _____

Computer software

Thursday 6 June: 9 a.m.

Time: 1½ hours in total (to complete two question booklets, one on each topic studied in Semester 1)

Pages: 10
Questions: 4

Topic 2: Investment and Loans

Examination material: two question booklets
one SACE registration number label

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 10 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 your SACE registration number label to the box at the top of this page on one of your question booklets. Copy the information from your SACE registration number label into the box on the front cover of your other question booklet.
13. At the end of the examination, place one question booklet inside the back cover of the other question booklet.

SACE
BOARD
OF SOUTH
AUSTRALIA

QUESTION 1

Khoa has $12 050 to invest over 3 years. He is considering the following three investment accounts:

Account A, with an interest rate of 4.5% per annum, compounded annually ☐

Account B, with an interest rate of 4.3% per annum, compounded fortnightly ☐

Account C, with a flat interest rate of 4.7% per annum ☐

(a) Tick the appropriate box above to indicate the account for which the compound interest rate and the effective (comparison) interest rate are the same.

(1 mark)

(b) Calculate the effective (comparison) interest rate for the other two investment accounts.

Write A, B, or C in the spaces provided, to indicate the account on which you are basing each calculation.

Account: _____

Account: _____

(4 marks)

(c) Which account (A, B, or C) should Khoa choose in order to maximise his savings?

(1 mark)

QUESTION 2

Bronwyn wants to save $15 000 for an overseas trip in 3 years' time.

(a) Bronwyn calculates that, if she saves $90 each week, she will reach her savings goal of $15 000 in 3 years.

(i) Show that Bronwyn has secured an interest rate of approximately 4.4% per annum, compounded weekly, in order to reach her savings goal.

(2 marks)

(ii) Calculate how much interest Bronwyn would earn over the 3 years.

(1 mark)

(iii) Calculate Bronwyn's after-tax return if her marginal tax rate is 37%.

(2 marks)

(b) Bronwyn wants to consider the effect that inflation will have on her savings goal of $15 000 over the 3 years.

(i) Assume that inflation averages 2.5% per annum.

What should Bronwyn's new savings goal be?

(2 marks)

(ii) State *one* implication for Bronwyn if she does not take inflation into account.

(1 mark)

(iii) Calculate how much Bronwyn must save each week if her savings goal is now $16 200. Assume that the original account conditions remain the same.

(2 marks)

QUESTION 3

Kimberly had a mortgage (home loan) of $177 000 with an interest rate of 6.5% per annum, compounded monthly over 15 years.

(a) Show that Kimberly's minimum monthly repayment was approximately $1540.

(2 marks)

(b) Calculate how much Kimberly owed after 3 years.

(2 marks)

(c) After 3 years of making the minimum monthly repayment, Kimberly switched her mortgage to another bank at no cost. She secured an interest rate of 5.6% per annum, compounded monthly. Her new minimum monthly repayment was $1470.08.

(i) Kimberly decided to continue making her original monthly repayment of approximately $1540.

Calculate how long (in months or years) it would take her to repay the new loan.

(2 marks)

(ii) How much time (in months or years) would Kimberly save by continuing to make her original monthly repayment?

(1 mark)

(iii) How much interest would Kimberly save by continuing to make her original monthly repayment?

(2 marks)

QUESTION 4

Corbin is a 29-year-old chef who has $35 000 in his superannuation account. His goal is to retire with $1 000 000 when he is 60. His annual contribution is $5616 and his superannuation account has an interest rate of 7.4% per annum.

(a) Show that Corbin cannot achieve this goal.

(2 marks)

(b) How long will it take Corbin to reach his goal of $1 000 000? Assume that the original account conditions remain the same.

(2 marks)

(c) If, instead of making an annual contribution, Corbin makes fortnightly deposits of $216, calculate how much he will now accumulate in his superannuation account if he retires at 60. Assume that the interest rate for his account remains 7.4% per annum but is compounded fortnightly.

(2 marks)

(d) You have investigated two possible strategies for Corbin: working longer or making more frequent payments.

Discuss the reasonableness of using one of these strategies to achieve Corbin's goal.

(2 marks)

(e) Suppose that Corbin retires when he has $1 000 000 in his superannuation account. According to his financial adviser, he will need an income of $1600 per week in retirement.

How long (in weeks) will his money last, at an interest rate of 4.3% per annum, compounded weekly?

(2 marks)

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 4(b) continued').