



Government
of South Australia

SACE
Board of SA

External Examination 2012

2012 MATHEMATICAL APPLICATIONS, Semester 2

FOR OFFICE
USE ONLY

SUPERVISOR
CHECK

RE-MARKED

ATTACH SACE REGISTRATION NUMBER LABEL
TO THIS BOX

Graphics calculator

Brand _____

Model _____

Computer software

Tuesday 30 October: 9 a.m.
Time: 1½ hours in total (to complete two question booklets,
one on each topic studied in Semester 2)

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. You may write on page 9 if you need more space, making sure to label each answer clearly.
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. Use only black or blue pens for all work other than graphs and diagrams, for which you may use a sharp dark pencil.
7. Appropriate steps of logic and correct answers are required.
8. 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.
9. Diagrams, where given, are not necessarily drawn to scale.
10. Complete the box on the top right-hand side of this page with information about the electronic technology you are using in this examination.
11. Attach one of your SACE registration number labels to the box at the top of this page.
12. At the end of the examination, place one question booklet inside the back cover of the other question booklet.

QUESTION 1

The local country club borrowed \$300 000 to pay for extensions to its hall. The club arranged an interest-only loan at 8.5% per annum. The \$300 000 loan must be repaid within 12 years. The club also set up a sinking fund that earns interest of 6.75% per annum, compounded monthly.

- (a) Calculate the yearly interest payable on the loan.

(1 mark)

- (b) Calculate the monthly deposit that the club must make to accumulate the \$300 000 in the sinking fund by the end of the 12 years.

(2 marks)

- (c) Find the value of the sinking fund after 6 years.

(2 marks)

- (d) Explain why, after 6 years (halfway through the term of the loan), the club has not saved half of the \$300 000.

(2 marks)

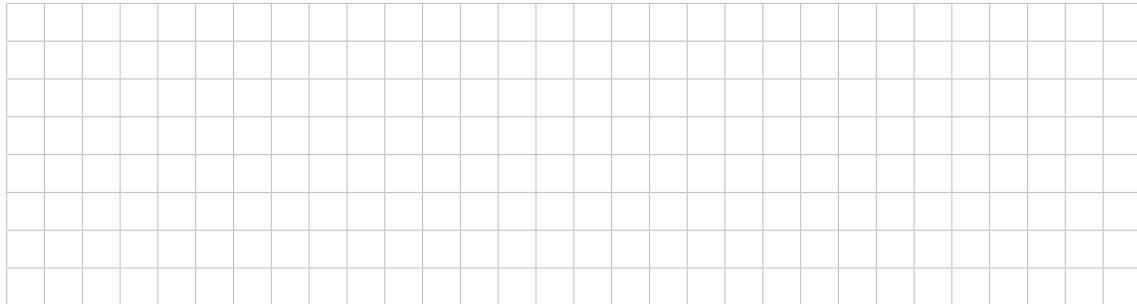
- (e) Find the total amount that the extensions to the hall will cost the club.

(2 marks)

QUESTION 2

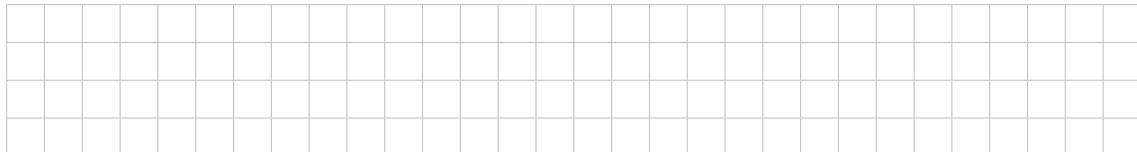
Georgina has been paying off her home loan for 15 years and has reduced the debt to \$356 000. She has made regular monthly payments of \$4357.37 over this time. Her original home loan was for 25 years at 8.2% interest per annum, calculated monthly.

- (a) Show that Georgina originally borrowed approximately \$555 000.



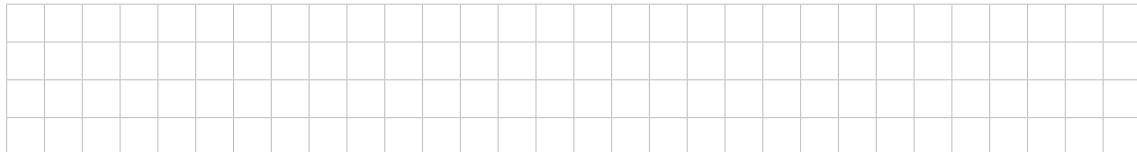
(2 marks)

- (b) (i) Calculate how much of the loan Georgina has paid off after 15 years.



(1 mark)

- (ii) Calculate the total repayments Georgina has made over 15 years.



(1 mark)

- (c) (i) Suppose that, after the 15 years, Georgina adds an extra \$120 a month to the repayments.

Show that this will reduce the term of the loan by approximately half a year.



(3 marks)

- (ii) Alternatively, suppose that, after the 15 years, Georgina transfers the remainder of the loan to a bank that has a lower interest rate.

If Georgina is able to repay the remainder of the loan in 9 years, what interest rate has the bank been charging? Assume that her monthly repayment remains \$4357.37.



(2 marks)

- (d) Discuss the reasonableness of the two interest minimisation strategies you have calculated in part (c) above.



(2 marks)

QUESTION 3

Jun deposited \$2750 in an account every quarter for 3 years. The account returned interest of 6.95% per annum, compounded quarterly.

- (a) Show that Jun deposited \$33000 in the account over the 3 years.

(1 mark)

- (b) Find the value of Jun's investment after 3 years.

(2 marks)

- (c) State *one* assumption that you made when calculating the value of Jun's investment.

(1 mark)

- (d) Calculate the interest that Jun's account earned over 3 years.

(1 mark)

- (e) Jun's marginal tax rate is 30%.

Calculate the total amount he will have in his account after he has paid tax.

(2 marks)

- (f) Assume that inflation averaged 3.4% per annum over the 3 years.

Calculate the value of \$33000 indexed for inflation over 3 years.

(2 marks)

- (g) Using the answers you have calculated in parts (d), (e), and (f), discuss the effectiveness of the return on Jun's investment.

(2 marks)

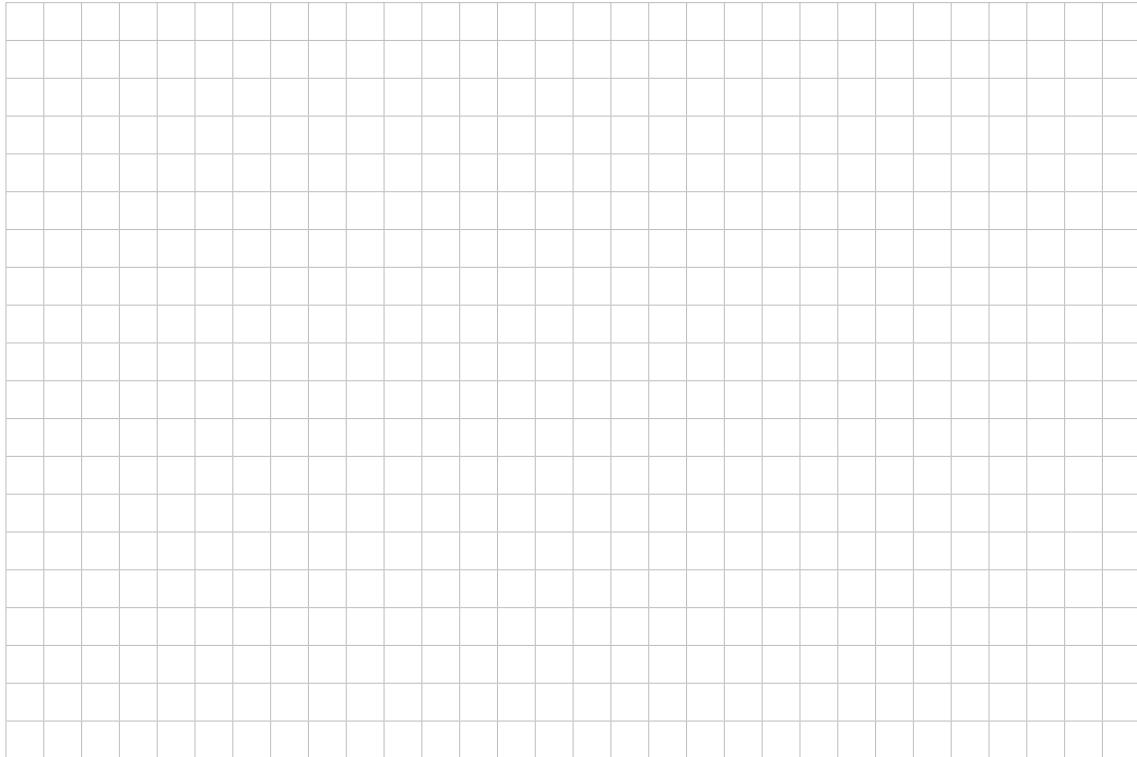
QUESTION 4

Henry is preparing to negotiate a home loan to be repaid monthly. He has identified two possible loans to choose from:

- Loan 1 has an interest rate of 7.05% per annum, compounded monthly. There are no other fees or charges.
- Loan 2 has an interest rate of 6.85% per annum, compounded monthly. There is a monthly account-keeping fee of \$8 and a set-up fee of \$300.

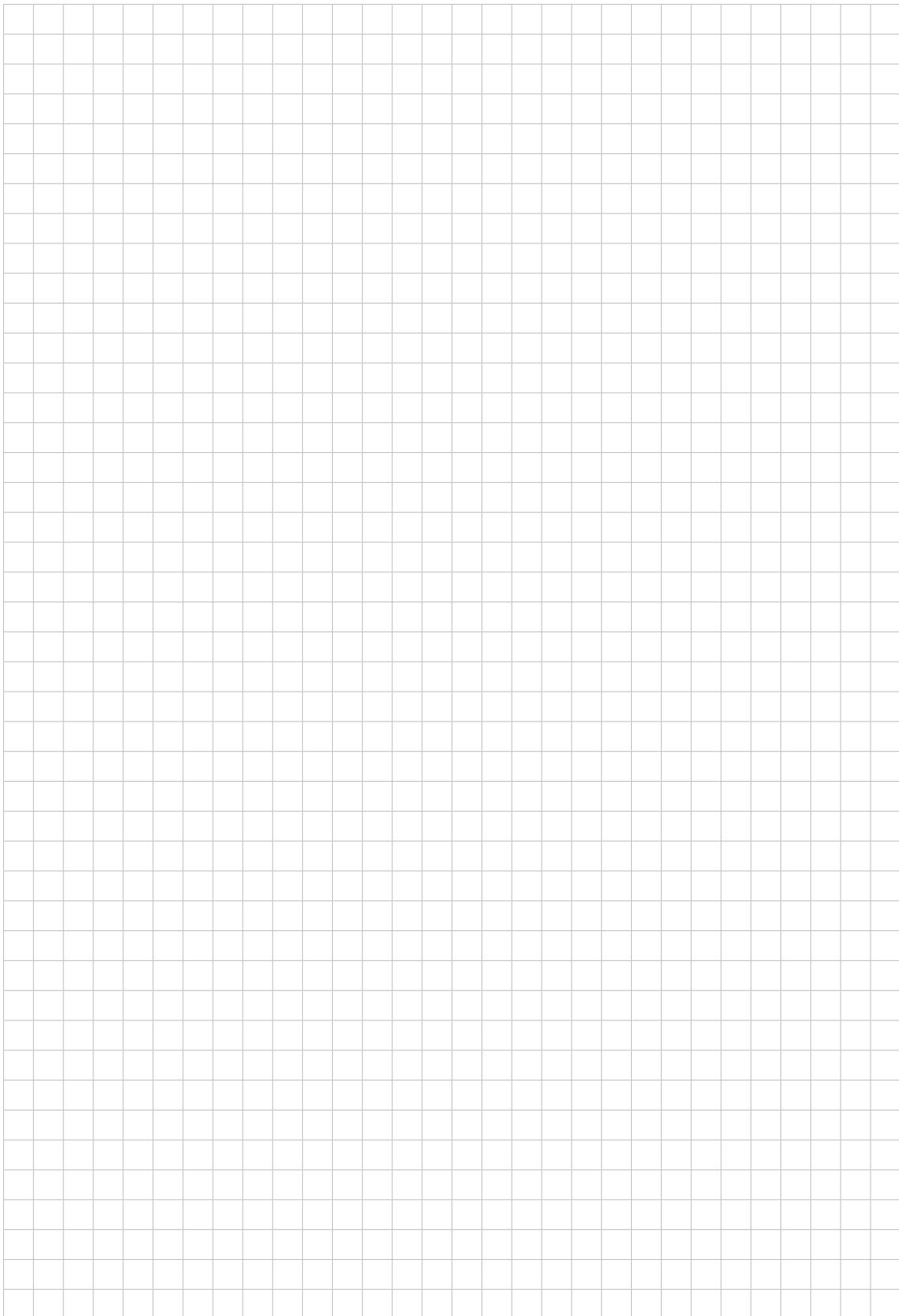
Henry wants to borrow \$295 000 over 30 years.

Show, using effective (comparison) interest rates, why he should choose Loan 2.



(4 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 2(c)(i) continued’).*

A large grid of squares, approximately 20 columns by 30 rows, intended for students to write their answers to Topic 2. The grid is located on the left side of the page, with a vertical margin line on the right.