Government of South Australia

SACE Board of SA

External Examination 2013

2013 MATHEMATICAL APPLICATIONS, Semester 2

TOPIC 3

FOR OFFICE USE ONLY

SUPERVISOR CHECK

RE-MARKED

SACE REGISTRATION NUMBER

SEQ | FIGURES | CHECK LETTER | BIN

MATHEMATICAL APPLICATIONS, Semester 2

Graphics calculator ☐

Brand _____

Model _____

Computer software ☐

Thursday 7 November: 9 a.m.

Time: 1½ hours in total (to complete two question booklets, one on each topic studied in Semester 2)

Pages: 11
Questions: 5

Topic 3: Mathematics and Small Business

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 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 5 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 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.

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QUESTION 1

Aden is looking at the following three options for new business premises for his hairdressing salon:

- Option A — $45 per year per square metre
- Option B — $9000 per year for 275 square metres
- Option C — $410 per week for 220 square metres.

(a) Which option should Aden choose if his decision is based only on price per square metre? Use calculations to support your answer.

(3 marks)

(b) The hairdressing salon is in the CBD (central business district) of a large city.

(i) State *one* advantage of this location.

(1 mark)

(ii) State *one* disadvantage of this location.

(1 mark)

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QUESTION 2

Louisa's Electronics stocks a range of computers and electrical items. The most basic computer is sold for $800 after a mark-up of 25% has been applied.

(a) Determine the cost price of this basic computer (ignore GST).

(1 mark)

(b) Using the straight-line method, determine the annual depreciation on the $800 basic computer, if it has no value after 5 years.

(1 mark)

(c) When buying the $800 basic computer a customer is offered two discount options:

- Option 1 — 22% off the selling price
- Option 2 — a series discount of 15%–8%–4%.

Which option provides the better discount for the customer? Show calculations to support your answer.

(2 marks)

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QUESTION 3

Tania has a business assembling gift baskets. Each basket contains three packets of chocolates, two balloons, and a teddy bear. The selling price is $35 per basket. Tania's costs include: packets of chocolates at $1 each, balloons at $2 each, advertising at $300, teddy bears at $5 each, telephone bill at $50, baskets at $2.50 each, wages at $450.

(a) Separate these costs into two lists under the following headings.

Fixed Costs	Variable Costs

(2 marks)

(b) Using the marginal income, calculate the number of gift baskets that need to be sold for the business to break even.

(3 marks)

(c) Calculate the profit that would be made if 104 gift baskets were sold.

(1 mark)

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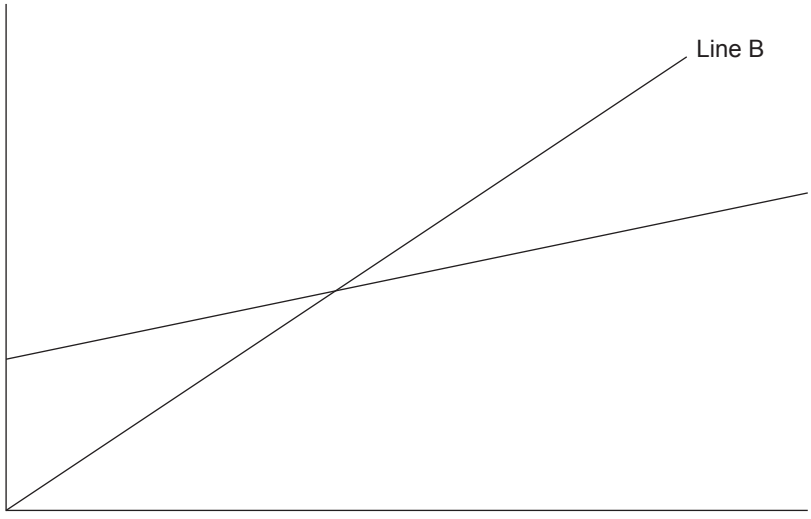
(d) (i) On the graph below, label Axis A to show which variable it represents.

Break-even Graph



Axis A: ☐

(1 mark)

(ii) Tick the appropriate box to indicate what Line B on the graph above represents.

fixed costs ☐ variable costs ☐ total revenue ☐ total costs ☐ (1 mark)

(e) Tania is considering increasing the selling price to $39 per basket.

Calculate the new number of gift baskets that would need to be sold for the business to break even.

(2 marks)

(f) State *one* reason why increasing the selling price of the baskets may not be the best strategy for the business.

(1 mark)

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QUESTION 4

Bank BCF operates two ATMs (automated teller machines) in a shopping centre.
The management wants to find out if the two machines are enough to meet the needs of the customers. The customer arrivals and service times at the machines have generally followed the pattern below:

- a customer arrives every 2 minutes
- the service time is 2 minutes but every third customer needs 2 extra minutes of service time.

(a) Using queuing efficiency calculations, determine the number of ATMs that should be able to handle the bank's customer demand.

(2 marks)

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On one particular day two customers used the ATMs at 9 a.m. A new customer arrived every minute until 9.05 a.m. One customer then arrived every 2 minutes as usual, and needed 2 minutes of service time. Every third customer needed 2 extra minutes of service time.

(b) Assuming the service times followed the pattern outlined above, complete the table below.

Customer	ATM	Customer Arrival Time	Start Service	Finish Service	Customer Waiting Time (min)	ATM Idle Time (min)
1	1	9.00	9.00	9.02	0	0
2	2	9.00	9.00	9.02	0	0
3	1	9.01	9.02	9.06	1	0
4	2	9.02	9.02	9.04	0	0
5	2	9.03	9.04	9.06	1	0
6						
7						
8						
9						
10						
11						
12						
13						
14	1	9.19	9.19	9.21	0	0
15	1	9.21	9.21	9.25	0	0
16	2	9.23	9.23	9.25	0	4
				Total		8

(4 marks)

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(c) With reference to your results in parts (a) and (b), discuss whether or not the two ATMs in the shopping centre are enough to meet the needs of the bank's customers.

(2 marks)

(d) Suggest *one* reason why the bank may regard ATM idle time differently from staff bankteller idle time.

(1 mark)

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You may write on this page if you need more space to finish your answers to Topic 3. Make sure to label each answer carefully (e.g. 'Question 1(a) continued').

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QUESTION 5

Adam collected the following information to use in preparing a profit-and-loss statement for his business, Christmas Trees 4 U:

- closing stock $102 300
- opening stock $152 010
- purchases of stock $97 800
- expenses $87 500
- sales $405 670.

(a) Using the information above, prepare a profit-and-loss statement for Christmas Trees 4 U, and show that the profit is $170 660.

Profit-and-Loss Statement for Christmas Trees 4 U

(4 marks)

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(b) *Refer to the following table when answering this part of the question:*

Individual Income Tax Rates, 2012–13

Taxable Income	Tax on This Income
0 – $18 200	nil
$18 201 – $37 000	19c for each $1 over $18 200
$37 001 – $80 000	$3572 plus 32.5c for each $1 over $37 000
$80 001 – $180 000	$17 547 plus 37c for each $1 over $80 000
$180 001 and over	$54 547 plus 45c for each $1 over $180 000

Source: Adapted from www.ato.gov.au

Adam is the sole owner of Christmas Trees 4 U.

Calculate his total tax liability for the business, including the Medicare Levy of 1.5%.

(2 marks)

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