



Rossmoyne Senior High School

Semester One Examination, 2018

Question/Answer booklet

MATHEMATICS APPLICATIONS UNIT 3 AND 4

Section One:
Calculator-free

If required by your examination administrator, please
place your student identification label in this box

Student number: In figures

| | | | | | | | |
|--|--|--|--|--|--|--|--|
| | | | | | | | |
|--|--|--|--|--|--|--|--|

In words

Your name

Time allowed for this section

Reading time before commencing work: five minutes

Working time: fifty minutes

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer booklet

Formula sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,
correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

| Section | Number of questions available | Number of questions to be answered | Working time (minutes) | Marks available | Percentage of examination |
|------------------------------------|-------------------------------|------------------------------------|------------------------|-----------------|---------------------------|
| Section One: Calculator-free | 8 | 8 | 50 | 52 | 35 |
| Section Two: Calculator-assumed | 10 | 10 | 100 | 98 | 65 |
| | | | | Total | 100 |

Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet.
3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.
4. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
5. Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you do not use pencil, except in diagrams.
7. The Formula sheet is not to be handed in with your Question/Answer booklet.

Section One: Calculator-free

35% (52 Marks)

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1

(10 marks)

(a) Determine the next two terms for the following sequences.

(i) $A_{n+1} = 2A_n + 3$ where $A_1 = -5$ (2 marks)

(ii) $P_n = \frac{P_{n-1}}{2} + 2^n$ where $P_1 = 2$ (2 marks)

(b) Given $T_{n+1} = 5 - T_n$ where $T_3 = -13$, find the first two terms. (2 marks)

(c) Determine the recursive definition for the following. (2 marks)

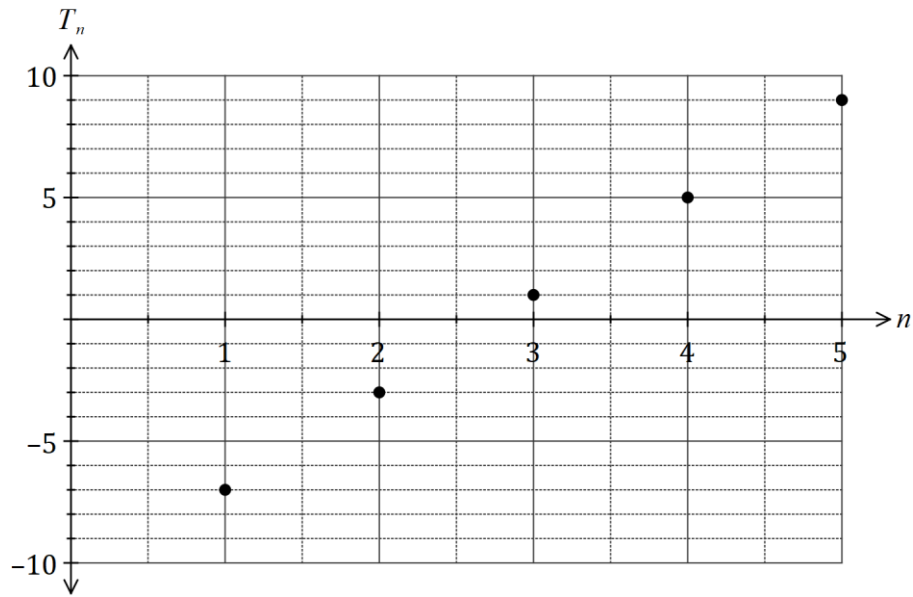
(i) $\frac{1}{2}, \frac{5}{4}, \frac{4}{2}, \frac{11}{4}, \dots$

(ii) 81, 27, 9, (2 marks)

Question 2

(4 marks)

The first five terms of an arithmetic sequence are shown on the graph below.



(a) Deduce a rule for the n^{th} term of this sequence.

(2 marks)

(b) Which term of the sequence has a value of 1197.

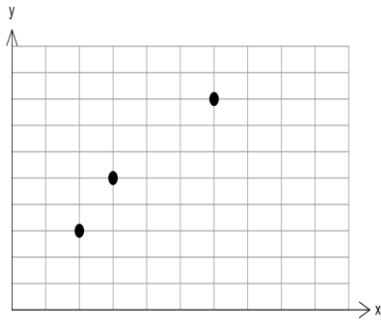
(2 marks)

Question 3

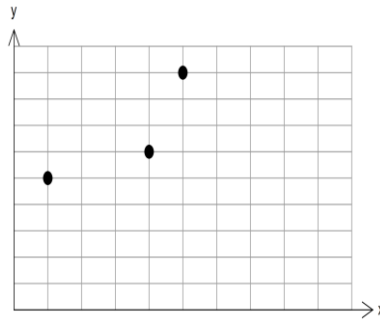
(6 marks)

(a) Match the following correlation coefficient values, -0.8 , 0.95 , 0.76 , to the graphs below. Write the value next to the letter.

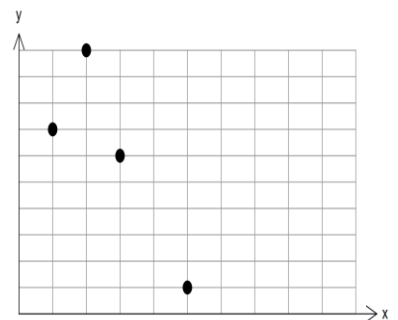
(3 marks)



A



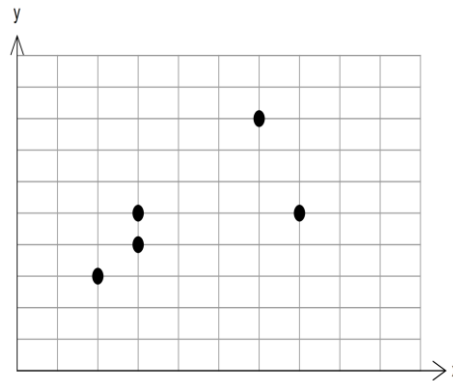
B



C

(b) The graph below represents a correlation coefficient of 0.68 . Circle the point that needs to be removed to make the correlation coefficient value higher.

(1 mark)



(c) Students in a high school were asked what their preferred mode of transport was for travelling to school. Column percentages are shown. Comment on the association that exists between the variables.

(2 marks)

| | Girls | Boys |
|-------------|-------|------|
| Car | 45 | 27 |
| Bike | 3 | 25 |
| Bus | 28 | 28 |
| Walk | 24 | 20 |

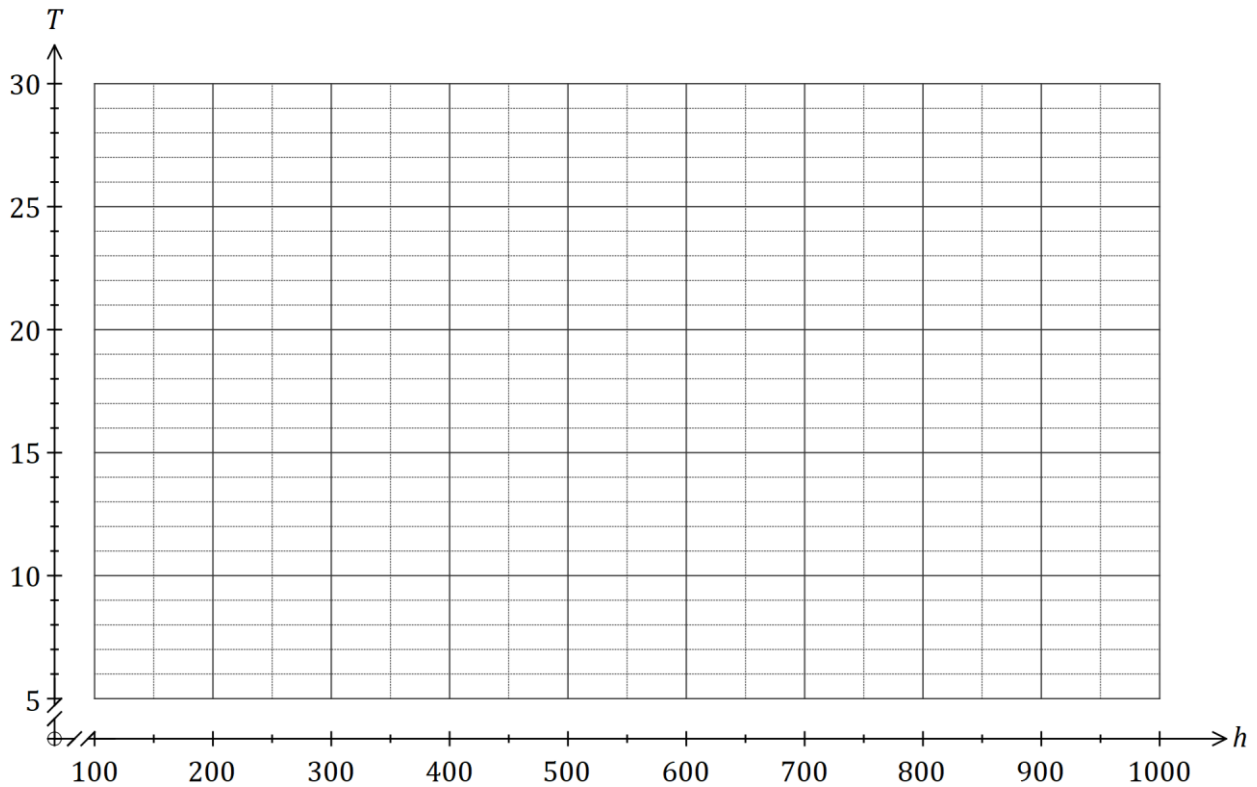
Question 4

(8 marks)

The average maximum temperature, T °C, was recorded for ten weather stations, together with the altitude of the station, h metres. The data is shown in the table below.

| | | | | | | | | | | |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Altitude, h | 987 | 932 | 781 | 640 | 563 | 465 | 374 | 324 | 272 | 125 |
| Temperature, T | 10 | 12 | 18 | 21 | 20 | 21 | 24 | 26 | 27 | 25 |

- (a) Construct a scatterplot on the axes below that can be used to identify whether an association exists between altitude and temperature. (3 marks)



- (b) Describe the features of the scatterplot that indicate a strong, negative and linear association exists between altitude and temperature. (2 marks)

- (c) Estimate a value for

(i) the temperature at an altitude of 850 metres. (1 mark)

(ii) the value of the correlation coefficient between the two variables. (2 marks)

Question 5**(5 marks)**

A recursive sequence is defined by the difference equation $aT_{n+1} - bT_n = 12$ and is such that $T_2 = 2$, $T_3 = 4$ and $T_4 = 20$.

(a) Show how to establish the equations $2a - b = 6$ and $5a - b = 3$. **(3 marks)**

(b) Solve the equations in (a) to determine the values of a and b . **(2 marks)**

Question 6

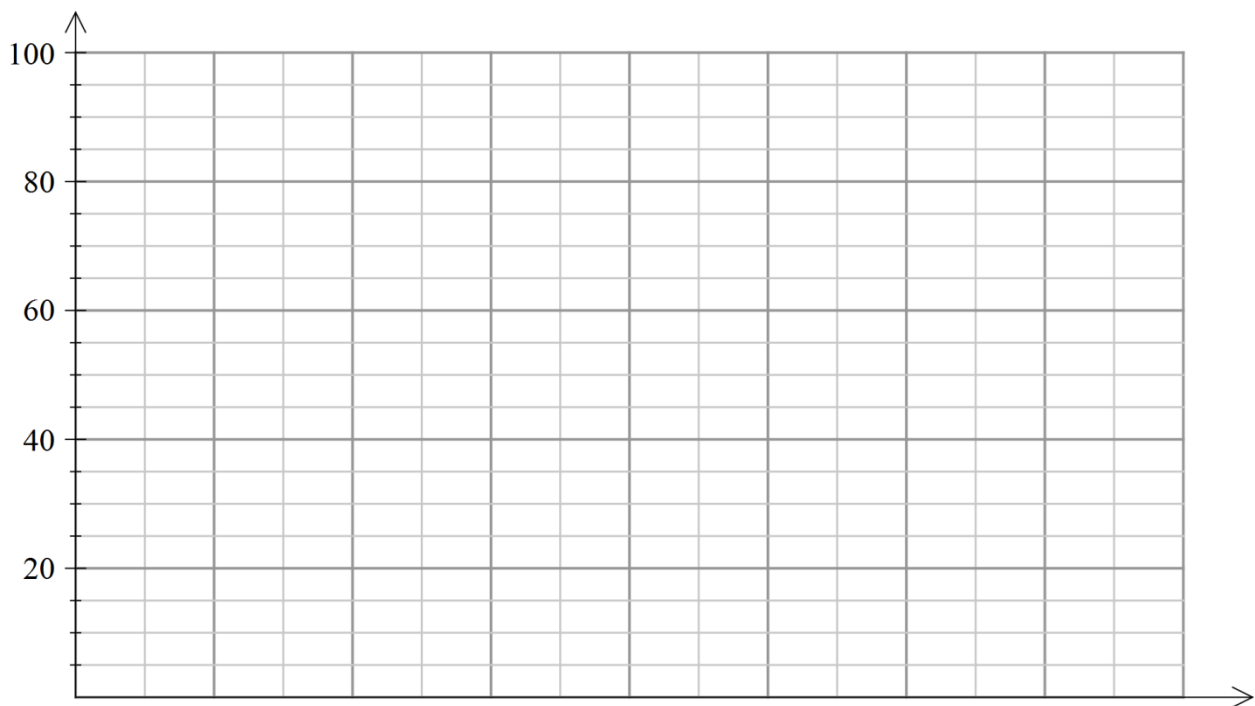
(6 marks)

A number of people were asked which type of movie genre they preferred to watch from horror, crime and romance. The results, by age of respondent, led to the following table.

| | Age of respondent (in years) | | |
|---------|------------------------------|----------|----------|
| | 15 to 34 | 35 to 54 | 55 to 74 |
| Horror | 64% | 40% | 26% |
| Mystery | 25% | 45% | 52% |
| Romance | 11% | 15% | 22% |
| Totals | 100% | 100% | 100% |

(a) Name the explanatory variable. (1 mark)

(b) Draw a proportional column graph involving three columns of equal height with one column for each of the three categories. (3 Marks)

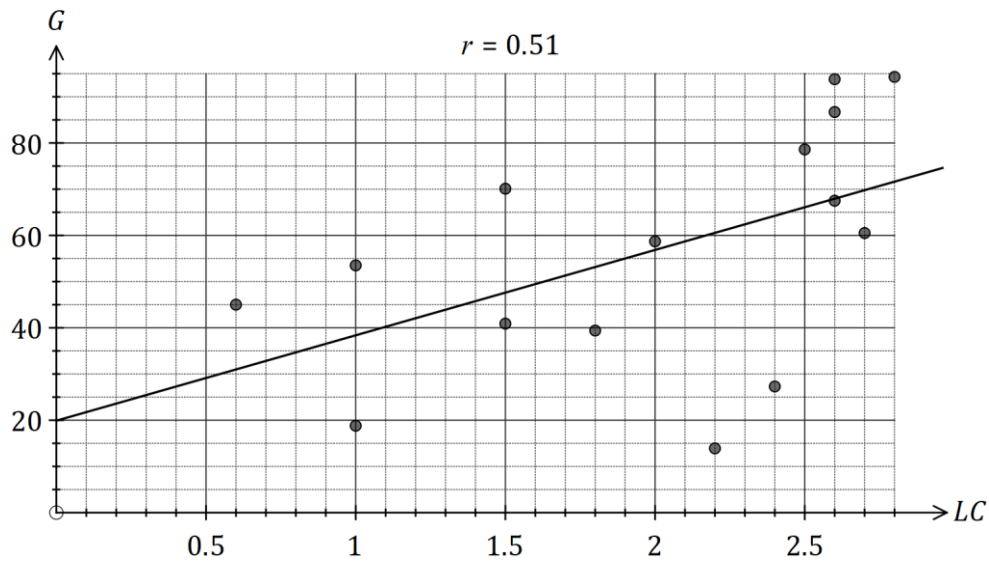


(c) Comment on whether or not there seems to be an association between the variables by describing the association and explaining your reasoning. (2 marks)

Question 7

(7 marks)

A medical study measured the lipoprotein-cholesterol (LC) and ghrelin (G) levels of a group of patients. The results were displayed in the scatterplot below, together with the least-squares line of best fit and the correlation coefficient between the variables.



- (a) How many patients in the study with a lipoprotein-cholesterol level of more than 0.75 had a ghrelin level of less than 65? (1 mark)

- (b) Determine the upper and lower predicted ghrelin levels for patients with lipoprotein-cholesterol levels between 0.8 and 2.45. (2 marks)

- (c) Comment on the validity of the claim that a high lipoprotein-cholesterol level causes a patient to have a high ghrelin level. (2 marks)

- (d) State the number of patients in the study and comment on how the size of the study could influence any explanation for an association between the variables. (2 marks)

Question 8 (6 marks)

Given the line of regression for a set of data is $\hat{y} = 10 - 3.4x$, state whether the following are true (T) or false (F).

- (a) The predicted value for $x = 5$ is $y = -7$. (1 mark)
- (b) The coefficient of determination is a negative value. (1 mark)
- (c) If the actual y value for when $x = 4$ is 8, then the residual is -3.6 . (1 mark)
- (d) If when plotted, the residuals form a random pattern, then this indicates that linear regression is the most appropriate regression to use. (1 mark)
- (e) A prediction for when $x = 19$ would be reliable if the x values for the data plotted ranged from 3 – 17 and the correlation coefficient was -0.87 . (1 mark)
- (f) $(10, -24)$ is a point on the line of regression. (1 mark)

Supplementary page

Question number: _____

