

Papers written by
Australian Maths
Software

SEMESTER ONE

YEAR 12, Unit 3

**MATHEMATICS APPLICATIONS
REVISION 2
2016**

**Section One
(Calculator-free)**

Name: _____

Teacher: _____

TIME ALLOWED FOR THIS SECTION

Reading time before commencing work:

5 minutes

Working time for section:

50 minutes

MATERIAL REQUIRED / RECOMMENDED FOR THIS SECTION

To be provided by the candidate

Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler.

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 notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

To be provided by the supervisor

Question/answer booklet for Section One.

A formula sheet which may also be used for Section Two.

Structure of this examination

	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One Calculator—free	6	6	50	52	35
Section Two Calculator—assumed	9	9	100	98	65
Total marks				150	

Instructions to candidates

1. The rules for the conduct of this examination are detailed in the Information Handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in the Question/Answer booklet.
3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Spare pages are provided at the end of this booklet. If you need to use them, indicate in the original answer space 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 an answer to 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.

1. (4 marks)

Between 2000 and 2009, it has been found in America that there is a very high correlation ($r = 0.947$) between the per capita cheese consumption and the number of people who died tangled in their bed sheets.

NB per capita means per person.

<http://www.tylervigen.com/spurious-correlations>

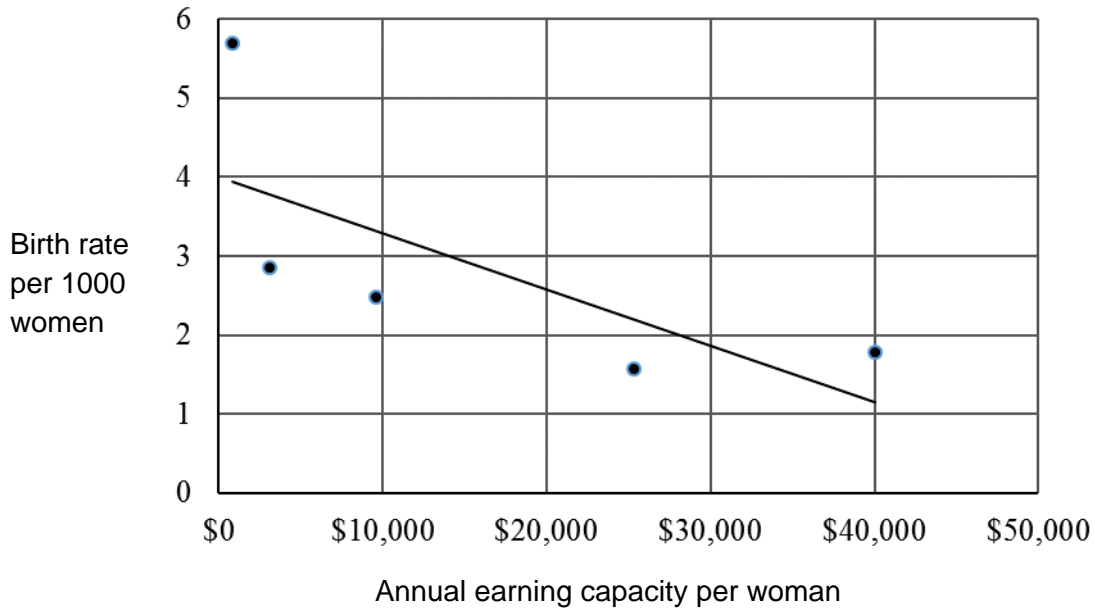
Jeremy concluded that if it was possible to slow down cheese consumption, then it would reduce the number of people who died tangled in their bedsheets.

(a) Comment on Jeremy's conclusion. (2)

(b) Suggest a possible cause for such a high but spurious correlation to exist. (2)

2. (7 marks)

The following chart shows the birth rate per 1000 women of child bearing age in five different countries against their average annual earning capacity.



(a) Explain why a linear fit to the data above is not the best fit for the data. (3)

(b) Sketch a scattergram and suggest the two possible variables for data with

(i) $r = 0.2$ (2)

(ii) $r = -0.9$ (2)

3. (8 marks)

Generate the first four terms of the sequences defined recursively below

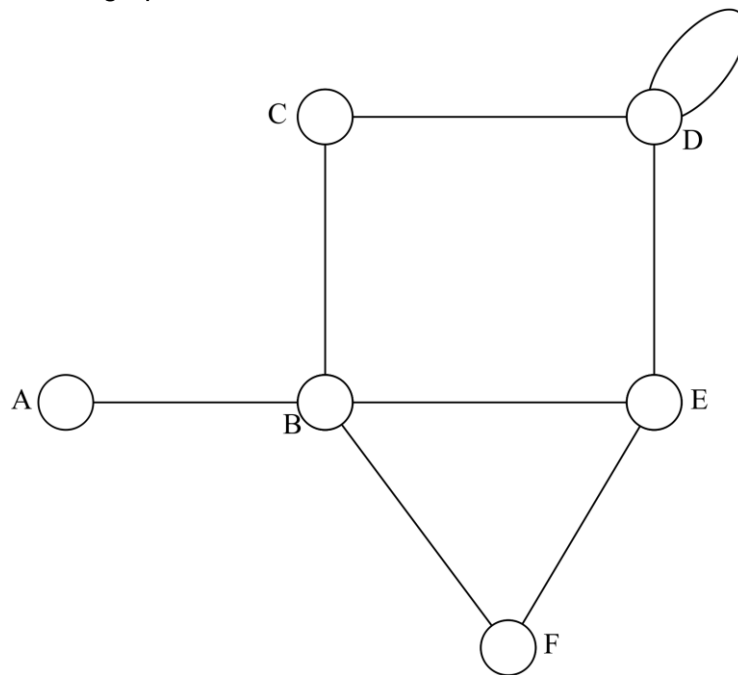
(a) $T_{n+1} = T_n - 4, T_1 = 20$ (2)

(b) $T_{n+1} = 1.1T_n, T_1 = 1000$ (3)

(c) $A_{n+1} = A_n + n, A_1 = 1$ (3)

4. (13 marks)

(a) Consider the graph below:



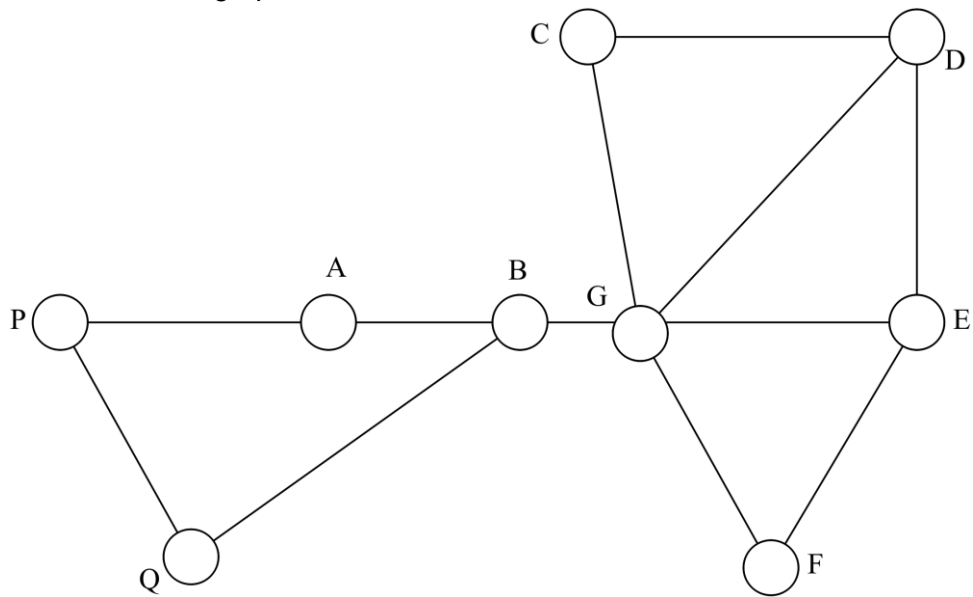
- (i) Explain why the graph is not a simple graph. (1)

- (ii) Write down the degree of vertex D. (1)

- (iii) Name a subgraph of the graph that is a cycle. (1)

- (iv) Explain why the graph is a semi-Eulerian graph. (2)

(b) Consider the graph below.



(i) Name a sub graph that is a closed trail. (2)

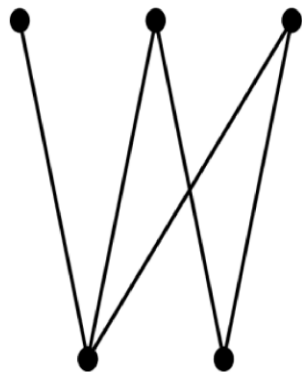
(ii) In the subgraph containing the vertices B,A,P and Q find and list a semi-Hamiltonian path. (2)

(iii) Name a bridge. (1)

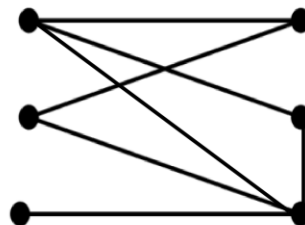
(c) Which of the following graphs are bipartite. Explain why.

(3)

A



B

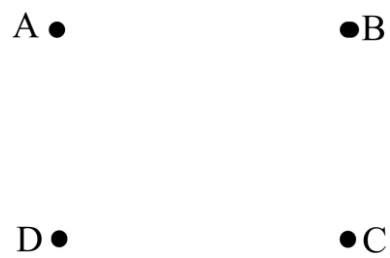


5. (12 marks)

- (a) Four friends, A,B,C and D, email each other regularly. The number of emails they sent to each other last week is shown in the adjacency matrix below.

		To			
		A	B	C	D
From	A	0	2	1	0
	B	2	0	2	1
	C	1	2	1	2
	D	0	1	2	0

Illustrate the data on a graph below:



(3)

- (b) Who sent an email to himself?

(2)

- (c) Who has the most communication with other people during this week? (2)

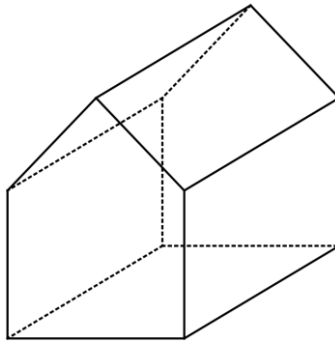
(d) Let $M = \begin{matrix} & \begin{matrix} A & B & C & D \end{matrix} \\ \begin{matrix} A \\ B \\ C \\ D \end{matrix} & \begin{pmatrix} 0 & 2 & 1 & 0 \\ 2 & 0 & 2 & 1 \\ 1 & 2 & 1 & 2 \\ 0 & 1 & 2 & 0 \end{pmatrix} \end{matrix}$

- (i) Determine M^2 . (4)

- (ii) Is the two stage matrix necessary for everyone to be connected? Explain. (1)

6. (8 marks)

Consider the three dimensional shape below.



(a) Write down the number of vertices (V), faces (F) and edges (E).

$$V = \qquad F = \qquad E = \qquad (3)$$

(b) Use Euler's formula $V + F - E = 2$ to determine whether or not the graph is planar. (3)

(c) Sketch the two dimensional graph that corresponds to the three dimensional shape above. (2)

END OF SECTION ONE
