

## Semester One Examination 2017 Question/Answer Booklet

### MATHEMATICS APPLICATIONS UNIT 3

#### Section One: Calculator-free

Student Name: \_\_\_\_\_

Teacher's Name: \_\_\_\_\_

#### Time allowed for this section

Reading time before commencing work: five minutes

Working time for paper: fifty minutes

#### Material 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 tape/fluid, erasers, 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 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.

## Structure of this paper

	Number of questions available	Number of questions to be attempted	Suggested working time (minutes)	Marks available
<b>Section One Calculator—free</b>	<b>8</b>	<b>8</b>	<b>50 minutes</b>	<b>50</b>
Section Two Calculator—assumed	9	9	100 minutes	100
				150

## Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2017*. Sitting this examination implies that you agree to abide by these rules.
- Answer the questions according to the following instructions.

Section One: Write answers in this Question/Answer Booklet. Answer **all** questions.

**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.

It is recommended that you **do not use pencil**, except in diagrams.

- 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.
- Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
  - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
  - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.
- The Formula Sheet is **not** handed in with your Question/Answer Booklet.

**Section One: Calculator-free**

**50 marks**

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

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Working time: 50 minutes

**Question 1 (6 marks)**

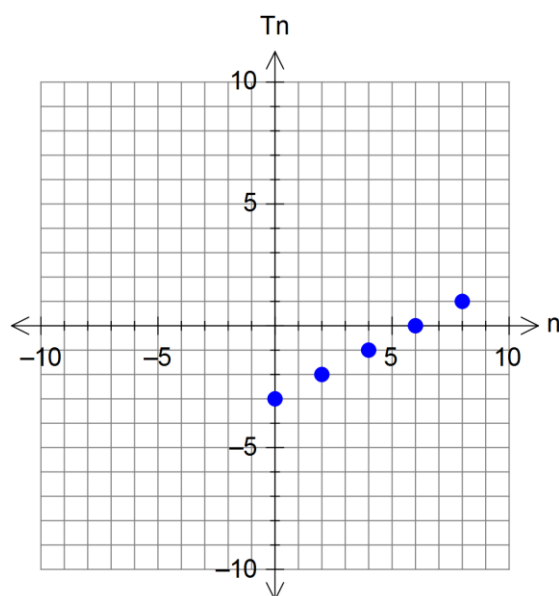
- (a) Determine the next three terms for the number sequence that is described using the following recursive equation. (3 marks)

$$T_{n+1} = 2T_n + n - 5 \quad T_1 = 4$$

- (b) The graph shown represents an arithmetic sequence.

- (i) Explain why it is an arithmetic sequence. (1 mark)

- (ii) Determine the recursive definition for the arithmetic sequence shown, where  $T_0 = -3$ ,  $T_2 = -2$ ,  $T_4 = -1$ ,  $T_6 = 0$  and  $T_8 = 1$ . (2 marks)



**Question 2 (12 marks)**

(a) Write the recursive definition for the following sequences.

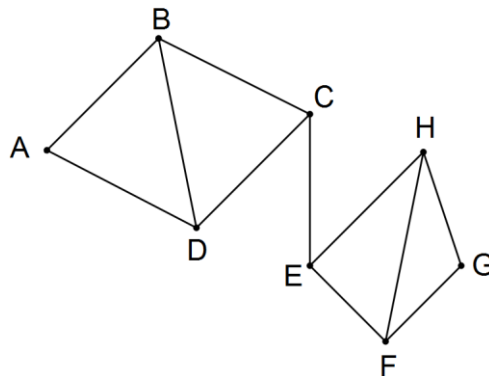
(i) 400, 100, 25, ..... (2 marks)

(ii) 4x, 8x, 12x, ..... (2 marks)

(b) (i) Determine the correlation coefficient for a coefficient of determination of 0.81. (2 marks)

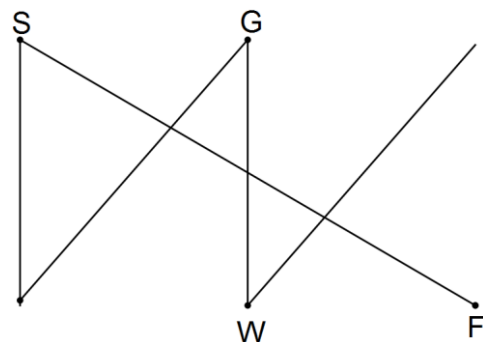
(ii) Comment on the strength of the correlation coefficient for **b(i)**. (1 mark)

(c) For the Hamiltonian path below, which node(s) could you not start with? (2 marks)



(d) Marjorie is a very talented musician. Apart from all of her other commitments, her musical times are shown in the table and bipartite graph below. Use the initials given, for each day and activity, to complete the table and bipartite graph below. (3 marks)

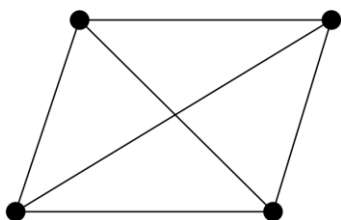
	Sing (S)	Guitar (G)	Piano (P)
Monday (M)	Y	Y	
Wednesday (W)	N		Y
Friday (F)	Y	N	N



**Question 3 (7 marks)**

(a) Explain why the graph below is non - planar.

(1 mark)



(b) Redraw the graph in (a) as a planar graph.

(1 mark)

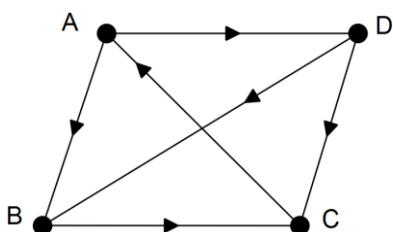
(c) Complete the table below using Euler’s rule.

(3 marks)

Number of Vertices	Number of Edges	Number of Faces
	8	5
8		6
6	9	

(d) Show for the graph below that the value of the in - degree total equals the value of out - degree total.

(2 marks)



**Question 4 (6 marks)**

A set of data, (two variables  $P$  and  $t$ ) has a line of regression equation  $P = -0.15t + 2.2$  and a coefficient of determination of 0.64.

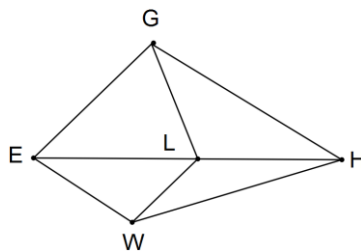
**(a)** State whether the following statements are true (T) or false (F). (4 marks)

- (i)**  $P$  is the response variable. \_\_\_\_\_
- (ii)** As  $t$  increases,  $P$  increases. \_\_\_\_\_
- (iii)** An outlier would increase the correlation coefficient. \_\_\_\_\_
- (iv)** For a linear regression model to be used to predict future values, the graph of the residuals will show a random pattern. \_\_\_\_\_

**(b)** If the residual is -0.2 when  $t = 5$ , state the real value of  $P$ . (2 marks)

**Question 5 (5 marks)**

James wanted to visit all of the animals included in the African Safari at the local zoo. Below is a map of where the animals are located. On entering the welcome centre (W) he would like to visit, in order, the lions (L), elephants (E), giraffes (G), hyenas (H) and then exit through the welcome centre.



**(a)** Explain why James' visit choice forms a Hamiltonian circuit. (2 marks)

**(b)** If the path between the giraffes and hyenas is no longer accessible, is a Hamiltonian circuit still maintained? Explain your answer. (2 marks)

**(c)** James was told on entry at the welcome centre that he could exit through a gate where the giraffes are located. By taking this new exit, he would have to change the order of his visit. Describe a semi-Hamiltonian path that he could take. (1 mark)

**Question 6 (6 marks)**

The matrix below shows the number of minutes a car detailing company (rows) takes to carry out the three tasks (columns) involved in detailing a car.

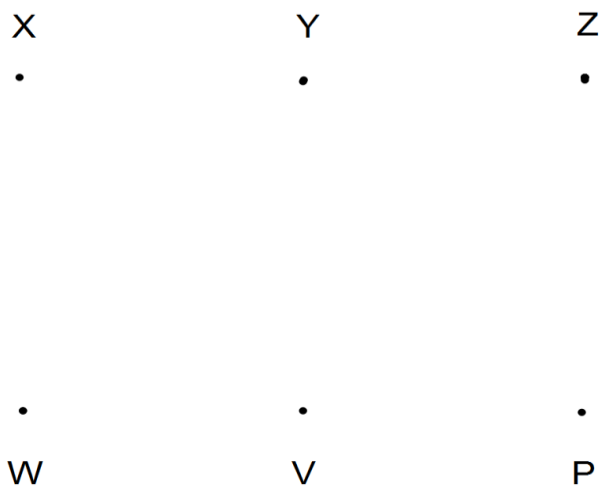
You Beaut Shine’s details are shown in the matrix below. The order of the detail is washing, vacuuming and wax and polish.

Xcellent Shine spends 20 minutes washing the outside of a car, 18 minutes vacuuming the inside of a car and 15 minutes to wax and polish the outside of the car.

Zest Car Detailing spends 64 minutes to complete the process. Half of the time is spent washing the car and the remainder of the time is split over the other two parts.

$$\begin{bmatrix} 25 & 17 & 18 \end{bmatrix}$$

- (a) Use the information above to complete the matrix? (2 marks)
- (b) Which company completes the car detail in the least amount of time? (1 mark)
- (c) Which company is the quickest in vacuuming a car? (1 mark)
- (d) On the graph below, show the companies that take the longest time to complete a task. (2 marks)



**Question 7 (4 marks)**

Use the table below to match each recursive equation with the statement.

Use the letter of each recursive equation (A, B, C, D) and the letter of the statement (a, b, c, d).

A:  $T_{n+1} = 2(T_n + 3)$       B:  $T_{n+1} = \frac{2}{3} T_n$       C:  $T_{n+1} = 1.5T_n$       D:  $T_{n+1} = 1.5(T_n + 2)$

- a: Each term is obtained by the previous term being multiplied by 3 then divided by 2.
- b: Each term is obtained by doubling the previous term, then dividing by 3.
- c: Each term is obtained by adding 3 to the previous term, then multiplying by 2.
- d: Each term is obtained by the previous term being added to 2, then multiplied by 1.5.

Recursive Equation	A	B	C	D
Statement				

**Question 8 (4 marks)**

Draw a digraph representing the information below in the table given. There is also a loop with a clockwise direction.

Vertex	A	B	C	D
in – degree	2	1	0	2
out - degree	0	1	2	2





**Additional working space**

Question number(s): .....

**Additional working space**

Question number(s): .....

**Additional working space**

Question number(s): .....

WATP acknowledges the permission of School Curriculum and Assessment Authority in providing instructions to students.