

# MATHEMATICS APPLICATIONS

## MAWA Semester 1 (Unit 3) Examination 2018

### Calculator-free

### Marking Key

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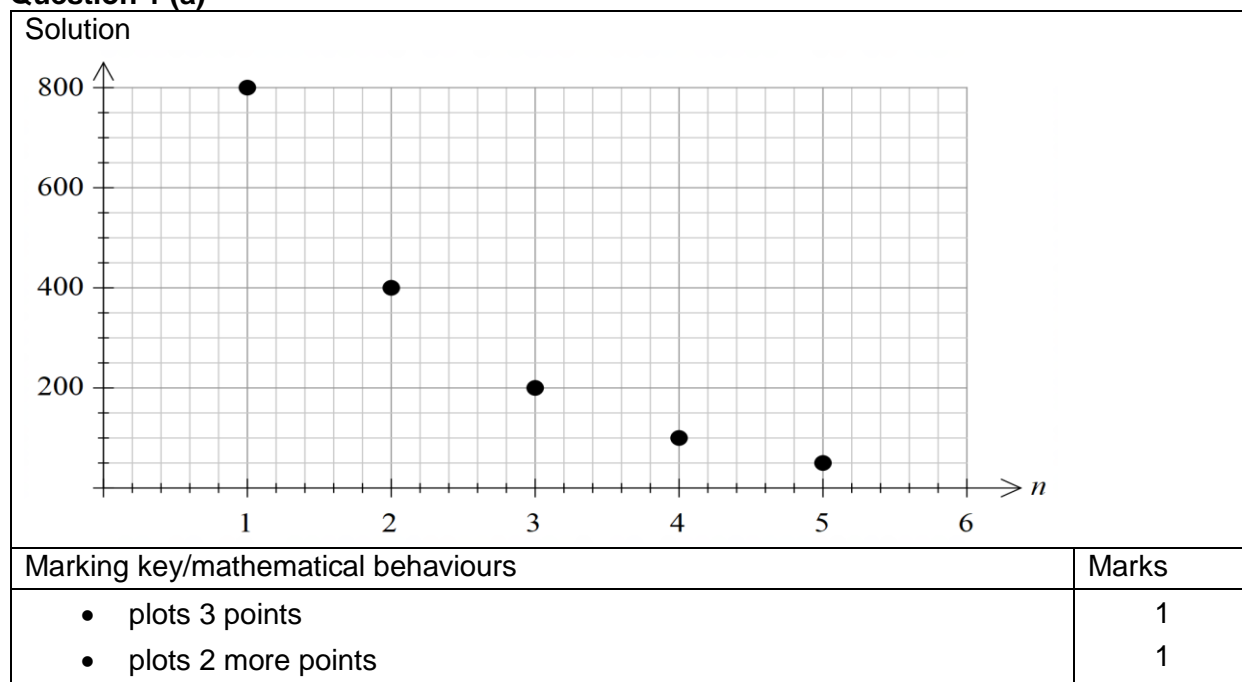
The release date for this exam and marking scheme is

- **the end of week 8 of term 2, 2018**

Section One: Calculator-free

(50 Marks)

Question 1 (a)



Question 1 (b)

Solution

$$T_n = 800(0.5)^{n-1}$$

Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies correct rate and power</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies correct format with starting term</li> </ul>	1

Question 1 (c)

Solution

Never. The values keep getting smaller and closer to zero but the values remain positive

Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies the sequence is never negative</li> </ul>	1
<ul style="list-style-type: none"> <li>provides explanation of sequence behaviour</li> </ul>	1

Question 2 (a)

Solution

The values have been rounded to the nearest tenth. Some loss of accuracy has resulted

Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>indicates numbers are rounded</li> </ul>	1

**Question 2 (b)**

Solution	
Which party will you vote for at the next election?	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies an appropriate question for data collection</li> </ul>	1

**Question 2 (c)**

Solution	
The proportion of people surveyed who supported the Orange party increased over the time of the three surveys. The percentages rose from 36.5 to 39.3 to 41.3	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>indicates variables that are related</li> </ul>	1
<ul style="list-style-type: none"> <li>describes the change in voting percentages over time</li> </ul>	1

**Question 2 (d)**

Solution	
The ages of the voters in all three surveys were comparable. There were about the same numbers of females and males in each survey The surveys were conducted in the same regions each time	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies first condition</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies second condition</li> </ul>	1

**Question 2 (e)**

Solution	
A column graph Party along the horizontal axis Percentages along the vertical axis A column for each time period (different colours) A legend for each time period Titles etc..	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies an appropriate type of graph</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies first graph feature</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies second graph feature</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies third graph feature</li> </ul>	1

**Question 3 (a)**

Solution	
(i) The vertices represent the players	
(ii) There are no loops because there are no paths from any vertex to itself	
(iii) The graph is a digraph because there are directions on the edges	
(iv) Complete	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies significance of vertices</li> </ul>	1
<ul style="list-style-type: none"> <li>determines lack of loops</li> </ul>	1
<ul style="list-style-type: none"> <li>explains lack of loops</li> </ul>	1
<ul style="list-style-type: none"> <li>explains meaning of digraph</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies meaning of a complete graph</li> </ul>	1

**Question 3 (b)**

Solution	
$  \begin{array}{c}  K \quad L \quad M \quad R \quad P \\  K \begin{bmatrix} 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \end{bmatrix} \\  L \\  M \\  R \\  P  \end{array}  $	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>presents labelled matrix with size 5 x 5</li> </ul>	1
<ul style="list-style-type: none"> <li>leading 0s along the diagonal</li> </ul>	1
<ul style="list-style-type: none"> <li>other values correct</li> </ul>	1

**Question 3 (c)**

Solution	
Numbers are all 0	
Players do not compete against themselves	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies 0s on leading diagonal</li> </ul>	1
<ul style="list-style-type: none"> <li>explains why these numbers are 0</li> </ul>	1

**Question 3 (d)**

Solution	
Mal: By looking for the row where the elements add to the greatest total	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies the node</li> </ul>	1
<ul style="list-style-type: none"> <li>explains relevance of greatest sum</li> </ul>	1

**Question 4 (a)**

Solution	
positive	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies direction of an association</li> </ul>	1

**Question 4 (b)**

Solution	
15 cents	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>interprets gradient in equation of a line</li> </ul>	1

**Question 4 (c)**

Solution	
68.7%	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>correct interpretation of the coefficient of determination</li> </ul>	1

**Question 4 (d)**

Solution	
0.8 It is the closest to $\sqrt{0.687}$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies closest estimate</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies relationship between correlation coefficient and coefficient of determination</li> </ul>	1

**Question 4 (e)**

Solution	
$y = 0.15x - 0.7 = 0.15 \times 50 - 0.7 = \$6.80$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>substitutes into given equation</li> </ul>	1
<ul style="list-style-type: none"> <li>determines subject of formula</li> </ul>	1

**Question 4 (f)**

Solution	
Not very reliable. Prediction is extrapolated beyond the data given.	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>concludes prediction is not reliable</li> </ul>	1
<ul style="list-style-type: none"> <li>refers to extrapolation</li> </ul>	1

**Question 4 (g)**

Solution	
<p style="text-align: center;">Motoring costs</p>	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>plots point on scatter plot</li> </ul>	1

**Question 4 (h)**

Solution decrease	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>interprets coefficient of determination</li> </ul>	1

**Question 5 (a)**

Solution	
ELBA = 300 m	ELSA = 260 m ** shortest path
ERBA = 450 m	ELMA = 470 m
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>names two paths and provides distances</li> </ul>	1
<ul style="list-style-type: none"> <li>names two more paths and provides distances</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies shortest path</li> </ul>	1

**Question 5 (b)**

Solution weighted	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies that graph is weighted</li> </ul>	1

**Question 5 (c)**

Solution	
No loops	
No multiple paths between nodes	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies first feature of a simple graph</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies second feature of a simple graph</li> </ul>	1

**Question 6 (a)**

Solution				
Years passed	1	2	3	4
Population	400	340	274	200
Marking key/mathematical behaviours				Marks
<ul style="list-style-type: none"> <li>determines population after 2 years</li> </ul>				1
<ul style="list-style-type: none"> <li>enters given data</li> </ul>				1

**Question 6 (b)**

Solution	
(i) 100	
(ii) increases by 10% each year	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>interprets fixed value in recurrence relation</li> </ul>	1
<ul style="list-style-type: none"> <li>interprets rate in recurrence relation</li> </ul>	1

**Question 6 (c)**

Solution	
$P_{n+1} = 1.1P_n - 20$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies appropriate recurrence relation</li> </ul>	1