

# MATHEMATICS APPLICATIONS

## MAWA Semester 1 (Unit 3) Examination 2017

### 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, 2017**

**Section One: Calculator-free**

**(50 Marks)**

**Question 1**

Solution	
Direction is positive – the dots rise as the number of boats nominated increase. Association is linear, the dots form a pattern around a straight line Strength is very good – nearly in a straight line	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>describes direction and justifies</li> </ul>	2
<ul style="list-style-type: none"> <li>describes form and justifies</li> </ul>	2
<ul style="list-style-type: none"> <li>describes strength and justifies</li> </ul>	2

**Question 2 (a)**

Solution	
2, 5, 12.5	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies second term</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies third term</li> </ul>	1

**Question 2 (b)**

Solution	
30, 10, $3\frac{1}{3}$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies first term, second term and identifies third term</li> </ul>	3

**Question 2 (c)**

Solution	
$T_1 = 994, T_{n+1} = T_n - 7$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies first term</li> </ul>	1
<ul style="list-style-type: none"> <li>expresses recursive rule using recursive notation</li> </ul>	1

**Question 2 (d)**

Solution	
$T_n = 1000 \left(\frac{1}{10}\right)^{n-1}$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>uses notation for the general rule with initial term</li> </ul>	1
<ul style="list-style-type: none"> <li>identifies ratio with power</li> </ul>	1

**Question 3 (a)**

Solution	
4	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies degree of nominated vertex</li> </ul>	1

**Question 3 (b)**

Solution	
RB forms a bridge because the graph would not be connected if RB was removed.	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies RB as a bridge</li> <li>explains connectedness of graph changing without the bridge</li> </ul>	1
	1

**Question 3 (c)**

Solution	
BRHTSWMRS	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies a trail</li> </ul>	1

**Question 3 (d)**

Solution	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>redraws graph in planar form</li> </ul>	1

**Question 3 (e)**

Solution	
$V + f - e = 7 + 3 - 8 = 2$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>substitutes into Euler's rule</li> <li>uses values for <math>v, f, e</math> to match graph</li> </ul>	1
	1

**Question 3 (f)**

Solution	
Yes: Nodes can be divided into two groups (RWT and BMSH) and within each group there is no connection and all edges are from a node in one group to a node in another group.	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies there are 2 groups of nodes hence bipartite</li> </ul>	1
<ul style="list-style-type: none"> <li>explains why nodes can be formed into groups</li> </ul>	1

**Question 4 (a)**

Solution	
Number of internet users per 100 people in the country	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>Identifies the response variable</li> </ul>	1

**Question 4 (b)**

Solution	
$0.4 \times 200 + 3 = 83$	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>Determines value of the subject of the formula</li> </ul>	1

**Question 4 (c)**

Solution	
Not very reliable. Prediction is extrapolated beyond the data given. At the high end the dots are not very close to the line. (correlation coefficient is less than 0.6)	
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>gives 2 reasons to justify the lack of reliability</li> </ul>	2

**Question 4 (d)**

Solution	
With no mobile phones in the population there are still 3 people per 100 using the internet.	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>interprets the vertical intercept</li> </ul>	1

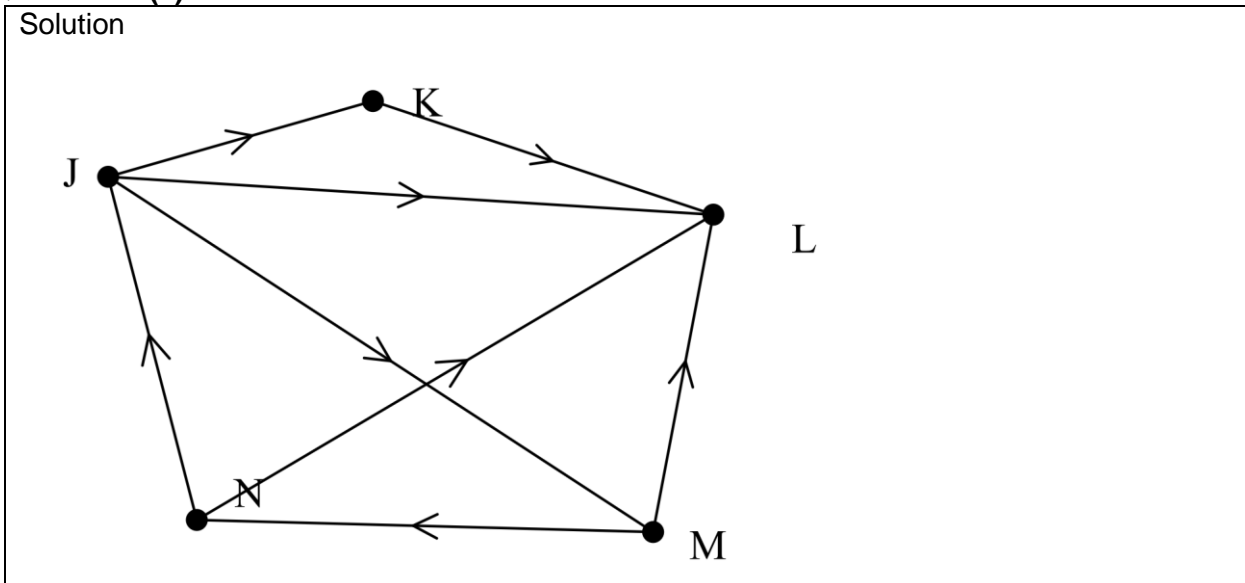
**Question 4 (e)**

Solution	
Positive gradient or rate of change - For every extra mobile phone there is 0.4 extra internet users. (10 for 4)	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>notes a positive trend</li> </ul>	1
<ul style="list-style-type: none"> <li>details the rate of change</li> </ul>	1

**Question 4 (f)**

Solution	
<p>The scatter plot shows a positive correlation between mobile phones (x-axis, 0-200) and internet users (y-axis, 0-90). A line of best fit is drawn through the data points. One point at approximately (140, 8) is circled, indicating it is an outlier below the line.</p>	
There were about 50 less than expected	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>circles point to match description</li> </ul>	1
<ul style="list-style-type: none"> <li>estimates difference using line</li> </ul>	1

**Question 5 (a)**



Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>determines directed edges for Jon</li> </ul>	1
<ul style="list-style-type: none"> <li>determines directed edges for Kay</li> </ul>	1
<ul style="list-style-type: none"> <li>determines directed edges for Min</li> </ul>	1
<ul style="list-style-type: none"> <li>determines directed edges for Nat</li> </ul>	1

**Question 5 (b)**

Solution	
<p style="text-align: center;">J K L M N</p> <p>J    <math>\begin{bmatrix} 0 &amp; 1 &amp; 1 &amp; 1 &amp; 0 \end{bmatrix}</math></p> <p>K    <math>\begin{bmatrix} 0 &amp; 0 &amp; 1 &amp; 0 &amp; 0 \end{bmatrix}</math></p> <p>L    <math>\begin{bmatrix} 0 &amp; 0 &amp; 0 &amp; 0 &amp; 0 \end{bmatrix}</math></p> <p>M    <math>\begin{bmatrix} 0 &amp; 0 &amp; 1 &amp; 0 &amp; 1 \end{bmatrix}</math></p> <p>N    <math>\begin{bmatrix} 1 &amp; 0 &amp; 1 &amp; 0 &amp; 0 \end{bmatrix}</math></p>	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>labels rows and columns</li> </ul>	1
<ul style="list-style-type: none"> <li>0 along the leading diagonal</li> </ul>	1
<ul style="list-style-type: none"> <li>5 x 5 with only 0 or 1</li> </ul>	1
<ul style="list-style-type: none"> <li>1 for wins</li> </ul>	1
<ul style="list-style-type: none"> <li>0 for loss or not player</li> </ul>	1

**Question 6 (a)**

Solution	
<p>Does the use of mobile phones include texting? IS the time spent parked at the lights included in the driving?</p>	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>Devises a question to clarify the task</li> </ul>	1

**Question 6 (b)**

Solution	
<p>Number of calls made your mobile while driving yesterday Number of texts sent from your mobile while driving last Saturday</p>	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"> <li>identifies two numeric variables relevant to the investigation</li> </ul>	2

**Question 6 (c)**

Solution	
<p>Observation – watch people driving and see if they are using their phones Survey – ask drivers Ask police for the data</p>	

Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"><li>identifies 2 ways by which data can be collected.</li></ul>	2

**Question 6 (d)**

Solution	
It is not texting that causes the accident but the loss of concentration on the task in hand It is due to confounding – the other variable (concentration) is affected by the texting	
Marking key/mathematical behaviours	Marks
<ul style="list-style-type: none"><li>identifies confounding</li></ul>	1
<ul style="list-style-type: none"><li>concludes it is not a causal relationship</li></ul>	1