**MATHEMATICS APPLICATIONS**

**MAWA Semester 1 (Unit 3) Examination 2019**

**Calculator-free**

# Marking Key

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**The release date for this exam and marking scheme is 14th June.**

**Section One: Calculator-free (50 Marks)**

**Question 1 (a) (1 marks)**

|  |  |
| --- | --- |
| Solution | |
| Sum of the degrees of the vertices | |
| Marking key/mathematical behaviours | Marks |
| * calculates correct sum value | 1 |

**Question 1 (b) (1 marks)**

|  |  |
| --- | --- |
| Solution |  |
| Edge and |  |
| Marking key/mathematical behaviours | Marks |
| * correctly identifies BOTH edges that form a bridge | 1 |

**Question 1 (c) (2 marks)**

|  |  |
| --- | --- |
| Solution |  |
| or vice versa |  |
| Marking key/mathematical behaviours | Marks |
| * identifies a walk with 5 edges * given walk contains a cycle | 1  1 |

**Question 1 (d) (3 marks)**

|  |  |
| --- | --- |
| Solution |  |
|  |  |
| Marking key/mathematical behaviours | Marks |
| * correctly identifies TWO groups as and * correctly draws at least 4 edges * correctly draws all edges | 1  1  1 |

**Question 2 (a) (1 mark)**

|  |  |
| --- | --- |
| Solution | |
| Rate how well you like Company ABC’s new website using the categories  VWL: very well liked, WL: well liked, S: satisfactory, UL: un-liked, VUL: very un-liked | |
| Marking key/mathematical behaviours | Marks |
| * asks respondents to rate the website and provides an appropriate scale | 1 |

**Question 2 (b) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Marking key/mathematical behaviours | Marks |
| * one mark for each correct answer provided | 1+1+1 |

**Question 2 (c) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
| 1. Samples Y produced a proportionally consistent rating of satisfactory, both of around 30%, while the two X samples produced proportionally more varied ratings of satisfactory. 2. Samples Y both produced combined ratings of VWL, WL and S that were higher than the combined rating of the same 3 categories for the two X samples. | |
| Marking key/mathematical behaviours | Marks |
| * identifies that the Y samples both produce roughly the same proportion of rating S, while the X samples are more varied. * identifies the ‘combined ratings’ as the sum of the three * states that the Y samples produce the higher ratings | 1  1  1 |

**Question 2 (d) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| Yes  Because both of the Y samples produce roughly the same proportion of responses for each category, where as the sample X responses are not proportionally consistent. | |
| Marking key/mathematical behaviours | Marks |
| * states, Yes * refers to proportional consistency (or equivalent idea, however expressed) | 1  1 |

**Question 3 (a) (4 marks)**

|  |  |
| --- | --- |
| Solution | |
| 1. Graphs 1 and 3 2. Graph 3 3. Graph 2 is a digraph. Digraphs can be identified by the lack of symmetry across the leading diagonal. | |
| Marking key/mathematical behaviours | Marks |
| * identifies BOTH graphs containing loop * identifies graph 3 having the isolated vertex * identifies Graph 2 as a digraph * refers to no symmetry AND leading diagonal | 1  1  1  1 |

**Question 3 (b) (5 marks)**

|  |  |
| --- | --- |
| Solution | |
| 2. This network is traversable as it has exactly two odd vertices. | |
| Marking key/mathematical behaviours | Marks |
| * draws network with 5 vertices * correctly draws at least 3 vertices with correct order value * correctly draws all vertices with correct order value * states network is traversable * refers to EXACTLY two odd vertices in justification | 1  1  1  1  1 |

**Question 4 (a) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
| is an integer  1 is a term of the sequence and it is the seventh term | |
| Marking key/mathematical behaviours | Marks |
| * substitutes 1 into the formula * rearranges and solves the equation for *n* * states | 1  1  1 |

**Question 4 (b)** **(3 marks)**

|  |  |
| --- | --- |
| Solution | |
| -----  -----  results in  and  Hence, | |
| Marking key/mathematical behaviours | Marks |
| * uses  and  to form two equations * solves the two simultaneous equations correctly for “a” and “d” values * states the nth term correctly | 1  1  1 |

**Question 5 (a) (3 marks)**

|  |  |
| --- | --- |
| Solution | |
| The relationship is a strong linear and positive one.  The trend line provided appears to be a ‘good fit’ and the coefficient of determination of 0.6567 implies a correlation coefficient of ~ 0.8 which is quite strong. | |
| Marking key/mathematical behaviours | Marks |
| * uses at least two of the words the words, linear, strong and positive * refers to the coefficient of determination (R2) * states and refers to the correlation coefficient of ~ 0.8 | 1  1  1 |

**Question 5 (b) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| 2013-14  Suburb A recorded 1819 crimes while Suburb B recorded 8616.  Suburb B had a significantly higher number of crimes than would have been expected based on the more highly correlated relationship of the other years. | |
| Marking key/mathematical behaviours | Marks |
| * identifies the correct year * provides a plausible interpretation | 1  1 |

**Question 5 (c) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| The best estimate is 0.8  Since |  |
| Marking key/mathematical behaviours | Marks |
| * selects the correct estimate * uses the coefficient of determination correctly to justify the selection | 1  1 |

**Question 5 (d) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| The number of crimes in suburb B | |
| Marking key/mathematical behaviours | Marks |
| * applies the provided linear prediction formula correctly * calculates the correct result, rounding appropriately * if uses the graph to give a rough estimate – allow 1 mark only (for a reasonable predicted figure) | 1  1 |

**Question 5 (e) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| Low reliability, because while it is interpolation in terms of the range of crime figures known, it is a prediction into the future and other unknown and possibly confounding factors could have played a part in influencing the crime numbers in Suburb B. | |
| Marking key/mathematical behaviours | Marks |
| * states that the prediction is questionable or has low reliability * provides a plausible explanation, consistent with answer about the reliability | 1  1 |

**Question 6 (a) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| Substitute into  resulting in    i.e. | |
| Marking key/mathematical behaviours | Marks |
| * substitutes into * solves for correct “r” value of 1.1 | 1  1 |

**Question 6 (b) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
| Increasing exponentially | |
| Marking key/mathematical behaviours | Marks |
| * identifies increasing * identifies increasing exponentially | 1  1 |

**Question 6 (c) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Marking key/mathematical behaviours | Marks |
| * calculates correct values for  and * plots the data points correctly on graph | 1  1 |

**Question 6 (d) (2 marks)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Marking key/mathematical behaviours | Marks |
| * states the correct recurrence relation * states the value of | 1  1 |