**MATHEMATICS APPLICATIONS**

**MAWA Semester 1 (Unit 3) Examination 2018**

**Calculator-Assumed**

# Marking Key

© MAWA, 2018

**Licence Agreement**

This examination is Copyright but may be freely used within the school that purchases this licence.

* The items that are contained in this examination are to be used solely in the school for which they are purchased.
* They are not to be shared in any manner with a school which has not purchased their own licence.
* The items and the solutions/marking keys are to be kept confidentially and not copied or made available to anyone who is not a teacher at the school. Teachers may give feedback to students in the form of showing them how the work is marked but students are not to retain a copy of the paper or marking guide until the agreed release date stipulated in the purchasing agreement/licence.

The release date for this exam and marking scheme is

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

**Section Two: Calculator-assumed (100 Marks)**

**Question 7 (a)**

|  |
| --- |
| SolutionAs population increases so does the number of people migrating overseas |
| Marking key/mathematical behaviours | Marks |
| * describes the association
 | 1 |

**Question 7 (b)**

|  |
| --- |
| SolutionIt is possible but unlikely as an increase in population does not cause migration. Association does not guarantee causality. |
| Marking key/mathematical behaviours | Marks |
| * concludes correctly
* explains role of causality
 | 11 |

**Question 7 (c)**

|  |
| --- |
| SolutionConfounding – both of these variables are influenced by / associated with another variable which has a similar effect on both of these variables. These two variables may be responding to the current population with each state. |
| Marking key/mathematical behaviours | Marks |
| * explains confounding
* identifies another variable
 | 11 |

**Question 8 (a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * determines recurrence growth
* identifies first term
 | 11 |

**Question 8 (b)**

|  |
| --- |
| Solution20 = 10 + 25 x 0.4 So at the end of the 26th week |
| Marking key/mathematical behaviours | Marks |
| * determines equation to solve / lists terms of the sequence
* determines term number
 | 11 |

**Question 8 (c)**

|  |
| --- |
| SolutionKlind. Growth is at 0.8 km per week but in Fland it is 0.4 km per week |
| Marking key/mathematical behaviours | Marks |
| * identifies sequence with fastest rate
* explains conclusion
 | 11 |

**Question 8 (d)**

|  |
| --- |
| Solution4 + 0.8*n* = 9.6 + 0.4 *n* 🡪 *n* = 14OR10 10.4 10.8 11.2 11.6 12.0 12.4 12.8 13.2 13.6 14.0 14.4 14.8 15.24.8 5.6 6.4 7.2 8.0 8.8 9.6 10.4 11.2 12.0 12.8 13.6 14.4 15.2 |
| Marking key/mathematical behaviours | Marks |
| * determines term number
* justifies conclusion
 | 11 |

**Question 9 (a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * marks all routes
* correct markings on 2-way routes
* correct markings on one-way routes
 | 111 |

**Question 9 (b)**

|  |
| --- |
| SolutionNF is a bridge – without it the netball centre is not connected |
| Marking key/mathematical behaviours | Marks |
| * identifies bridge
* explains selection
 | 11 |

**Question 9 (c)**

|  |
| --- |
| SolutionYes – because it can be drawn without paths crossing |
| Marking key/mathematical behaviours | Marks |
| * correctly concludes
* explains conclusions
 | 11 |

**Question 10 (a)**

|  |
| --- |
| SolutionPositive, strong, linear |
| Marking key/mathematical behaviours | Marks |
| * describes relationship as strong
* describes relationship as approaching linear
* describes relationship as positive
 | 111 |

**Question 10 (b)**

|  |
| --- |
| Solutionresponse |
| Marking key/mathematical behaviours | Marks |
| * identifies response variable
 | 1 |

**Question 10 (c)(i)(ii)**

|  |
| --- |
| SolutionWBGT = 0.62 x AT + 6.15*r*=0.9258 |
| Marking key/mathematical behaviours | Marks |
| * identifies gradient and intercept
* expresses relationship as linear with correct variables
* identifies correlation coefficient
 | 111 |

**Question 10 (d)**

|  |
| --- |
| Solution0.62 x 25 + 6.15 = 21.7 |
| Marking key/mathematical behaviours | Marks |
| * uses relationship to predict temperature
 | 1 |

**Question 10 (e)**

|  |
| --- |
| SolutionFairly reliable- correlation coefficient is close to 1- uses interpolation |
| Marking key/mathematical behaviours | Marks |
| * concludes correctly
* gives first reason for conclusion
* gives second reason for conclusion
 | 111 |

**Question 10 (f)**

|  |
| --- |
| Solution(i) smaller(ii) smaller |
| Marking key/mathematical behaviours | Marks |
| * selects best option for change in correlation coefficient
* selects best option for change in gradient
 | 11 |

**Question 11 (a)**

|  |
| --- |
| Solution Decreasing exponential |
| Marking key/mathematical behaviours | Marks |
| * identifies decreasing
* identifies type of decreasing
 | 11 |

**Question 11 (b)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | 1980 | 1990 | 2000 | 2010 | 2020 |
| Population | 1000 | 800 | 640 | 512 | 410 |

 |
| Marking key/mathematical behaviours | Marks |
| * enters 3 correct values
* enters a further 2 correct values
 | 11 |

**Question 11 (c)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * correctly plots three values
* correctly plots further two values
 | 11 |

**Question 11 (d)**

|  |
| --- |
| Solution*n* = 18 so 2160 |
| Marking key/mathematical behaviours | Marks |
| * determines which term
* states value of term
 | 11 |

**Question 11 (e)**

|  |
| --- |
| Solution(i) rhinos(ii) rhinos(iii) both |
| Marking key/mathematical behaviours | Marks |
| * identifies faster rate
* identifies difference in terms
* identifies geometric sequences
 | 111 |

**Question 12 (a)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution(i) They can all be drawn in the plane without any edges crossing(ii)

|  |  |  |  |
| --- | --- | --- | --- |
| Number of vertices(*v*) | Number of edges(*e*) | Number of faces(*f*) | *v* + *f* - *e* |
| 5 | 4 | 1 | 2 |
| 5 | 5 | 2 | 2 |
| 5 | 5 | 2 | 2 |
| 5 | 6 | 3 | 2 |
| 5 | 7 | 4 | 2 |
| 5 | 8 | 5 | 2 |

 |
| Marking key/mathematical behaviours | Marks |
| * describes planarity
* completes first column with given data
* completes last column
* determines number of edges in each graph
* determines number of internal faces
* includes external faces
 | 111111 |

**Question 12 (b)**

|  |
| --- |
| Solution(i) multiple edges from W to G OR M to G(ii) G(iii) |
| Marking key/mathematical behaviours | Marks |
| * identifies multiple edges between two nodes
* identifies vertex with highest degree
* redrawn with same number of vertices
* redrawn with same number of edges
* redrawn so no edges cross
 | 11111 |

**Question 13 (a)**

|  |
| --- |
| Solution420 |
| Marking key/mathematical behaviours | Marks |
| * determines total in column / row
 | 1 |

**Question 13 (b)**

|  |
| --- |
| SolutionDog ownershipgender |
| Marking key/mathematical behaviours | Marks |
| * identifies one categorical variable
* identifies second categorical variable
 | 11 |

**Question 13 (c)**

|  |
| --- |
| Solution35% 15% 50% |
| Marking key/mathematical behaviours | Marks |
| * determines correct percentages
* rounds to the nearest integer
 | 11 |

**Question 13 (d)**

|  |
| --- |
| SolutionMales favoured Option 3 whereas females favoured Option 1The least favoured options for males (or females) was Option 2 at 15% or 20% and this was lower than for other options selected by males |
| Marking key/mathematical behaviours | Marks |
| * describes one association
* provides data from the table to support description
 | 11 |

**Question 13 (e)**

|  |
| --- |
| SolutionComparisons can only be made when the values are comparable eg percentagesCannot compare the numbers when the totals are different |
| Marking key/mathematical behaviours | Marks |
| * describes ability to compare values
 | 1 |

**Question 14 (a)**

|  |
| --- |
| Solutionarithmetic |
| Marking key/mathematical behaviours | Marks |
| * identifies pattern in arithmetic sequence
 | 1 |

**Question 14 (b)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * identifies starting value and increasing amount
* determines an expression to show arithmetic sequence
 | 11 |

**Question 14 (c)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * substitutes into rule
* determines 10th term
 | 11 |

**Question 14 (d)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * determines recurrence relation
 | 1 |

**Question 14 (e)**

|  |
| --- |
| SolutionUsing table function on CAS, sequence = 98.8 when *n* = 63 and 100.2 when *n* = 64 So *n* = 64 |
| Marking key/mathematical behaviours | Marks |
| * provides evidence of attempt to solve equation
* presents *n* as an integer
 | 11 |

**Question 14 (f)**

|  |
| --- |
| SolutionB is increasing faster than A. At *n* = 16, A is 33 and B is 32.548. This is as close as they get |
| Marking key/mathematical behaviours | Marks |
| * identifies term number 16
* justifies by providing values or list of values
 | 11 |

**Question 15 (a)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * marks given route
 | 1 |

**Question 15 (b)**

|  |
| --- |
| SolutionNo. Vertex C is not linked to G |
| Marking key/mathematical behaviours | Marks |
| * determines correct conclusion
* justifies conclusion
 | 11 |

**Question 15 (c)**

|  |
| --- |
| SolutionStarts and ends at the same vertexNo repeated edgesNo repeated vertices |
| Marking key/mathematical behaviours | Marks |
| * identifies first reason
* identifies second reason
* identifies third reason
 | 111 |

**Question 15 (d)**

|  |
| --- |
| SolutionHamiltonian |
| Marking key/mathematical behaviours | Marks |
| * identifies cycle is Hamiltonian
 | 1 |

**Question 15 (e)**

|  |
| --- |
| Solution10 (edges) |
| Marking key/mathematical behaviours | Marks |
| * identifies length of cycle
 | 1 |

**Question 15 (f)**

|  |
| --- |
| SolutionCPMNTWBGKSC |
| Marking key/mathematical behaviours | Marks |
| * names another route
* shows route on diagram
 | 11 |

**Question 16 (a)**

|  |
| --- |
| SolutionNo edges are repeatedStarts and finishes at different vertices |
| Marking key/mathematical behaviours | Marks |
| * identifies feature of trail
* identifies feature of being open
 | 11 |

**Question 16 (b)**

|  |
| --- |
| SolutionQHYQGPRHBRZBGZ |
| Marking key/mathematical behaviours | Marks |
| * starts and finishes at an odd vertex
* all edges covered once only
* all destinations visited
 | 111 |

**Question 16 (c)**

|  |
| --- |
| SolutionSemi- eulerianIt has a open trail – every edge is included and the trail finishes at a vertex other than the starting vertex |
| Marking key/mathematical behaviours | Marks |
| * concludes graph is semi-eulerian
* identifies open
* identifies trail
 | 111 |

**Question 16 (d)**

|  |
| --- |
| SolutionVertex must have an even degree |
| Marking key/mathematical behaviours | Marks |
| * identifies conditions for an additional vertex
 | 1 |

**Question 17 (a)**

|  |
| --- |
| Solution99.27 |
| Marking key/mathematical behaviours | Marks |
| * interprets the coefficient of determination
 | 1 |

**Question 17 (b)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Residuals | -11 | -10 | -5 | 8 | 12 | 21 | -1 | -14 |

 |
| Marking key/mathematical behaviours | Marks |
| * uses cost – predicted cost
* determines residuals
 | 11 |

**Question 17 (c)**

|  |
| --- |
| Solution |
| Marking key/mathematical behaviours | Marks |
| * scales horizontal axis
* scales vertical axis
* plots 4 correct values
* plots another 4 correct values
 | 1111 |

**Question 17 (d)**

|  |
| --- |
| SolutionResiduals are randomly scattered around the x-axis |
| Marking key/mathematical behaviours | Marks |
| * identifies condition for linear relationship
 | 1 |