**MATHEMATICS APPLICATIONS**

**MAWA Semester 2 (Units 3 & 4)**

**Examination 2018**

**Calculator-free**

# Marking Key

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

**Question 1 (a)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * labels both axes accurately * plots first four points * plots further two points | 1  1  1 |

**Question 1 (b)**

|  |  |
| --- | --- |
| Solution  *Pn= -6n + 24* or *Pn= -6(n - 1) + 18* | |
| Marking key/mathematical behaviours | Marks |
| * uses the correct format in the expression for the *nth* term * identifies rate of change | 1  1 |

**Question 1 (c)**

|  |  |
| --- | --- |
| Solution  *Pn= -6n + 24* or *Pn= -6(n - 1) + 18*  -400 = *-6n + 24*  -424 = *-6n*  *n* = 70.7 so 71st term which is -402 | |
| Marking key/mathematical behaviours | Marks |
| * creates a statement of equivalence * solves for *n* * identifies value of first term less than -400 | 1  1  1 |

**Question 2 (a)**

|  |  |
| --- | --- |
| Solution  (i) 7  (ii) 15 | |
| Marking key/mathematical behaviours | Marks |
| * identifies number of vertices * identifies number of edges | 1  1 |

**Question 2 (b)**

|  |  |
| --- | --- |
| Solution  No. It cannot be drawn without the edges crossing | |
| Marking key/mathematical behaviours | Marks |
| * identifies if graph is planar * justifies decision | 1  1 |

**Question 2 (c)**

|  |  |
| --- | --- |
| Solution  It is simple because there are no loops or multiple edges  It is connected because all vertices are linked – there are no isolated vertices | |
| Marking key/mathematical behaviours | Marks |
| * describes why graph is simple * describes why graph is connected | 1  1 |

**Question 2 (d)**

|  |  |
| --- | --- |
| Solution  DCPLWNSD 39 km or DCNPLWSD 33 km or DCLPWNSD 50 km  (other options also exist) | |
| Marking key/mathematical behaviours | Marks |
| * identifies a route to fit description * determines length of route | 1  1 |

**Question 2 (e)**

|  |  |
| --- | --- |
| Solution  Hamiltonian cycle | |
| Marking key/mathematical behaviours | Marks |
| * identifies a Hamiltonian cycle | 1 |

**Question 2 (f)**

|  |  |
| --- | --- |
| Solution  DNPCLWSD | |
| Marking key/mathematical behaviours | Marks |
| * identifies a route to fit description | 1 |

**Question 3 (a)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * all connections between nodes completed * 10 edges correctly weighted * further 4 edges correctly weighted | 1  1  1 |

**Question 3 (b)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * displays information in matrix form | 1 |

**Question 3 (c)**

|  |  |
| --- | --- |
| Solution  Lucy on Wednesday Ron on Thursday Jed on Friday  Barb on Saturday Mark on Sunday  18 hours | |
| Marking key/mathematical behaviours | Marks |
| * schedules three people correctly * schedules further two people correctly * identifies maximum number of hours | 1  1  1 |

**Question 3 (d)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution  Take all numbers from the maximum number in the table   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Wednesday | Thursday | Friday | Saturday | | Rachel | 10 | 10 | 15 | 0 | | Nick | 15 | 5 | 20 | 10 | | Penny | 10 | 5 | 0 | 15 | | Sue | 0 | 5 | 15 | 10 |     In each row take the smallest number from each number.   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | Wednesday | Thursday | Friday | Saturday | | Rachel | 10 | 10 | 15 | 0 | | Nick | 10 | 0 | 15 | 5 | | Penny | 10 | 5 | 0 | 15 | | Sue | 0 | 5 | 15 | 10 |     Assignment is now possible when to cross out all the zeros 4 lines are needed. Assign where there is a zero next to the name,   * Rachel on Saturday 30 * Nick on Thursday 25 * Penny on Friday 30 * Sue on Wednesday 30   Total = 115 cupcakes | |
| Marking key/mathematical behaviours | Marks |
| * Takes all numbers from the maximum number in the table * In each row takes the smallest number from each number. * Justifies assignment is possible | 1  1  1 |

**Question 4 (a)**

|  |  |
| --- | --- |
| Solution  *Vn* + 1 = 1.06*Vn*  , *V*0 = 8000 where *Vn* represents value and *n* = number of years passed | |
| Marking key/mathematical behaviours | Marks |
| * determines first term * uses correct format for rules * determines ratio | 1  1  1 |

**Question 4 (b)**

|  |  |
| --- | --- |
| Solution  (i) $24 000  (ii) *Vn* = 8000 (1.08)*n* where *Vn* represents value and *n* = number of years passed | |
| Marking key/mathematical behaviours | Marks |
| * identifies expected value * uses correct format * identifies starting value and rate | 1  1  1 |

**Question 4 (c)(d)**

|  |  |
| --- | --- |
| Solution  (c) Monthly rate = 0.06 ÷ 12 = 0.005  (d) increase of $500 | |
| Marking key/mathematical behaviours | Marks |
| * identifies monthly interest rate * identifies approximate change in investment * specifies the change is a growth | 1  1  1 |

**Question 4 (e)**

|  |  |
| --- | --- |
| Solution | |
| Marking key/mathematical behaviours | Marks |
| * uses the same starting value * similar type of graph * steeper rate of growth and ends above $24000 | 1  1  1 |

**Question 5 (a)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Solution   |  |  |  |  | | --- | --- | --- | --- | |  | **Percentages** | | | | **Preferred sport** | | | | **Area where worker located** | Football | Cricket | Netball | | Office | 16 | 64 | 20 | | Grounds | 20 | 60 | 20 | | Deliveries | 30 | 50 | 20 | | |
| Marking key/mathematical behaviours | Marks |
| * calculates percentages for office workers * calculates percentages for delivery workers | 1  1 |

**Question 5 (b)**

|  |  |
| --- | --- |
| Solution  Sport preferred | |
| Marking key/mathematical behaviours | Marks |
| * identifies response variable | 1 |

**Question 5 (c)**

|  |  |
| --- | --- |
| Solution  Regardless of where the worker is located, the majority prefer to watch cricket  There is at least 50% in each category  OR  The percentage preferring netball is the same regardless of where the worker is located. It is 20% in each category | |
| Marking key/mathematical behaviours | Marks |
| * describes the association * uses data from the table to justify conclusion | 1  1 |

**Question 6 (a)**

|  |  |
| --- | --- |
| Solution    40+10+20+20+40+30+30+50 = 240 km | |
| Marking key/mathematical behaviours | Marks |
| * identifies all correct connections * only includes correct connections * determines length of minimum spanning tree | 1  1  1 |

**Question 6 (b)**

|  |  |
| --- | --- |
| Solution    The tree is the same except road BW is not included  Extra $60 million cost | |
| Marking key/mathematical behaviours | Marks |
| * identifies change to minimum spanning tree * identifies change in cost | 1  1 |