MATHEMATICS APPLICATIONS

MAWA Semester 2 (Units 3 & 4) Examination 2016

Calculator-free

Marking Key

The release date for this exam and marking scheme is

- **the end of week 1 of term 4, 2016**

Section One: Calculator-free (51 Marks)

Question 1 (a)

Solution

Time	Start 9 am	10 am	11 am	noon
Luca	20	31	42	53
Mila	30	38	46	54

Marking key/mathematical behaviours	Marks
• accurately completes pattern for Luca	1
• accurately completes pattern for Mila	1

Question 1 (b)

Solution

$L_0 = 20, L_{n+1} = L_n + 11$

Marking key/mathematical behaviours	Marks
• identifies initial term	1
• identifies recurrence relation	1

Question 1 (c)

Solution

$M_n = 22 + 8n$

Marking key/mathematical behaviours	Marks
• identifies correct “gradient”	1
• expresses rules correctly in linear format	1

Question 1 (d)

Solution

$M_n = 22 + 8n = 22 + 8 \times 12 = 118$

Marking key/mathematical behaviours	Marks
• determines correct expression using rule identified	1

Question 2 (a)

Solution

	Monday	Tuesday	Wednesday
Jean	3	5	2
Ray	2	4	3
Mario	4	5	1

Marking key/mathematical behaviours	Marks
• creates table to represent assignment data	1

Question 2 (b)

Solution

$$\begin{array}{c} \\ Jean \\ Ray \\ Mario \end{array} \begin{array}{c} \begin{array}{ccc} M & T & W \end{array} \\ \begin{bmatrix} 3 & 5 & 2 \\ 2 & 4 & 3 \\ 4 & 5 & 1 \end{bmatrix} \end{array}$$

Marking key/mathematical behaviours	Marks
• creates labelled matrix to represent assignment data	1

Question 2 (c)

Solution

Jean for Tuesday, Ray for Wednesday and Mario for Monday [12 hours]

Marking key/mathematical behaviours	Marks
• determines optimum assignment by inspection	1

Question 2 (d)

Solution

Every number was subtracted from 7

Marking key/mathematical behaviours	Marks
• identifies calculation used	1

Question 2 (e)

Solution

In each row the smallest number was subtracted from each number in the row

Marking key/mathematical behaviours	Marks
• identifies calculation used	1

Question 2 (f)

Solution

Where the optimum allocation is to be located. The intersection of the person and the day represents the solution

Marking key/mathematical behaviours	Marks
• interprets process in use of Hungarian algorithm	1

Question 2 (g)

Solution

Ned on Friday, Mary on Monday, Sue on Tuesday, Eva on Wednesday, Jon on Thursday OR
Ned on Friday, Mary on Monday, Sue on Tuesday, Eva on Thursday, Jon on Wednesday
31 hours

Marking key/mathematical behaviours	Marks
• determines optimum assignment	1
• describes first solution	1
• describes second solution	1

Question 3 (a)

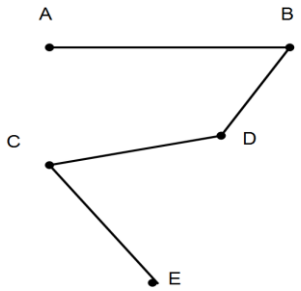
Solution

Edges in minimum spanning tree: AB = 11m BD = 12m DC = 10m CE = 8m
41 metres needed

Marking key/mathematical behaviours	Marks
• determines 2 correct sections	1
• determines 2 more correct connections	1
• determines total minimum	1

Question 3 (b)

Solution



Marking key/mathematical behaviours	Marks
• draws 2 correct edges	1
• draws other 2 correct edges	1

Question 3 (c)

Solution

Network drawn is a connected graph with all edges different, each vertex visited only once

Marking key/mathematical behaviours	Marks
• identifies 2 conditions	1
• identifies 3rd condition	1

Question 4 (a)

Solution $6000	
Marking key/mathematical behaviours	Marks
• reads investment graph	1

Question 4 (b)

Solution $6850	
Marking key/mathematical behaviours	Marks
• reads investment graph	1

Question 4 (c)

Solution monthly	
Marking key/mathematical behaviours	Marks
• reads investment graph	1

Question 4 (d)

Solution $P_1=6000, P_{n+1} = P_n \times (1 + 0.045 \div 12)$	
Marking key/mathematical behaviours	Marks
• identifies first term (or any other)	1
• determines correct interest rate	1
• identifies recurrence relation	1

Question 4 (e)

Solution (i) exponential (ii) The growth is a rate not a fixed amount (iii) The increasing growth is too small to be noticed on a graph with a very small scale.	
Marking key/mathematical behaviours	Marks
• identifies type of relationship	1
• explains lack of constant growth	1
• identifies small amount of growth	1

Question 5 (a)

Solution 4	
Marking key/mathematical behaviours	Marks
• reads time series graph	1

Question 5 (b)

Solution 700	
Marking key/mathematical behaviours	Marks
• reads time series graph	1

Question 5 (c)

Solution (i) 900 (ii) July 2011 to October 2011	
Marking key/mathematical behaviours	Marks
• reads pattern in time series graph	1
• interprets scale on horizontal axis	1

Question 5 (d)

Solution July 2009	
Marking key/mathematical behaviours	Marks
• interprets data point on time series graph	1

Question 5 (e)

Solution Removing the outlier allows the calculation to be more typical of what normally occurs	
Marking key/mathematical behaviours	Marks
• explains outlier's effect on calculations	1

Question 5 (f)

Solution The owners may have been away in January of that particular year	
Marking key/mathematical behaviours	Marks
• links percentage to drop in consumption	1

Question 5 (g)

Solution	
Divide the consumption for the January by the average for each season of that year	
Marking key/mathematical behaviours	Marks
• describes method of calculation	1

Question 5 (h)

Solution	
April Has the lowest seasonal index AND it is the lowest point on the graph in each cycle	
Marking key/mathematical behaviours	Marks
• identifies period for minimum consumption	1
• gives reason to justify choice	1
• gives second reason to justify choice	1

Question 6 (a)

Solution	
The repayments are less than the interest charged	
Marking key/mathematical behaviours	Marks
• explains increasing loan value	1

Question 6 (b)

Solution	
$2000	
Marking key/mathematical behaviours	Marks
• reads investment graph	1

Question 6 (c)

Solution

Change to feature of the loan	**Letter**
An increased amount is borrowed	D
An increase in the rate at which interest is charged on the loan	B
An increase in the size of the repayments	A
An increase in the frequency of compounding	C
An increase in the time taken to pay off the loan	D, B
An increase in the overall amount paid back	D, B

Marking key/mathematical behaviours	Marks
• selects graphs showing each of the 6 features described	6