MATHEMATICS APPLICATIONS

MAWA Semester 1 (Unit 3) Examination 2016

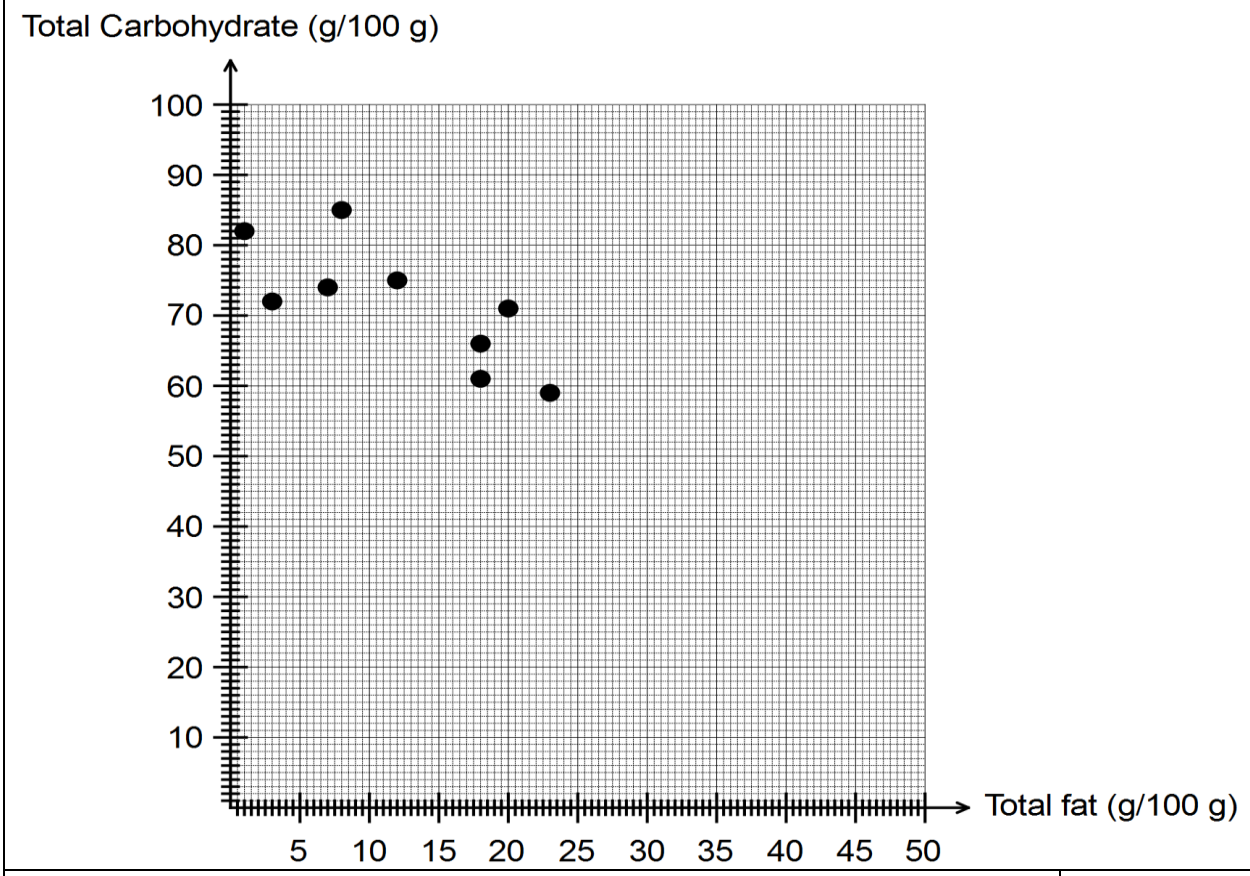
Calculator-Assumed

Marking Key

Section Two: Calculator-assumed (100 Marks)

Question 7 (a)

Solution



Marking key/mathematical behaviours	Marks
• allocates total fat to horizontal axis	1
• labels both axes with correct variables	1
• scales both axes accurately	1
• selects correct type of graph	1
• plots any 5 points correctly	1
• plots remaining 4 points correctly	1

Question 7 (b)

Solution

(i) Total carbohydrate = -0.849 x total fat + 82.048
(ii) r = -0.77

Marking key/mathematical behaviours	Marks
• determines gradient and intercept on vertical axis for regression line	1
• identifies variables in regression line	1
• determines correlation coefficient	1

Question 7 (c)

Solution

Total carbohydrate = -0.849 x total fat + 82.048 = -0.849 x 30 + 83.048 = 57.6 g per 100 g

Marking key/mathematical behaviours	Marks
• substitutes correctly into equation of line from (b)	1
• determines total carbohydrate	1

Question 7 (d)

Solution

Prediction is fairly reliable. It is made from within the data set – ie interpolated AND the correlation coefficient is much nearer -1 than 0

Marking key/mathematical behaviours	Marks
• identifies strength of the prediction	1
• gives one reason to justify prediction	1
• gives second reason to justify prediction	1

Question 8 (a)

Solution

7%

Marking key/mathematical behaviours	Marks
• states the correct percentage	1

Question 8 (b)

Solution

Year	2012	2013	2014	2015	2017	2018
Number of tigers	427	457	489	523	599	641

Marking key/mathematical behaviours	Marks
• determines correct year for population of 641	1
• determines another two entries	1
• determines another two entries	1

Question 8 (c) (i)

Solution

$P = 427 \times 1.07^{(n-1)}$

Marking key/mathematical behaviours	Marks
• expresses rule in correct format with correct starting term	1
• uses correct factor of $1.07^{(n-1)}$ in rule	1

Question 8 (c) (ii)

Solution	
$P = 427 \times (1.07)^8$ =686	
Marking key/mathematical behaviours	Marks
• identifies correct term	1
• determines correct population	1

Question 8 (d)

Solution	
No because the difference between the annual populations is not constant	
Marking key/mathematical behaviours	Marks
• concludes correctly	1
• justifies conclusion	1

Question 8 (e)

Solution	
For 2022, n =11 $P_{11} = 427 \times (1.07)^{10}$ = 839	
Marking key/mathematical behaviours	Marks
• identifies correct term n = 11	1
• determines population	1

Question 8 (f)

Solution	
$P_?$ >= 1000 ? = 14 2025	
Marking key/mathematical behaviours	Marks
• identifies procedure to solve problem	1
• determines correct year	1

Question 8 (g)

Solution	
The population will reach the target before 2025 (earlier) There is an increase in the rate of growth	
Marking key/mathematical behaviours	Marks
• identifies earlier time	1
• describes faster growth	1

Question 9 (a)

Solution	
EFGB (23), EFDGB (21), EACB (20) Quickest route is E A C B. Time taken is 20 minutes.	
Marking key/mathematical behaviours	Marks
• identifies edges for quickest route	1
• determines time taken	1
• shows a method for solution	1

Question 9 (b)

Solution	
Jane's route: via F is E F D G B	
Marking key/mathematical behaviours	Marks
• identifies initial edge and finishing point	1
• identifies edges for quickest route from F to B	1

Question 9 (c)

Solution	
Time taken via F = 21 minutes walking + 5 minutes at florist = 26 minutes. 26 mins – 20 mins = 6 minutes. Jane's journey took 6 minutes longer.	
Marking key/mathematical behaviours	Marks
• determines time taken via F	1
• determines difference in times	1

Question 9 (d)

Solution	
EFDGBCA Visiting every intersection to check traffic lights working.	
Marking key/mathematical behaviours	Marks
• identifies Hamiltonian path	1
• identifies practical use of Hamiltonian path	1

Question 10 (a)

Solution Survey more people OR Survey a greater variety of people	
Marking key/mathematical behaviours	Marks
• suggests improvement for data collection	1

Question 10 (b)

Solution How many hours did you spend driving a car before you sat the Practical Driving Assessment?	
Marking key/mathematical behaviours	Marks
• determines an appropriate survey question	1

Question 10 (c)

Solution Collect data to the nearest hour Collect data from more people Get the students to keep a driving log Collect data from a greater range of students	
Marking key/mathematical behaviours	Marks
• identifies two ways to improve the data collection	2

Question 10 (d)

Solution The mode is 30 and so is the median. Thirty hours is a typical time for these students to spend on driving before sitting the PDA. The maximum score was 50, this is the most number of hours any student spent driving before the PDA. The minimum number of hours of driving before the PDA was 25 – it is the lowest score.	
Marking key/mathematical behaviours	Marks
• interprets the frequency table provided, drawing conclusions and uses data to justify these conclusions.	2 2

Question 11 (a)

Solution Falling at 1.5% per year	
Marking key/mathematical behaviours	Marks
• identifies rate of decline	1

Question 11 (b)

Solution The population change is classified as exponential decay.	
Marking key/mathematical behaviours	Marks
• identifies decay or negative change	1
• identifies the change is exponential	1

Question 11 (c)

Solution 242 000	
Marking key/mathematical behaviours	Marks
• identifies first term	1

Question 11 (d)

Solution The 7^{th} term is $242 \times 0.985^{6} = 221\ 020$	
Marking key/mathematical behaviours	Marks
• determines 7^{th} term	1

Question 11 (e)

Solution June 30, 2028	
Marking key/mathematical behaviours	Marks
• identifies recording at the end of June	1
• determines correct year	1

Question 11 (f)

Solution

Date	No pigs imported	5000 pigs imported each year after 2015
30 Jun 2015	242 000	242 000
30 Jun 2016	238 370	243 370
30 Jun 2017	234 794	244 719
Linear recurrence relation	$P_0 = 242\,000$ $P_{n+1} = 0.985\,P_n$	$P_0 = 242\,000$ $P_{n+1} = 0.985\,P_n + 5$

Marking key/mathematical behaviours	Marks
• enters number of pigs for first option	1
• enters number of pigs for second option	1
• identifies linear recurrence relation for first option	1
• identifies linear recurrence relation for second option	1

Question 12 (a)

Solution

A = 100 – 4 – 21.1 – 47.9 = 27 or 27%

Marking key/mathematical behaviours	Marks
• determines remaining percentage	1

Question 12 (b)

Solution

Data have been rounded

Marking key/mathematical behaviours	Marks
• identifies cause of incorrect total	1

Question 12 (c)

Solution

Shopping

Marking key/mathematical behaviours	Marks
• interprets data in table	1

Question 12 (d)

Solution games	
Marking key/mathematical behaviours	Marks
• interprets data in table	1

Question 12 (e)

Solution A higher proportion of the males surveyed never use the internet for email i.e 31.6% males compared to 20.5% of the females. A higher proportion of females use the internet for email often i.e. 13.6% of females compared to 9.5% of the males.	
Marking key/mathematical behaviours	Marks
• provides an accurate statement of proportion and provides data to support the statement	1
• provides a second accurate statement of proportion and provides data to support the statement.	1

Question 12 (f)

Solution There could have been more males in the survey and 90% of this number may have been greater than the 92.5%. The respondents were left to interpret the descriptors of rarely, sometimes and often so there is no indication in the data about the number of times respondents used the internet.	
Marking key/mathematical behaviours	Marks
• gives one reason to support the conclusion provided	1
• gives a second reason to support the conclusion provided	1

Question 12 (g)

Solution NOT SUPPORTED The survey did not collect data about the amount of time, only the proportion of users so it is not known how much time people spent on the internet.	
Marking key/mathematical behaviours	Marks
• selects correct option	1
• recognises the limitation of the data	1

Question 13 (a)

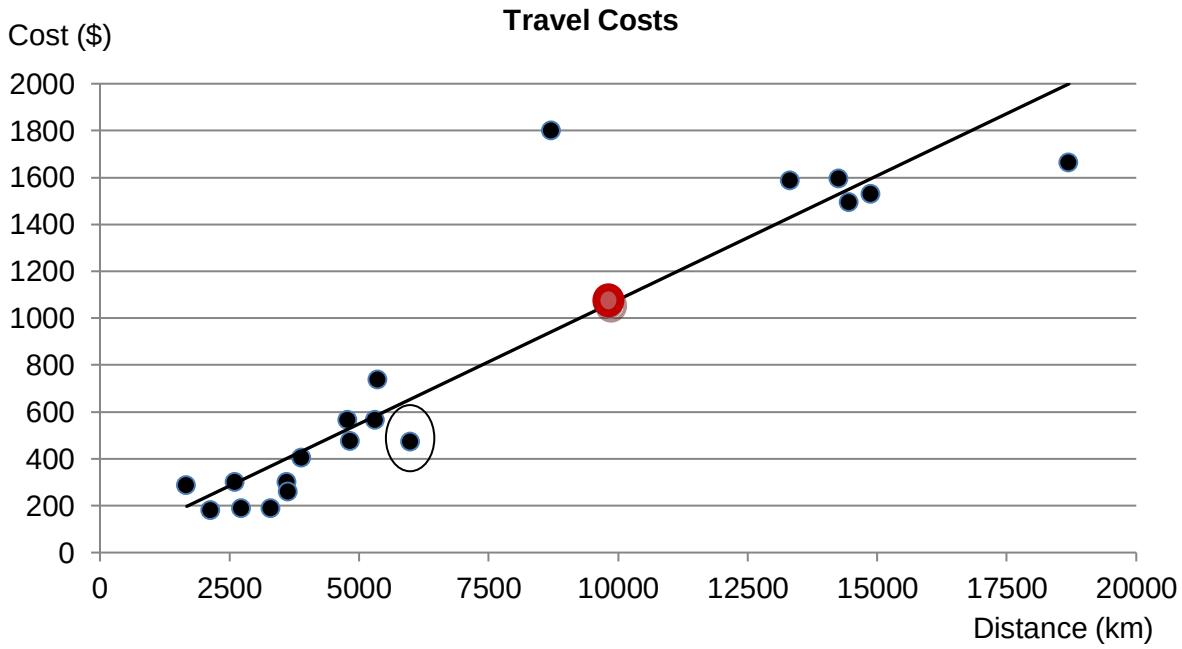
Solution	
$1800	
Marking key/mathematical behaviours	Marks
• reads scatter plot	1

Question 13 (b)

Solution	
Cost of flight	
Marking key/mathematical behaviours	Marks
• identifies response variable	1

Question 13 (c) & (h)

Solution



Marking key/mathematical behaviours	Marks
• (c) identifies data point – circled	1
• (d) plots data point – red dot	1

Question 13 (d)

Solution	
95.4%	
Marking key/mathematical behaviours	Marks
• identifies coefficient of determination	1

Question 13 (e)

Solution $r = 0.9766$	
Marking key/mathematical behaviours	Marks
• calculates correlation coefficient	1

Question 13 (f)

Solution 0.98 It was 0.9538 after the outlier was removed and would have been higher prior to that.	
Marking key/mathematical behaviours	Marks
• identifies correct value for coefficient of determination	1
• justifies choice	1

Question 13 (g)

Solution Cost = 0.103 x 10000 – 7.166 = $1023	
Marking key/mathematical behaviours	Marks
• shows substitution into the equation provided	1
• determines predicted cost	1

Question 13 (i)

Solution The prediction is very reliable The correlation coefficient is very close to 1 (0.9766)	
Marking key/mathematical behaviours	Marks
• describes prediction	1
• justifies conclusion	1

Question 14 (a)

Solution The values are all zero because players do not compete against themselves	
Marking key/mathematical behaviours	Marks
• explains the values in the leading diagonal	1

Question 14 (b)

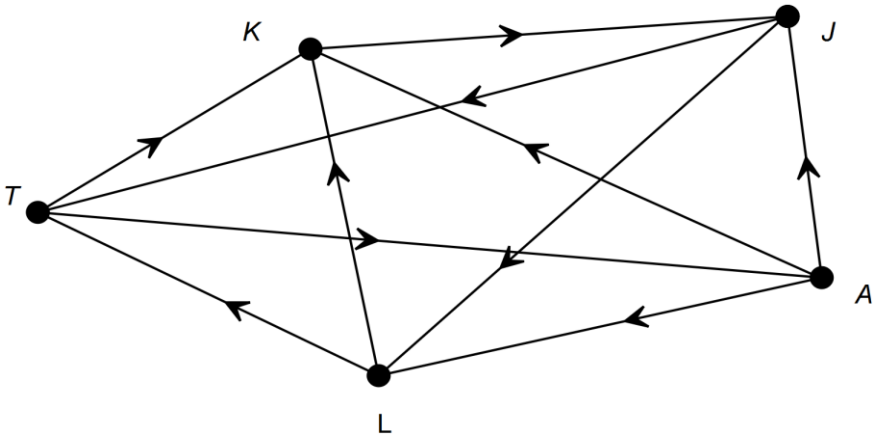
Solution Total number of games won by each player	
Marking key/mathematical behaviours	Marks
• identifies total number of games	1
• describes games belonging to one player	1

Question 14 (c)

Solution The person in row m had lost to the person in column n The person in row n must have beaten the person in column m. It is the same match so the opposite results are stored in the "complementary" positions..	
Marking key/mathematical behaviours	Marks
• identifies the same match is described	1
• identifies opposite results for the opponents	1

Question 14 (d)

Solution



Marking key/mathematical behaviours	Marks
• draws a complete graph	1
• identifies 7 correct edges	1
• identifies remaining 2 correct edges	1

Question 14 (e)

Solution

(i) Kate and Andrew
(ii) row 1 column 3

Marking key/mathematical behaviours	Marks
• interprets digraph	1
• relates digraph to matrix	1

Question 14 (f)

Solution

0, There was no one that Jane beat who also beat Liz

Marking key/mathematical behaviours	Marks
• locates element in matrix	1
• interprets matrix	1

Question 14 (g)

Solution

3

Marking key/mathematical behaviours	Marks
• uses adjacency matrix to solve problem	1

Question 15

Solution

Sequence	Arithmetic or geometric	Exponential or linear	Growth or decay
A	arithmetic	linear	growth
B	geometric	exponential	decay
C	geometric	exponential	decay
D	arithmetic	linear	growth
E	arithmetic	linear	growth
F	geometric	exponential	decay

Marking key/mathematical behaviours	Marks
• Identifies of given sequence	6

Question 16 (a)

Solution It decreases	
Marking key/mathematical behaviours	Marks
• interprets relationship between variables	1

Question 16 (b)

Solution **(**i) relationship is negative (ii) relationship is linear (ii) relationship is strong	
Marking key/mathematical behaviours	Marks
• interprets negativity of relationship	1
• interprets linearity of relationship	1
• interprets strength of relationship	1

Question 16 (c)

Solution Generally speaking students did ATAR or VET in 2015 so the percentages added up to about 100%. Some students achieved both (over 100% in some schools) and some achieved neither (less than 100%). One variable does not cause the other but there is a very strong association between them because students do not tend to choose to do both as the time to do both is limited.	
Marking key/mathematical behaviours	Marks
• indicates variables are complementary	1
• describes lack of causality	1