MATHEMATICS APPLICATIONS

MAWA Semester 2 (Units 3 & 4) Examination 2018

Calculator-Assumed

Marking Key

The release date for this exam and marking scheme is

- **the end of week 1 of term 4, 2018**

Section Two: Calculator-assumed (100 Marks)

Question 7 (a)

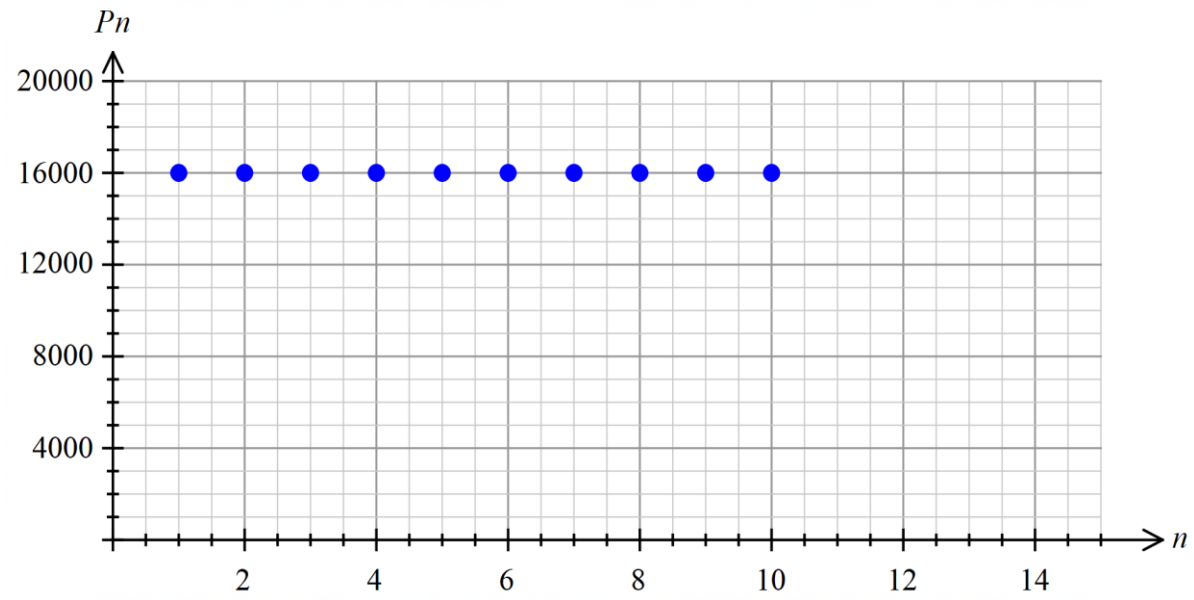
Solution 6.25% of 16000 = 1000	
Marking key/mathematical behaviours	Marks
• determines 6.25% of 16000	1

Question 7 (b)

Solution $P_{n+1} = P_n \times 1.0625 - 1000$, $P_1 = 16000$	
Marking key/mathematical behaviours	Marks
• expresses relationship in correct format with first term • identifies correct ratio	1 1

Question 7 (c)

Solution



Marking key/mathematical behaviours	Marks
• labels and scales vertical axis	1
• labels and scales horizontal axis	1
• plots points	1

Question 8 (a)

Solution 4-point cycle. Values at quarter = 2,6,10,14 and 18 are quite high compared to the other values.	
Marking key/mathematical behaviours	Marks
• identifies a 4-point cycle	1
• refers to the graph to justify conclusion	1

Question 8 (b)

Solution Downward trend. Peaks and troughs are getting lower	
Marking key/mathematical behaviours	Marks
• describes trend	1
• justifies trend	1

Question 8 (c)

Solution Summer 2021	
Marking key/mathematical behaviours	Marks
• identifies season associated with occurrence	1

Question 8 (d)

Solution 369 ÷ ((369+249+261+298) ÷ 4) x 100	
Marking key/mathematical behaviours	Marks
• identifies the expression to calculate percentage of seasonal mean	1

Question 8 (e)

Solution (89 + 80 + 70 + 81) ÷ 4 = 80%	
Marking key/mathematical behaviours	Marks
• determines seasonal index	1

Question 8 (f)

Solution 207 ÷ 0.8 = 259	
Marking key/mathematical behaviours	Marks
• determines deseasonalised data	1

Question 9 (a)

Solution

BDFG 900
BMDFG 100
BMFG 200
BMPG 900
BMJPG 300
BMJG 800

Total number of cyclists is 3200

Marking key/mathematical behaviours	Marks
• determines 2 paths and their respective number of cyclists	1
• determines a further 2 paths and their respective number of cyclists	1
• determines a further 2 paths and their respective number of cyclists	1
• determines maximum number of cyclists	1

Question 9 (b)

Solution

The maximum flow will not be affected so stays at 3200. The edge was not used in determining the path.

Marking key/mathematical behaviours	Marks
• describes the effect on the path	1
• justifies conclusion	1

Question 10 (a)

Solution

n	1	2	3
Value of boat after n years	\$15 980	\$15 021.20	\$14 119.93

Marking key/mathematical behaviours	Marks
• determines two values	1
• determines third value	1

Question 10 (b)

Solution

6% per annum

Marking key/mathematical behaviours	Marks
• identifies rate of depreciating	1

Question 10 (c)

Solution $1 020	
Marking key/mathematical behaviours	Marks
• identifies the depreciated amount	1

Question 10 (d)

Solution Each year the rate is applied to a decreasing amount and thus the rate can be constant but the value is not.	
Marking key/mathematical behaviours	Marks
• explains difference in rate and absolute change	1

Question 10 (e)

Solution Sell at 7000 or less. After 15 years. (n = 15 → 6720 in value)	
Marking key/mathematical behaviours	Marks
• determines sell-off value • determines time for sell-off.	1 1

Question 11 (a)

Solution AMRWSC 31 days	
Marking key/mathematical behaviours	Marks
• identifies critical path • determines minimum completion time	1 1

Question 11 (b)

Solution EST = 22 days LST = 23 days Float time = 1 day	
Marking key/mathematical behaviours	Marks
• identifies earliest start time • identifies latest start time • identifies float time	1 1 1

Question 11 (c)

Solution

(i) The critical path changes to AMPKC and completion time increases by 2 days
(ii) The critical path is now 37 days and remains the same path

Marking key/mathematical behaviours	Marks
• (i) identifies path	1
• (i) identifies change to completion time	1
• (ii) identifies path	1
• (ii) identifies change to completion time	1

Question 11 (d)

Solution

Activity	Immediate Predecessors	Time (days)
A	-	5
B	A	8
E	B	7
F	A	7
M	A	6
R	M	7
P	M	8
W	F, R	7
S	E, W	2
T	F, R	4
K	T, P	4
C	S, K	4

Marking key/mathematical behaviours	Marks
• lists all activities	1
• lists associated times taken	1
• identifies activities with single predecessors	1
• identifies activities with multiple predecessors	1

Question 12 (a)

Solution

Strong association, points are close to each other on the graph
Direction is positive (upward), as cost increases, points are further up.

Marking key/mathematical behaviours	Marks
• identifies strength of the association	1
• justifies conclusion about the strength using graph's features	1
• identifies direction of the association	1
• justifies conclusion about the direction using graph's features	1

Question 12 (b)

Solution y=14.328 x – 840.25	
Marking key/mathematical behaviours	Marks
• determines equation for least squares line	1

Question 12 (c)

Solution r = 0.8263	
Marking key/mathematical behaviours	Marks
• determines the correlation coefficient	1

Question 12 (d)

Solution H = 13 x 90 –640 = \$530 000	
Marking key/mathematical behaviours	Marks
• substitutes into given equation	1
• determines median house price	1

Question 12 (e)

Solution The prediction is from within the given data ie interpolated Correlation coefficient near 1 thus indicating a strong relationship	
Marking key/mathematical behaviours	Marks
• gives one reason to justify reliability of prediction	1
• gives second reason to justify reliability of prediction	1

Question 12 (f)

Solution 81%	
Marking key/mathematical behaviours	Marks
• identifies coefficient of determination	1

Question 12 (g)

Solution \$130 000	
Marking key/mathematical behaviours	Marks
• interprets gradient of linear model	1

Question 13 (a)

Solution 0.7%	
Marking key/mathematical behaviours	Marks
• identifies monthly interest rate	1

Question 13 (b)

Solution $T_1 = 25000 \quad T_{n+1} = T_n \times 1.007 - 250$	
Marking key/mathematical behaviours	Marks
• rule is in the correct format	1
• correct ratio and subtraction	1

Question 13 (c)

Solution 24 773.42, $173.41, $250, $24 696.83	
Marking key/mathematical behaviours	Marks
• enters each data value into 4th row of the table	4

Question 13 (d)

Solution 250 x 60 = $15000 paid in instalments. Loan reduced by 25000 – 19431.40 = $5568.40 Interest = 15000 - $5568.40 = $9341.40	
Marking key/mathematical behaviours	Marks
• determines amount by which loan is reduced	1
• determines interest paid	1

Question 13 (e)

Solution No. Interest is still calculated once each month so the loan will not reduce any more quickly.	
Marking key/mathematical behaviours	Marks
• concludes correctly	1
• justifies conclusion	1

Question 13 (f)

Solution Another 87 months (total 147 months). Altogether he takes 12 years and 3 months	
Marking key/mathematical behaviours	Marks
• determines n=87	1
• interprets 87 in terms of the question	1

Question 14 (a)

Solution

(0.5x265+323+288+213+238+307+0.5x360) ÷ 6 = 280.25

Marking key/mathematical behaviours	Marks
• identifies 7 values to use in the expression	1
• determines 6-point moving average	1

Question 14 (b)

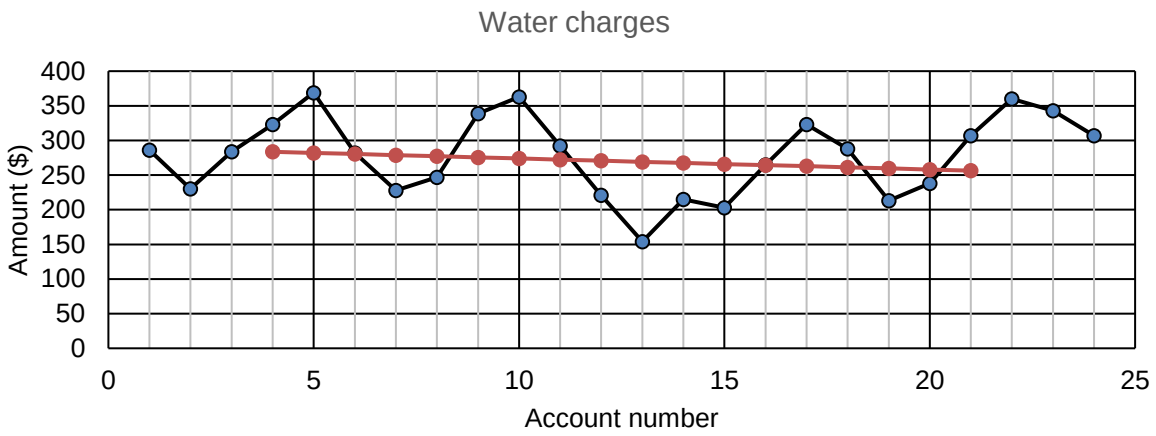
Solution

The data show a cycle of length 6 with a peak every 6 points and a trough every 6 points

Marking key/mathematical behaviours	Marks
• explains the cycle length of 6	1

Question 14 (c)(d)

Solution



Marking key/mathematical behaviours	Marks
• plots remaining points	1
• plots trend line for relevant account numbers	1
• uses appropriate slope for the trend line	1
• uses relevant vertical “intercept” for trend line	1

Question 14 (e)

Solution

July 2018

Marking key/mathematical behaviours	Marks
• identifies year and month	1

Question 14 (f)

Solution Account 1	
Marking key/mathematical behaviours	Marks
• identifies outlier	1

Question 14 (g)(i)

Solution 36x25+68=968 968 x 27% = 261 L per day	
Marking key/mathematical behaviours	Marks
• determines deseasonalised value for account 25	1
• selects correct seasonal index	1
• determines predicted daily water usage	1

Question 14 (g)(ii)

Solution Not reliable as the prediction is extrapolated and the linear model was determined from averaged cyclic data	
Marking key/mathematical behaviours	Marks
• identifies predictability	1
• justifies conclusion	1

Question 15 (a)

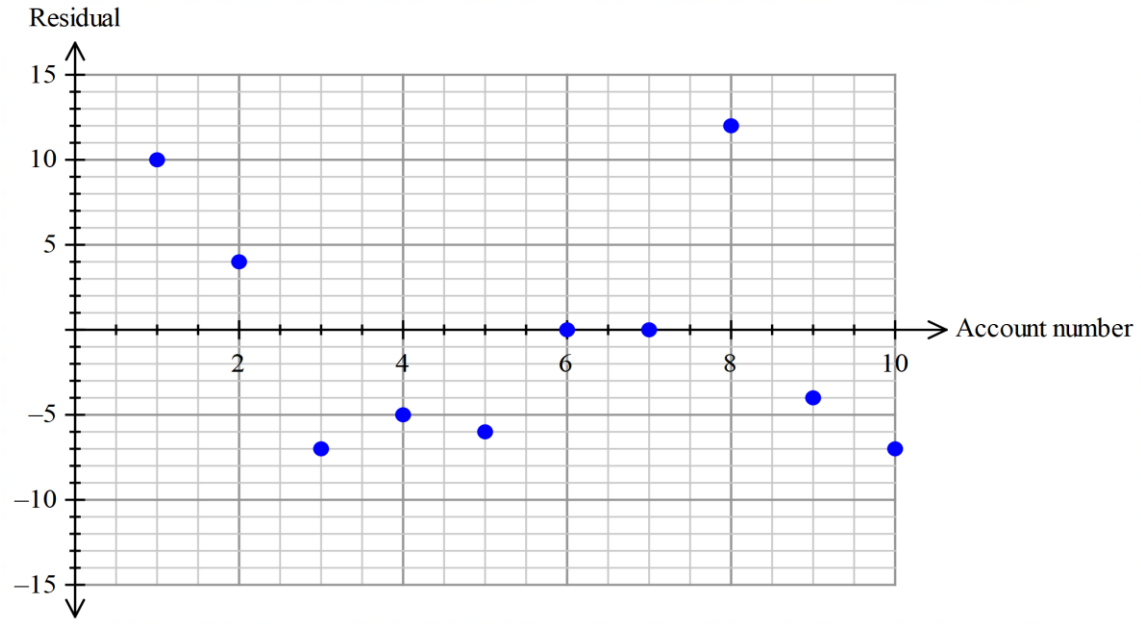
Solution The higher the mean score the more likely it is that there is a high percentage of students reaching the highest level. OR The more students there are in the highest level, the greater the mean score is likely to be.	
Marking key/mathematical behaviours	Marks
• justifies an association between the two variables	1

Question 15 (b)

Solution 3	
Marking key/mathematical behaviours	Marks
• distinguishes relevant data in table	1

Question 15 (c)

Solution



Marking key/mathematical behaviours	Marks
• labels and scales horizontal axis	1
• labels and scales vertical axis	1
• calculates residuals using observed - predicted	1
• plots 6 points correctly	1
• plots further 4 points correctly	1

Question 15 (d)

Solution

A linear model is appropriate as there does not appear to be a pattern in the location of the points on the residual plot.

Marking key/mathematical behaviours	Marks
• concludes the linear model is appropriate	1
• justifies conclusion using residual plot	1

Question 15 (e)

Solution

Even though the correlation between the two variables is high ($r > 0.9$) predications made from the linear model may not be reliable. The graph showing achievement looks exponential in nature and the data is only given for 10 countries. For one country the predicted percentage was negative, and this is not possible

Marking key/mathematical behaviours	Marks
• identifies reliability of the linear model	1
• justifies conclusion	1

Question 16 (a)

Solution $v = 8$, $f = 7$, $e = 13$ and $v + f - 2 = e$ ie $8 + 7 - 2 = 13$	
Marking key/mathematical behaviours	Marks
• identifies the number of faces, edges and vertices	3
• verifies Euler's rule applies	1

Question 16 (b)

Solution It starts and ends at the same vertex. There are no repeated edges or vertices.	
Marking key/mathematical behaviours	Marks
• identifies start and end points	1
• identifies each edge and vertex used once (except start)	1

Question 16 (c)

Solution OTBAKBSKPSTPWO	
Marking key/mathematical behaviours	Marks
• identifies a route that contains no repeated edges	1
• includes all vertices	1

Question 16 (d)

Solution It has a closed trail which starts and ends at the same vertex and for which no edges are repeated.	
Marking key/mathematical behaviours	Marks
• identifies edges are not repeated	1
• identifies starting and finishing at the same vertex	1