MATHEMATICS APPLICATIONS

MAWA Semester 2 (Units 3 & 4) Examination 2018

Calculator-free

Marking Key

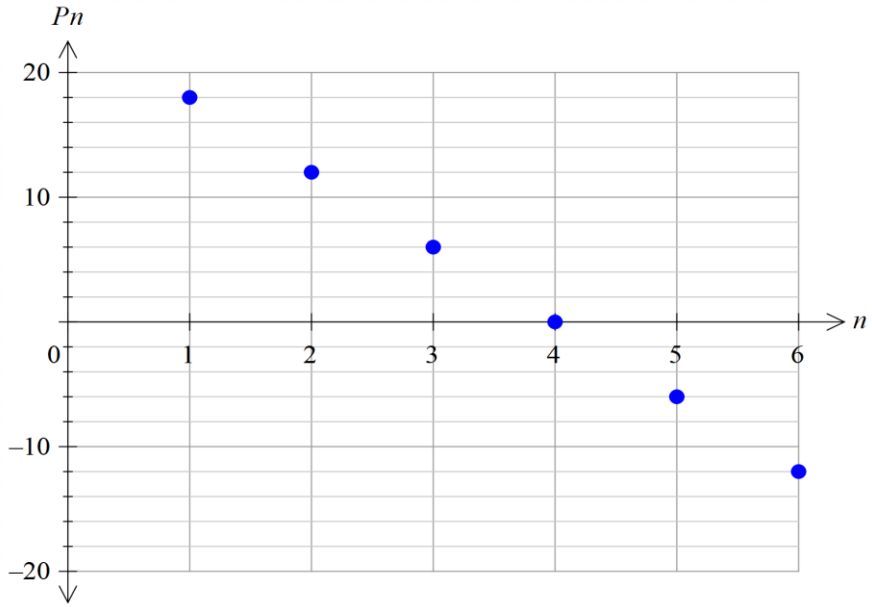
The release date for this exam and marking scheme is

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

Section One: Calculator-free (50 Marks)

Question 1 (a)

Solution



Marking key/mathematical behaviours	Marks
• labels both axes accurately	1
• plots first four points	1
• plots further two points	1

Question 1 (b)

Solution

$P_n = -6n + 24$ or $P_n = -6(n - 1) + 18$

Marking key/mathematical behaviours	Marks
• uses the correct format in the expression for the n^{th} term	1
• identifies rate of change	1

Question 1 (c)

Solution

$P_n = -6n + 24$ or $P_n = -6(n - 1) + 18$
$-400 = -6n + 24$
$-424 = -6n$
$n = 70.7$ so 71^{st} term which is -402

Marking key/mathematical behaviours	Marks
• creates a statement of equivalence	1
• solves for n	1
• identifies value of first term less than -400	1

Question 2 (a)

Solution

(i) 7
(ii) 15

Marking key/mathematical behaviours	Marks
• identifies number of vertices	1
• identifies number of edges	1

Question 2 (b)

Solution

No. It cannot be drawn without the edges crossing

Marking key/mathematical behaviours	Marks
• identifies if graph is planar	1
• justifies decision	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	1
• describes why graph is connected	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	1
• determines length of route	1

Question 2 (e)

Solution

Hamiltonian cycle

Marking key/mathematical behaviours	Marks
• identifies a Hamiltonian cycle	1

Question 2 (f)

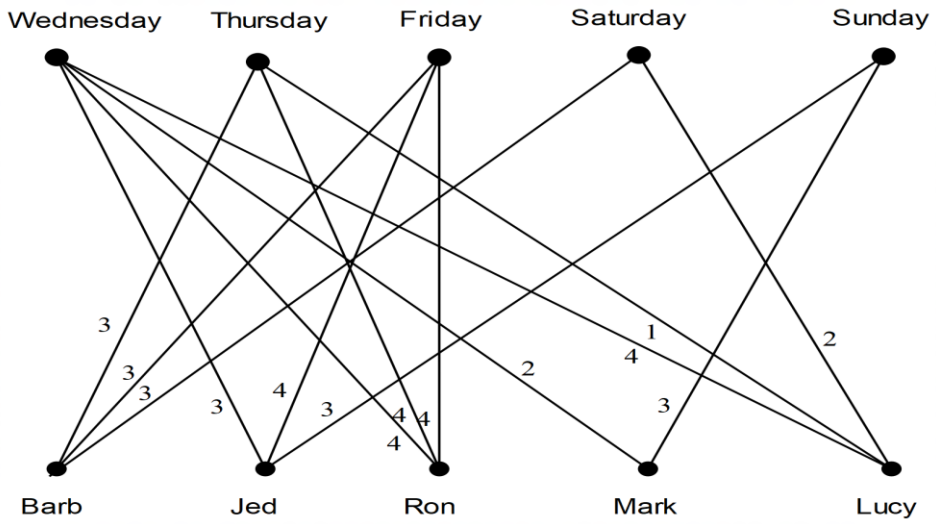
Solution

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	1
• 10 edges correctly weighted	1
• further 4 edges correctly weighted	1

Question 3 (b)

Solution

$$\begin{array}{c} \\ Barb \\ Jed \\ Ron \\ Mark \\ Lucy \end{array} \begin{array}{c} \begin{array}{ccccc} Wed & Th & Fr & Sat & Sun \end{array} \\ \begin{bmatrix} 0 & 3 & 3 & 3 & 0 \\ 3 & 0 & 4 & 0 & 3 \\ 4 & 4 & 4 & 0 & 0 \\ 2 & 0 & 0 & 0 & 3 \\ 4 & 1 & 0 & 2 & 0 \end{bmatrix} \end{array}$$

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	1
• schedules further two people correctly	1
• identifies maximum number of hours	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	1
• In each row takes the smallest number from each number.	1
• Justifies assignment is possible	1

Question 4 (a)

Solution

$V_{n+1} = 1.06V_n$, $V_0 = 8000$ where V_n represents value and n = number of years passed

Marking key/mathematical behaviours	Marks
• determines first term	1
• uses correct format for rules	1
• determines ratio	1

Question 4 (b)

Solution

(i) $24 000

(ii) $V_n = 8000\ (1.08)^n$ where V_n represents value and n = number of years passed

Marking key/mathematical behaviours	Marks
• identifies expected value	1
• uses correct format	1
• identifies starting value and rate	1

Question 4 (c)(d)

Solution

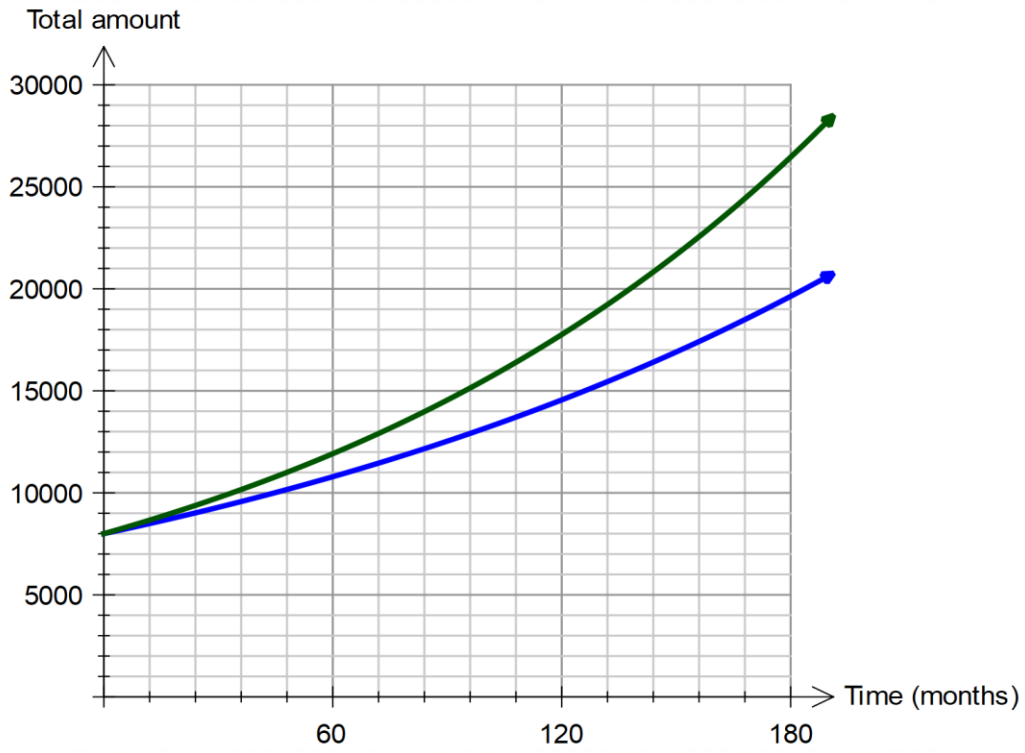
(c) Monthly rate = 0.06 ÷ 12 = 0.005

(d) increase of $500

Marking key/mathematical behaviours	Marks
• identifies monthly interest rate	1
• identifies approximate change in investment	1
• specifies the change is a growth	1

Question 4 (e)

Solution



Marking key/mathematical behaviours	Marks
• uses the same starting value	1
• similar type of graph	1
• steeper rate of growth and ends above $24000	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	1
• calculates percentages for delivery workers	1

Question 5 (b)

Solution

Sport preferred

Marking key/mathematical behaviours	Marks
• identifies response variable	1

Question 5 (c)

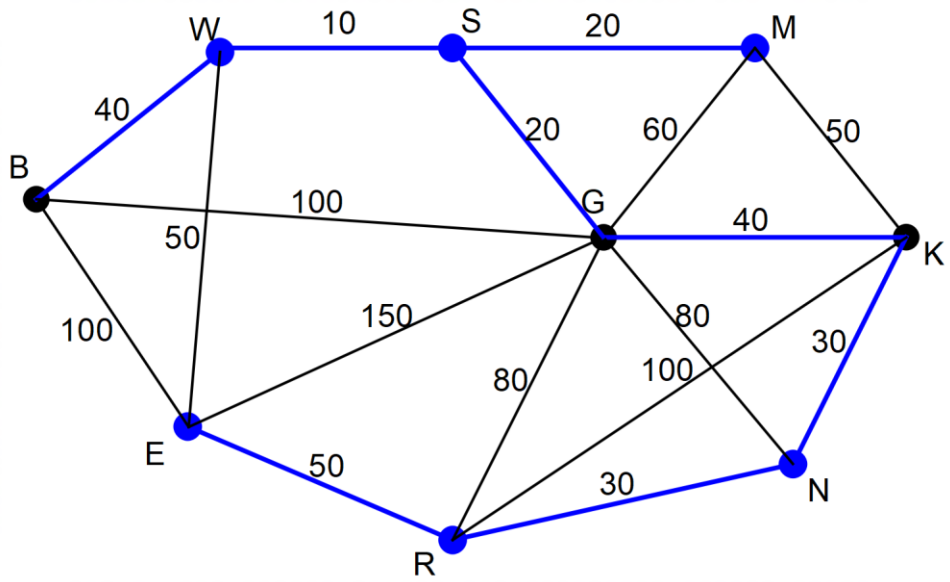
Solution

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	1
• uses data from the table to justify conclusion	1

Question 6 (a)

Solution

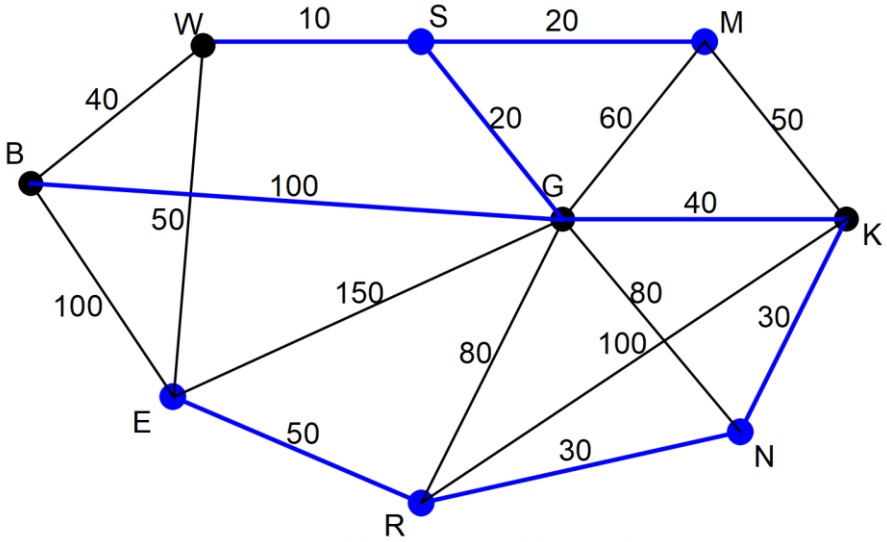


40+10+20+20+40+30+30+50 = 240 km

Marking key/mathematical behaviours	Marks
• identifies all correct connections	1
• only includes correct connections	1
• determines length of minimum spanning tree	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	1
• identifies change in cost	1