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MATHEMATICS APPLICATIONS UNIT 3

Semester One

2017

SOLUTIONS

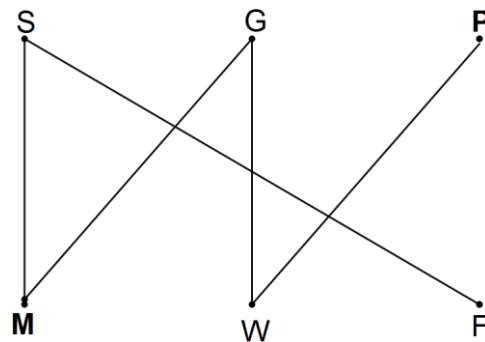
Calculator-free Solutions

1. (a) $T_2 = 4$ ✓
 $T_3 = 5$ ✓
 $T_4 = 8$ ✓
- (b) (i) A straight line is formed/common difference ✓
- (ii) $T_{n+1} = T_n + 0.5$ $T_0 = -3$ ✓✓ [6]

2. (a) (i) $T_{n+1} = \frac{T_n}{4}$ $T_1 = 400$ ✓✓
- (ii) $T_{n+1} = T_n + 4x$ $T_1 = 4x$ ✓✓

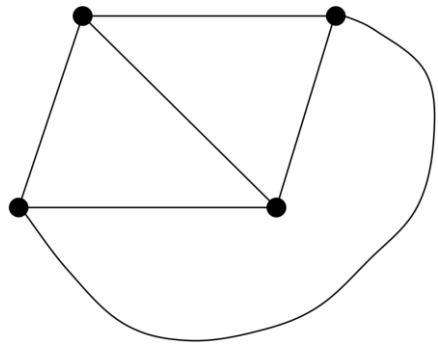
- (b) (i) -0.9 and 0.9 ✓✓
(ii) Strong ✓
- (c) C and E ✓✓
- (d) ✓✓

| | Sing (S) | Guitar (G) | Piano (P) |
|---------------|----------|------------|-----------|
| Monday (M) | Y | Y | N |
| Wednesday (W) | N | Y | Y |
| Friday (F) | Y | N | N |



✓ [12]

3. (a) Not planar as lines cross ✓
 (b) ✓



- (c) ✓✓

| Number of Vertices | Number of Edges | Number of Faces |
|--------------------|-----------------|-----------------|
| 5 | 8 | 5 |
| 8 | 12 | 6 |
| 6 | 9 | 5 |

- (d) ✓✓

| Node | In | Out |
|------|----|-----|
| A | 1 | 2 |
| B | 2 | 1 |
| C | 2 | 1 |
| D | 1 | 2 |

Total In – degree = 6 and total Out – degree = 6. [8]

4. (a) (i) True ✓
 (ii) False ✓
 (iii) False ✓
 (iv) True ✓

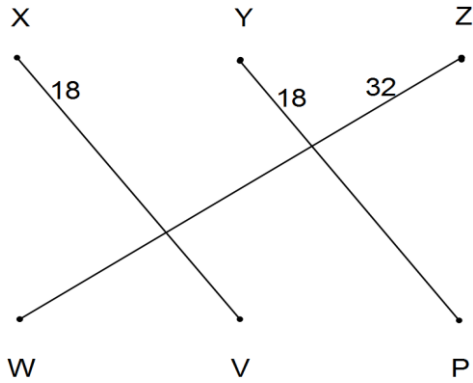
(b) $\hat{P} = 1.45 \therefore P = 1.25$ ✓✓ [6]

5. (a) Starts and finishes at the W. ✓✓
 Visits all nodes. ✓✓
 (b) Yes, W H L G E W (other solutions may exist) ✓✓
 (c) W H L E G or W E L H G. ✓ [5]

6. (a) $\begin{bmatrix} \mathbf{20} & \mathbf{18} & \mathbf{15} \\ 25 & 17 & 18 \\ \mathbf{32} & \mathbf{16} & \mathbf{16} \end{bmatrix}$
 (b) Xcellent Shine
 (c) Zest Car
 (d)

✓✓
 ✓
 ✓
 ✓✓

[6]



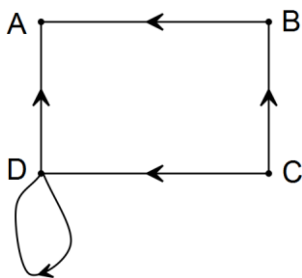
7.

| | | | | |
|---------------------------|---|---|---|---|
| Recursive Equation | A | B | C | D |
| Statement | c | b | a | d |

✓✓✓✓

[4]

8.



Other solutions may exist.

✓✓✓✓

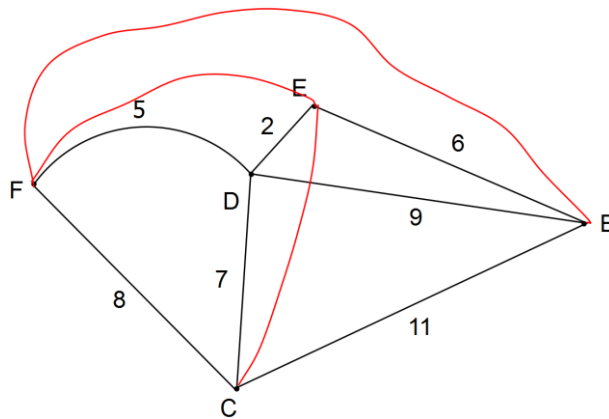
[4]

Calculator-Assumed Solutions

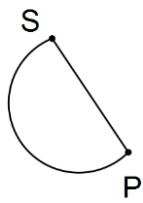
9. (a) 80 ✓
 (b) 1.5% ✓
 (c) $X_1 = 243$ or 244 ✓
 $X_2 = 247$ or 248 ✓
 $X_3 = 250$ or 251 ✓
 (d) During the 13th year i.e. 2028 ✓✓
 (e) 2021 ✓

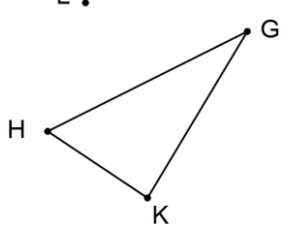
[8]

10. (a) (i) Adjacent ✓
 (ii) D ✓
 (iii) FEB 1300 kilometres ✓✓
 (b) (i) 3 ✓
 (ii) ✓



- (c) (i) Not a simple graph as it contains loops and multiple edges. ✓✓
 (ii) Yes ✓
 (iii) ✓



- (d)  ✓

(e)

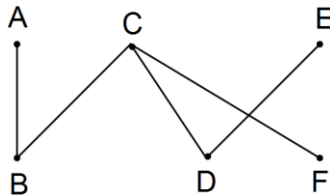
✓✓

| | | | | | | | |
|-----------------|---|---|---|-----------|----|-----------|------|
| Vertices | 2 | 3 | 4 | 5 | 6 | 10 | 50 |
| Edges | 1 | 3 | 6 | 10 | 15 | 45 | 1225 |

(f)

✓✓

[15]



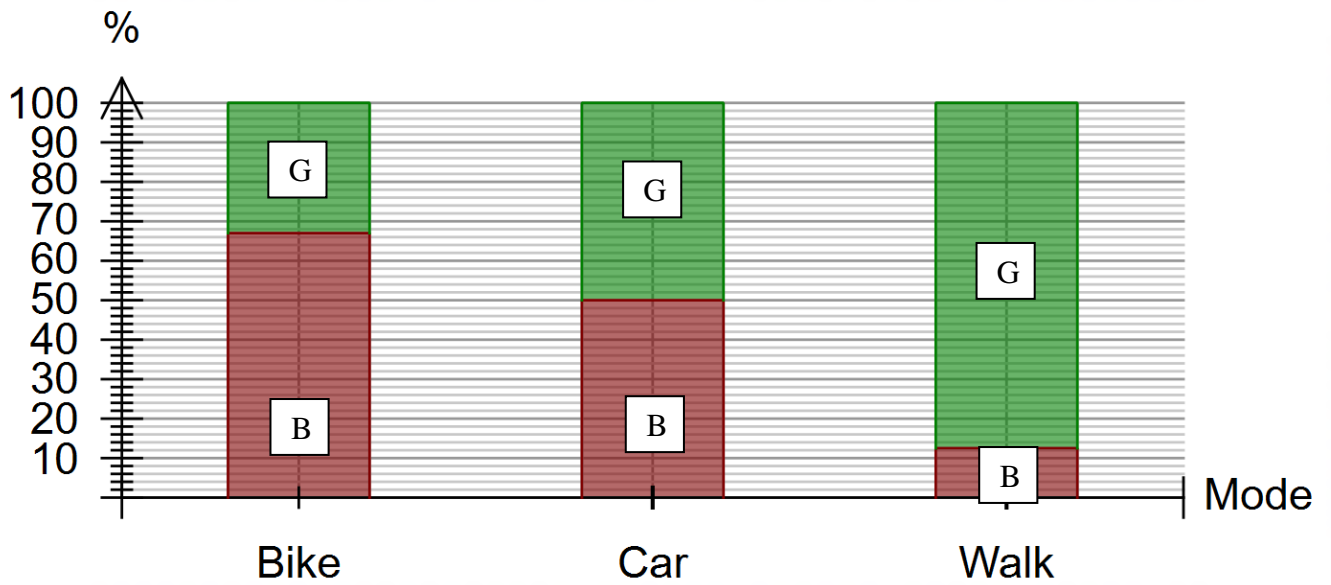
11. (a)

✓✓✓✓

| Transport/Gender | Boys | Girls | Total |
|------------------|-----------|-----------|-----------|
| Bike | 20 | 10 | 30 |
| Car | 15 | 15 | 30 |
| Walk | 5 | 35 | 40 |
| Total | 40 | 60 | 100% |

(b) (i)

✓✓✓



(ii) Boys prefer riding bikes over walking.
Going by car is the same in both genders.

✓✓

(iii) $720 - \left(\frac{15}{60} \times 720\right) = 540$ or $45\% \text{ of } 1200 = 540$

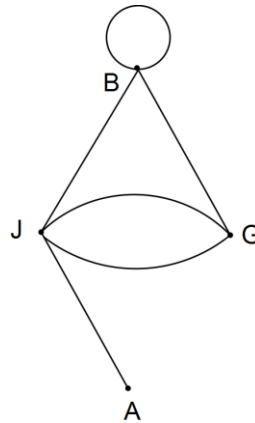
✓✓

[11]

12. a)

✓✓

$$\begin{matrix} & \mathbf{B} & \mathbf{G} & \mathbf{J} & \mathbf{A} \\ \mathbf{B} & \left[\begin{array}{cccc} 1 & 1 & 1 & 0 \\ 1 & 0 & 2 & 1 \\ 1 & 2 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{array} \right] \end{matrix}$$



(b) (i) Two odd nodes.

✓✓

(ii) R E U R P Z U Other solutions may exist

✓

(c) A is not a tree, it has a cycle.

✓

B is not a tree, it is disconnected

✓

C is a tree.

✓

[8]

13. (a)

(i) \$8500

✓

(ii) 9.66% p.a.

✓

(iii) \$1350

✓

(b) 3 years 10 months

✓

(c) $45 \times 225 + (49 \cdot 304 \times 1 \cdot 00805) - 8500 = \$1674 \cdot 70$

✓✓

[6]

14. (a)

Admin – F – Canteen – Gym – E

✓✓

97 metres

✓

(b) Admin – F – Canteen – Gym – E – C – B – A – Admin

✓✓

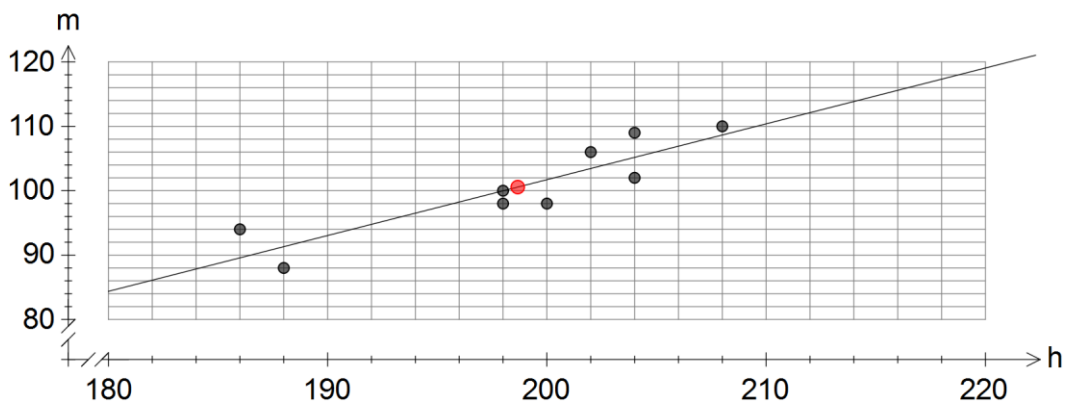
Shortest distance = 222 m

[5]

15. (a)

✓✓✓

Basketballers' Statistics



(b) (i) 0.79

✓✓

(ii) Strong positive linear relationship

✓✓

(c) 198 cm

✓

(d) (i) 0.79

✓

(ii) 79% of the variation in mass can be explained by the variation in height

✓

(e) $\hat{m} = 0 \cdot 87h - 71 \cdot 74$

✓✓

(f) (i) (199, 101)

✓

(ii) In red - see the graph above in part a)

✓

(iii) See the graph in part a)

✓

- (g) (i) 110.96 \therefore 111 kilograms ✓
 (ii) Extrapolation ✓
 (h) No, causation. ✓ [15]

16. a) (i) Something like below



- Should show axes names and point in a negative direction. ✓✓
- (ii) Data only suggests a relationship exists.
 This score is considered an outlier. ✓✓
- (b) (i) Increasing ✓
 (ii) 12 kilograms ✓
 (iii) 40 kilograms ✓
 (iv) 1.25 kilograms per month ✓
- (c) (i) 0 – 0.3 ✓
 (ii) No relationship will exist between this data ✓
- (d) Strong positive linear correlation. ✓✓
- (e) -0.93, ignore the sign. The greater value is the stronger. ✓✓
- (f) Interpolation ✓
- (g) (i) Value will increase ✓
 (ii) The points are closer to a straight line
 and so predictions will be more accurate ✓✓ [18]
17. (a) $T_{n+1} = T_n + 3$ $T_1 = 5$ ✓✓
 (b) 14 mm ✓
 (c) 42 mm ✓✓
 (d) $T_{n+1} = T_n - 3$ $T_1 = 20$ ✓✓
 (e) 130 mm ✓✓
 (f) $2 \times 30 + 130 + 10 \times 100 = 1190$ mm ✓✓ [11]