



2017 VCAA Further Mathematics Exam 1 Solutions

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SECTION A Core

Data analysis

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| D | B | D | D | B | E | E | D | A | A | D | D | B | D | D | A |

Recursion and financial modelling

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| A | D | C | D | E | A | D | B |

SECTION B

Module 1: Matrices

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| B | E | C | C | A | D | A | A |

Module 2: Networks and decision mathematics

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|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| B | C | A | D | C | E | D | B |

Module 3: Geometry and measurement

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| D | D | B | B | C | B | E | A |

Module 4: Graphs and relations

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| B | C | B | E | D | C | C | D |

SECTION A Core

Data analysis

Q1 D

Q2 B

Q3 D

Q4 $3 < \log_{10}(\text{area}) < 4$, $10^3 < \text{area} < 10^4$ D

Q5 30% of 300 = 90 B

Q6 E

Q7 E

Q8 D

Q9 $17.7 - 18.4 = -0.7$ A

Q10 $z = \frac{x - \bar{x}}{s_x} = \frac{-0.3 - 0.02}{0.4} = -0.8$ A

Q11 D

Q12 D

Q13 B

Q14 D

Q15 $\frac{22 + 19 + 22 + 43}{4} = 26.5$, $\frac{19 + 22 + 43 + 37}{4} = 30.25$

$\frac{26.5 + 30.25}{2} = 28.375$ D

Q16 $1.6 = \frac{\text{actual}}{\text{deseasonalised}}$

$\text{deseasonalised} = \frac{\text{actual}}{1.6} = 0.625 \times \text{actual} = (1 - 0.375) \times \text{actual}$ A

Recursion and financial modelling

Q17 A

Q18 D

Q19 C

Q20 D

Q21 $\frac{680 - 125}{4 \times 1920} \approx \0.072 E

Q22 A

Q23 Interest rate = $\frac{28.42}{7105.41} \approx 0.004$

Interest = $7233.83 \times 0.004 = 28.94$

Principal addition = $7500.00 - 7233.83 = 266.17$

Payment = $266.17 - 28.94 = 237.23$ D

Q24

$N = 120$, $I\% = 4.35$, $PV = 245\,000$, $PMT = -1800$,

$P/Y = 12$, $C/Y = 12$, $FV = -108\,219.1611$

$N = 60$, $PV = 108\,219.1611$, $PMT = -2000$, $FV = 0$,

$P/Y = 12$, $C/Y = 12$, $I\% \approx 4.14$ B



SECTION B
Module 1: Matrices

- Q1
Q2
Q3 $\Delta \neq 0$
Q4
Q5
Q6 $a_{ij} + b_{ij} = (2i + j) + (i - j) = 3i$

Q7 Let $F_{n+1} = F_n = F_0$.

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} F_0 = \begin{bmatrix} 0.65 & 0 & 0 & 0 \\ 0.25 & 0.75 & 0 & 0 \\ 0 & 0.20 & 0.95 & 0 \\ 0.10 & 0.05 & 0.05 & 1 \end{bmatrix} F_0 + B$$

$$B = \left(\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0.65 & 0 & 0 & 0 \\ 0.25 & 0.75 & 0 & 0 \\ 0 & 0.20 & 0.95 & 0 \\ 0.10 & 0.05 & 0.05 & 1 \end{bmatrix} \right) F_0$$

$$\therefore B = \begin{bmatrix} 17\,500 \\ -10\,000 \\ -1\,650 \\ -5\,850 \end{bmatrix} \begin{matrix} Y \\ J \\ A \\ D \end{matrix}$$

$$Q8 \begin{bmatrix} 0.3 & 0.2 & V \\ 0.2 & 0.2 & W \\ X & Y & Z \end{bmatrix} \begin{bmatrix} 40 \\ 15 \\ 20 \end{bmatrix} = \begin{bmatrix} 29 \\ 13 \\ 33 \end{bmatrix}$$

$X = 1 - 0.3 - 0.2 = 0.5$
 $Y = 1 - 0.2 - 0.2 = 0.6$
 $40X + 15Y + 20Z = 33, Z = 0.2$
 $0.2 \times 40 + 0.2 \times 15 + 20W = 13, W = 0.1$

Module 2: Networks and decision mathematics

- Q1
Q2
Q3
Q4 $CGJ: 4 + 3 + 5 = 12$
Q5 Critical path $CFHM$
Q6
Q7
Q8 The minimum cut is Cut B

Module 3: Geometry and measurement

- Q1 $\theta = \frac{360}{5} = 72$
Q2 $XZ = \sqrt{38.5^2 + 24.0^2} \approx 45.4$
Q3 $139^\circ \text{ E}, 25^\circ \text{ E}, 3^\circ \text{ W}, 58^\circ \text{ W}$
Q4 $V = \frac{1}{3}\pi \times 5^2 \times 1.8 + \pi \times 5^2 \times 16 \approx 1304$
Q5

Q6 $r = \sqrt{10^2 - 8^2} = 6$

Q7 $\frac{\sin \theta}{7} = \frac{\sin 26^\circ}{4}, \theta \approx 50^\circ \text{ or } 130^\circ$

The third angle: $180 - 50 - 26 = 104^\circ$ or $180 - 130 - 26 = 24^\circ$

Q8 Shaded area $\approx \frac{1}{2} \times 100^2 \sin 60^\circ - \frac{1}{2} \times \pi \times 50^2 \approx 403$

Module 4: Graphs and relations

- Q1
Q2
Q3 $100 = k \times 5^2, k = 4$
Q4 $500 + 240 + 200 = 940$
Q5
Q6 $2a + 3c = 69.50$ and $a + 5c = 78.50$
 $\therefore a = 16$ and $c = 12.5$
 $\therefore 3a + 4c = 98.00$
Q7 $150x + 50 \times \frac{x}{2} = 0.8 \times 200 + 250, x = 2.35$
Q8

Please inform mathline@itute.com re conceptual and/or mathematical errors