



## 2016 VCAA Further Mathematics

### Sample (v2 April) Exam 1 Solutions © 2016 itute.com

#### SECTION A - Core

##### Data analysis Recursion and financial modelling

1	2	3	4	5	6	7	8	9	10	11	12
B	D	C	B	A	B	B	A	C	E	B	D

13	14	15	16	17	18	19	20	21	22	23	24
A	E	E	B	D	C	D	B	C	C	C	E

#### SECTION B

##### Module 1: Matrices

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

##### Module 2: Networks and decision mathematics

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

##### Module 3: Geometry and measurement

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

##### Module 4: Graphs and relations

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

#### SECTION A - Core

##### Data analysis

- Q1 The 14<sup>th</sup> entry **B**
- Q2 68% of 2850 = 1938 **D**
- Q3 By CAS **C**
- Q4 Distance is a **continuous** variable; type of car used a whole number as a **code**; postcode used a 4-digit number as a **code**. **B**
- Q5 **A**
- Q6 **B**
- Q7  $\log_{10} 10 = 1.0$ , frequency of  $\log_{10} 10 > 1.0$  is 1, percentage of countries with  $\log_{10} 10 > 1.0$  is  $\frac{1}{58} \approx 2\%$  **B**
- Q8 Upper fence =  $Q_3 + 1.5 \times \text{IQR} = 80$ , ∴ 2 outliers **A**
- Q9 **C**
- Q10 **E**
- Q11 Slope =  $\frac{6.7 - 10.7}{1700 - 900} = -0.005$  **B**
- Q12 **D**
- Q13  $\frac{\text{actual}}{1.25} = \text{actual} \times 0.80$  **A**
- Q14 Sum of indices = 12 **E**
- Q15 Deseasonalised value =  $\frac{213956}{0.89} = 240400$  **E**
- Q16 **B**

#### Recursion and financial modelling

- Q17 **D**
- Q18 **C**
- Q19  $\left(1 + \frac{6.75}{365 \times 100}\right)^{365} - 1 \approx 0.0698 = 6.98\%$  **D**
- Q20  $1 + \frac{0.096}{12} = 1.008$  **B**
- Q21  $400\,000.00 - 34\,572.00 = 365\,428.00$  **C**
- Q22  $254\,931.44 - 215\,717.24 = 39\,214.20$  **C**
- Q23 3.2% of 133 484.14  $\approx 4271.49$  **C**
- Q24 Relatively slow exponential decay **E**

#### SECTION B

##### Module 1: Matrices

- Q1 **B**
- Q2  $\begin{bmatrix} 1 & 3 \\ 2 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 9 \\ 16 \end{bmatrix}$ ,  $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -5 & 3 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} 9 \\ 16 \end{bmatrix}$  **E**
- Q3 Statements I and II are true. **C**

$$Q4 \begin{bmatrix} 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \end{bmatrix}^2 = \begin{bmatrix} 0 & 1 & 2 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix}$$

Sum of 1-step and 2-step dominances: A5, B2, C3, D4  
 Ranking: Ash (1), Dan (2), Con (3), Binh (4) **E**

- Q5  $S_1 = TS_0 - C = \begin{bmatrix} 180 \\ 130 \end{bmatrix}$ ,  $S_2 = TS_1 - C = \begin{bmatrix} 148 \\ 122 \end{bmatrix}$  **B**
- Q6 **C**
- Q7 **C**
- Q8  $S_1 = T^{-1}S_2 = \begin{bmatrix} 400 \\ 0 \\ 200 \end{bmatrix}$  **D**

##### Module 2: Networks and decision mathematics

- Q1 **D**
- Q2 **D**
- Q3  $4 + 1 + 3 + 2 = 10$  **B**
- Q4 **A**
- Q5 All vertices have even degree in the second graph. **B**
- Q6 Not the first graph **D**
- Q7 **E**
- Q8 Minimum cut = 17 **B**


**Module 3: Geometry and measurement**

Q1  $\frac{64}{360} \times \pi 2.5^2 \approx 3.49$  B

Q2 D

Q3  $\left(\frac{4}{6}\right)^3 \times 5.40 = 1.60$  A

Q4 Height =  $\sqrt{5^2 - 3^2} = 4$  C

Total area =  $(5 + 4 + 5) \times 12 + 2 \times \frac{1}{2} (4 + 10) \times 4 = 224$  C

Q5  $\angle BAC = \cos^{-1} \left( \frac{1900^2 + 2050^2 - 2250^2}{2 \times 1900 \times 2050} \right) \approx 69^\circ$  E

The bearing of C from A  $\approx 140^\circ + 69^\circ = 209^\circ$  E

Q6  $A = \sqrt{s(s-a)(s-b)(s-c)} = \sqrt{3100 \times 1200 \times 1050 \times 850}$  A

Q7 radius =  $6400 \sin 50^\circ \approx 4903$  B

Q8  $\overline{AC}^2 = 8^2 - 4^2 = 48$ ,  $\overline{AB}^2 = \frac{48}{2} = 24$ ,  $V = 24 \times 4 = 96$  B

**Module 4: Graphs and relations**

Q1 B

Q2 E

Q3 D

Q4 Average speed =  $\frac{\text{distance}}{\text{time taken}} = \frac{90}{2} = 45$  A

Q5 Cost =  $16 + 19.5 \times \text{hours} = 113.50$  D

Q6 B

Q7 Max Z =  $2 \times 4 + 3 \times 4 = 20$  C

Q8  $y \geq 2x$ ,  $x + y \geq 40$ ,  $x \geq 10$ ,  $y \leq 30$  C

Please inform [mathline@itute.com](mailto:mathline@itute.com) re conceptual, mathematical and/or typing errors