2018 VCAA Further Mathematics Exam 1 Solutions

SECTION A Core

Data analysis

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

Recursion and financial modelling

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

SECTION B

Module 1: Matrices

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

Module 2: Networks and decision mathematics

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

Module 3: Geometry and measurement

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

Module 4: Graphs and relations

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

SECTION A Core

Data analysis

Q1 $\frac{5}{25} = 20\%$ C

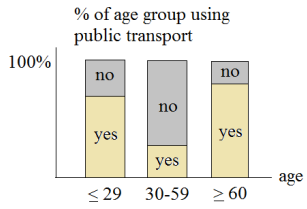
Q2 A

Q3 $69 - 4 \times 2.5 = 59$ A

Q4 $34\% + 50\% = 84\%$ E

Q5 $(2.5\% + 16\%) \times 200 = 37$ B

Q6 D



Q7 Residue = actual – predicted $= 63 - 64 = -1$ B

Q8 D

Q9 $-\sqrt{0.8339} \approx -0.913$ A

Q10 B

Q11 A

Q12 $\log_{10}(y) = 3.1 - 2.3 \times 1.1 = 0.57$, $y \approx 3.7$ E

Q13 $r\frac{s_y}{s_x} = b$, $r = \frac{bs_x}{s_y} = \frac{1.31 \times 2.33}{3.24} \approx 0.94$ D

Q14 C

Q15 April-May: 3241.25, May-June: 3346.5

May: $\frac{3241.25 + 3346.5}{2} \approx 3294$ B

Q16

2016 quarterly average ≈ 2.2925, 2016 q3 index $\approx \frac{3.34}{2.2925} \approx 1.4569$

2017 quarterly average ≈ 1.5775, 2017 q3 index $\approx \frac{2.05}{1.5775} \approx 1.2995$

Average q3 index $\approx \frac{1.4569 + 1.2995}{2} \approx 1.38$ C

Recursion and financial modelling

Q17 D

Q18

$V_1 = 1.0034 \times 46000.00 + 500 = 46656.40$

$V_2 = 1.0034 \times 46656.40 + 500 = 47315.03$

$V_3 = 1.0034 \times 47315.03 + 500 = 47975.90$, $V_3 - V_2 \approx 661$ C

Q19 Compare Loan I and Loan IV

Loan I: $5000\left(1 + \frac{0.126}{52}\right)^{52} \approx 5670.55$

Loan IV: $5000\left(1 + \frac{0.127}{4}\right)^{4} \approx 5665.89$ D

Q20 The graph has two linear sections, and the second section has a steeper negative gradient. B

Q21 $P_0 = 1.0047 \times P_0 - 846$, $P_0 = 180000$ B

Q22 Amount owing after 59 repayments ≈ 3557.0892

60th repayment $\approx 3557.0892\left(1 + \frac{0.0372}{12}\right) \approx 3568.12$ E

Q23

Before the change: $(229023.86 - 2200) \times \frac{r}{12} = 961.90$, $r \approx 0.050889$

After the change: $(227785.76 - 2200) \times \frac{r}{12} = 1002.26$, $r \approx 0.053315$

Increase by $0.053315 - 0.050889 \approx 0.0024 = 0.24\%$ A

Q24

N = 24, I% = 3.24, PV = −265298.48, PMT = −1000,
P/Y = 12, C/Y = 12, FV = 307794.4996

N = 96, I% ≈ 3.20, PV = −307794.4996, FV = 600000,
P/Y = 12, C/Y = 12, PMT = −1854.05 E

SECTION B

Module 1: Matrices

Q1 D

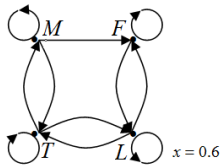
Q2 E

Q3 A

Q4 $\begin{bmatrix}0&0&1&0\\0&1&0&0\\1&0&0&0\\0&0&0&1\end{bmatrix}\begin{bmatrix}a\\b\\c\\d\end{bmatrix}=\begin{bmatrix}c\\b\\a\\d\end{bmatrix}$ B

Q5 $\begin{bmatrix}c\\r\\s\\w\end{bmatrix}=\begin{bmatrix}5&7&6&8\\8&6&9&7\\7&8&7&6\\8&8&5&5\end{bmatrix}^{-1}\begin{bmatrix}160\\172\\165\\162\end{bmatrix}=\begin{bmatrix}8\\6\\1\\9\end{bmatrix}$ B

Q6 C



Q7 $A_3=TA_2-D,\ A_2=T^{-1}(A_3+D)=\begin{bmatrix}1630\\2800\\2270\end{bmatrix}\begin{matrix}E\\N\\W\end{matrix}$ E

Q8 $\dfrac{96}{500}=0.192,\ T^{50}\approx\begin{bmatrix}0.098&0.098&0.098&0.098&0.098\\0.192&0.192&0.192&0.192&0.192\\0.248&0.248&0.248&0.248&0.248\\0.302&0.302&0.302&0.302&0.302\\0.159&0.159&0.159&0.159&0.159\end{bmatrix}$ B

Module 2: Networks and decision mathematics

Q1 B

Q2 C

Q3 E

Q4 D

Q5 Critical paths: *ADHK* or *BFJK* , .: *C*, *E*, G and *I* could be delayed. B

Q6 D

Q7 Critical path: *ACFGI*, $4+7+2+4+3=20$ C

Q8 Total completion time for the allocation $T=12$
$k\neq 0$. If $k=1$, minimum total time $=11$.
If $k=2$, minimum total time $=12$.
If $k=3$ or 4, minimum total time $=12$.
.: k is at least 2 for T to be minimum. C

Module 3: Geometry and measurement

Q1 $\text{Length}=\sqrt{8^2+15^2}=17$ B

Q2 $\text{Area}=\dfrac{1}{2}\times 26\times 18\sin 30°=117$ A

Q3 $\text{Arc length}=6400\times\dfrac{\pi}{180}\times(90-25)=\dfrac{65}{180}\times\pi\times 6400$ C

Q4 $\angle TUV=(180-69-47)°=64°$
Angle between VU and north $=(64-30)°=34°$
Bearing of U from $V=(360-34)°=326°$ E

Q5 4 minutes per degree C

Q6 Total distance
$=5.4+2.8+\sqrt{5.4^2+2.8^2-2\times 5.4\times 2.8\cos(180-60-45)°}\approx 13.6$ C

Q7 $\text{Area}=\dfrac{110}{360}\pi(39^2-9^2)\approx 1382$ B

Q8 $V=\dfrac{1}{3}\pi(2.5^2)\sqrt{x^2-2.5^2}=36,\ x\approx 6.04188$
$\text{Area}\approx\pi(2.5)(2.5+6.04188)\approx 67$ D

Module 4: Graphs and relations

Q1 $\dfrac{0-2}{4-0}=-\dfrac{1}{2}$ C

Q2 D

Q3 D

Q4 $m=\dfrac{200-100}{45-20}=4,\ d=4t+c$ B

Q5 $y=k\left(\dfrac{1}{x^2}\right),\ 2=k(1)$
.: $y=\dfrac{2}{x^2}$ and $(1, 2)$ satisfies the equation. A

Q6 Let *S* be the selling price per quilt.
$80S=800+35\times 80+1200,\ S=60$ E

Q7 Line *MN* : $y=-2x+10,\ 2x+y=10$ C

Q8 Judy: $8t+10d+2.55=16.75$, Pat: $20t+18d+2.55=30.35$
Solve $t=0.4$ and $d=1.1$
.: Roy: $10t+15d+2.55=10(0.4)+15(1.1)+2.55=23.05$ D

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