2003 VCAA Further Mathematics Exam 2 Solutions
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Core

Q1a Mean $= \$6.51$, standard deviation $= \$3.31$.

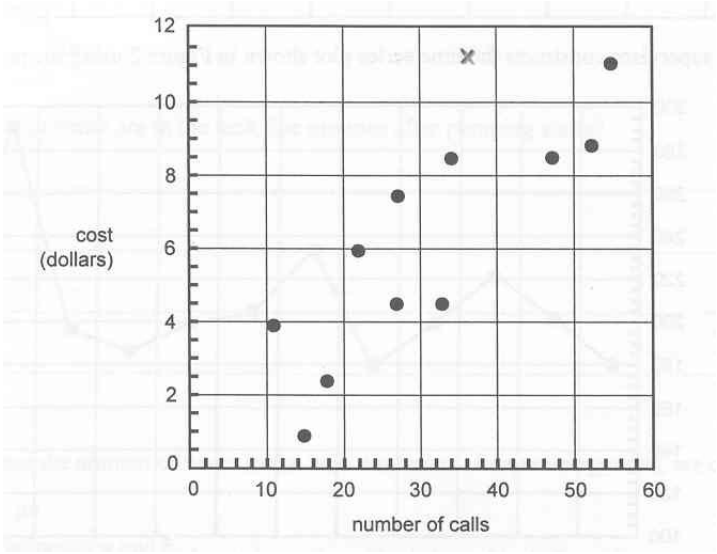
Q1b For the sample of 12 workers, 9 workers are above the mean, percentage $= \frac{9}{12} \times 100\% = 75\%$.

Q1ci Cost $= 0.66 + 0.19 \times$ number of calls

Q1cii $r = 0.8049$

Q1d linear

Q1e



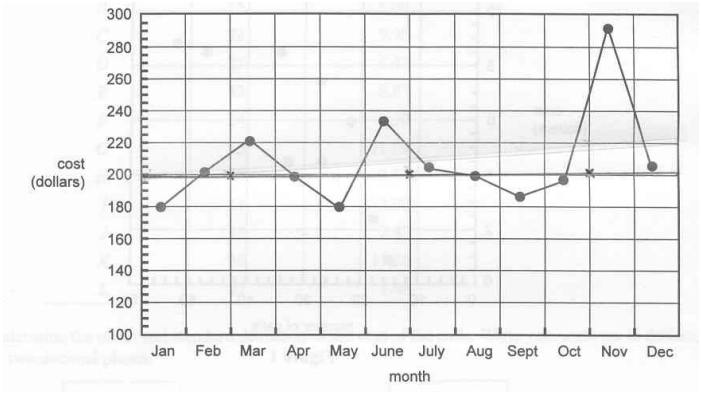
Q1f cost of calls

Q1gi by 19 cents per call

Q1gii 65%

Q1h Predicted value $= 7.12$,
Residual value $= 8.50 - 7.12 = 1.38$

Q2a



Q2b Yes, smoothed time series has a positive gradient (very gentle).

Q2c There are twelve pairs of data values and they divide neatly into three groups of four.

Module 1: Number patterns and applications

Q1a $10000 + 800 = 10800$ litres

Q1b $10000 + 800 \times 5 = 14000$ litres

Q1c $a = 10000$, $b = 800$

Q1d Number of minutes $= \frac{20000}{800} = 25$

Q2a At the end of the first week, volume of water in the tank $= 30000 \times 0.95 = 28500$ litres

Q2b At the end of the fourth week, volume of water in the tank $= 30000 \times 0.95^4 = 24435$ litres

Q2c $30000 \times 0.95^n < 10000$, $0.95^n < \frac{1}{3}$, $n = 22$ (graphics calc.). End of 22^{nd} week.

Q3a Usage increases by 10% means the usage is 110% of previous week's . $r = 110\% = 1.1$

Q3b Geometric series, $n = 5$, $a = 6000$, $r = 1.1$,
$S_5 = \dfrac{6000\left(1.1^5 - 1\right)}{1.1 - 1} = 36631$ litres

Q3c $G_1 = 8000$,
$G_2 = 0.98G_1 + 100 = 0.98 \times 8000 + 100 = 7940$,
$G_3 = 0.98G_2 + 100 = 0.98 \times 7940 + 100 = 7881$.

7881 litres in the third week.

Q3d

Week	O'Callaghans	Gerbers
1	6000	8000
2	6600	7940
3	7260	7881
4	7980	7823

Week 4.

Module 2: Geometry and trigonometry

Q1a $\overline{BC} = \sqrt{2.20^2 + 8.21^2} = 8.50$ metres

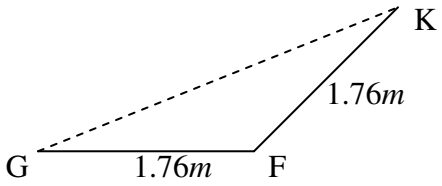
Q1b $\tan \angle ACB = \dfrac{2.20}{8.21}$, $\angle ACB = 15^o$

Q2a There are eight equal sides of a regular octagon and each side subtends the same angle at the centre.
$\therefore \angle GOH = \dfrac{360^o}{8} = 45^o$.

Q2b Area of $\Delta GOH = \dfrac{1}{2} \times 2.30^2 \sin 45^o = 1.87$,
Area of the octagonal paved area $= 1.87 \times 8 = 15m^2$

Q2c $\overline{GH} = 2 \times 2.30 \sin\left(\dfrac{45^o}{2}\right) = 1.76m$.

Q2di

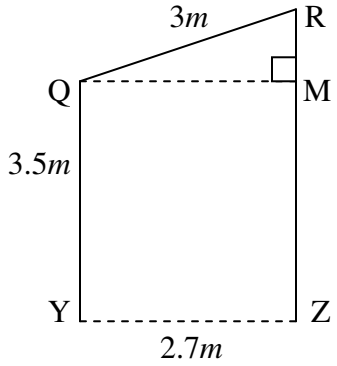


$\angle GFK = 180 - 45 = 135^o$, $\angle FGK = \dfrac{45^o}{2} = 22.5^o$
$\overline{GK} = 2 \times 1.76 \cos 22.5^o = 3.25m$.

Q2dii $\overline{OK} = 2.30 + 3.25 = 5.55m$.

Q2e Use the sine rule, $\dfrac{\overline{PR}}{\sin 105^o} = \dfrac{3}{\sin 35^o}$,
$\overline{PR} = 5.05m$.

Q2f



Consider ΔQMR, use Pythagoras' theorem,
$\overline{RM} = \sqrt{3^2 - 2.7^2} = 1.31m$,
$\therefore \overline{RZ} = 1.31 + 3.50 = 4.81m$, i.e. $4m\ 81cm$.

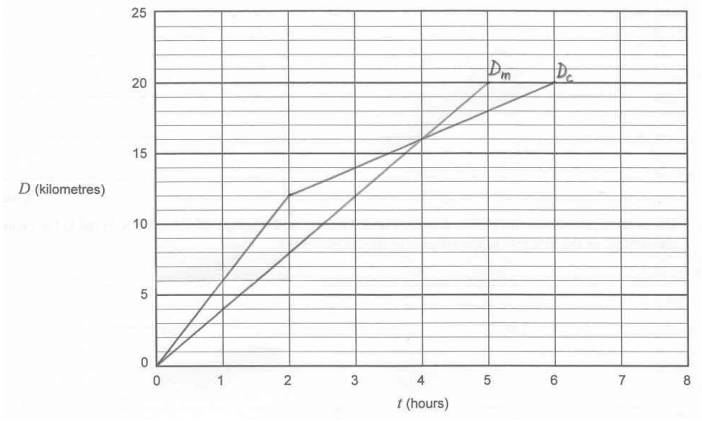
Q3a $V = \dfrac{1}{3}\pi \times 0.6^2 \times 0.7 = 0.26m^3$.

Q3b The first pile has the length measures half of the corresponding length measures of the second pile,
$\therefore \dfrac{V_1}{V_2} = \left(\dfrac{1}{2}\right)^3 = \dfrac{1}{8}$.

Module 3: Graphs and relations

Q1a Distance $= vt = 4 \times 1.5 = 6km$.

Q1b and c



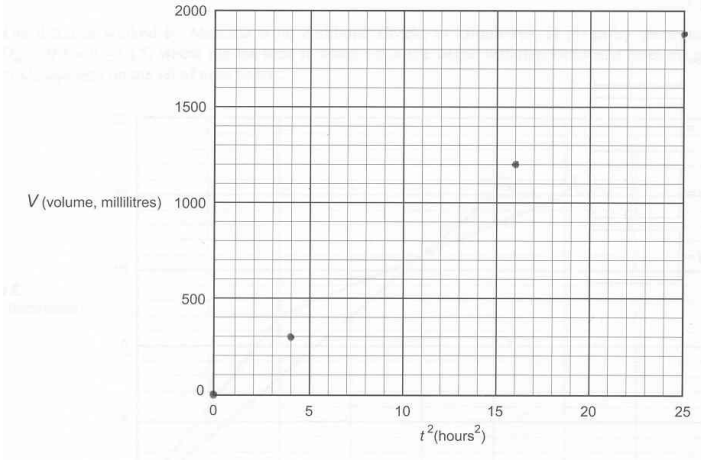
Q1d 4 hours (Read from graph).

Q1e $a = 6$, $b = 2$, $d = 6$,
$12 = 2 \times 2 + h$, $\therefore h = 8$.

Q2ai

t	0	2	4	5
t^2	0	4	16	25
V	0	300	1200	1875

Q2aii



Q2b k = gradient of V-t^2 graph $= \dfrac{1200}{16} = 75$.

Q2c $V = 75t^2 = 75 \times 3^2 = 675ml$

Q2di When $V = 1000$, $75t^2 = 1000$, $t = 3.65hours$.

Q2dii At $t = 3.65hours$, $D_m = 4 \times 3.65 = 14.6$,
$D_c = 2 \times 3.65 + 8 = 15.3$.
Distance apart $= D_c - D_m = 15.3 - 14.6 = 0.7km$

Module 4: Business-related mathematics

Q1a Discount $= 3450 - 3100 = 350$,
$\therefore$ % discount $= \dfrac{350}{3450} \times 100\% = 10.1\%$.

Q1bi Total cost $= 200 + 275 \times 12 = \$3500$

Q1bii Interest $= 3500 - 3100 = 400$
Flat rate of interest $= \dfrac{400}{3100 - 200} \times 100\% = 13.8\%$.

Q1ci $n = 24$, $P = 3100$, $A = 0$.

Q1cii $R = 1 + \dfrac{9}{12 \times 100} = 1.0075$,

$$Q = \frac{PR^n(R-1)}{R^n - 1} = \$141.62$$

Q1ciii Total cost $= 141.62 \times 24 = \$3399$

Q1d Discount King's terms offer the lowest total cost.
The difference $= 3500 - 3399 = \$101$

Q2a Depreciated value $= 3100 \times 0.85^3 = \$1904$.

Q2b Depreciated value $= 3100 - 0.030 \times 15000$
$= \$2650$.

Q2c $1904 = 3100 - 15000x$, where x is the unit cost in dollars, $\therefore x = 0.080$.
Unit cost $= 8.0$ cents.

Module 5: Networks and decision mathematics

Q1a cut A = 14, cut B = 23, cut C = 12.

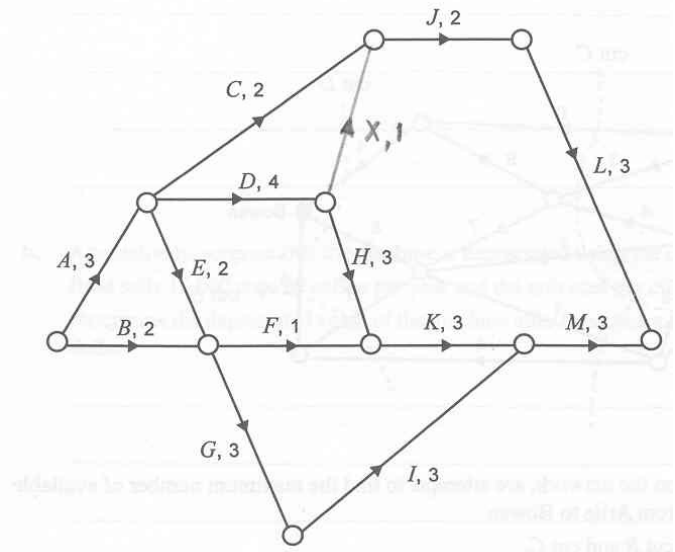
Q1b Cut E does not cut off the path from Arlie to Bowen.

Q1c Capacity of cut C is the minimum, 12.

Q2a

	Immediate predecessor(s)	EST
A	–	0
B	–	0
C	*A*	3
D	*A*	3
E	*A*	3
F	*B, E*	5
G	*B, E*	5
H	*D*	7
I	*G*	8
J	*C, X*	8
K	*F, H*	10
L	*J*	10
M	*I, K*	13
X	*D*	7

Q2b



Q2ci duration $= 16$ hours.

Q2cii It indicates the completion time for the entire project.

Q2d $x + 3 + 3 + 3 = 16$, $x = 7$
Max time for B = 7 hours.

Q3a EST = 3 + 2 + 1 = 6 hours.

Q3b Critical path = *A-C-J-L*

Q3c LST = $(3 + 2 + 2 + 3) - 2 = 8$ hours.

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

