

# 2007

## VCE Further Mathematics Trial Examination 2

# Suggested Solutions

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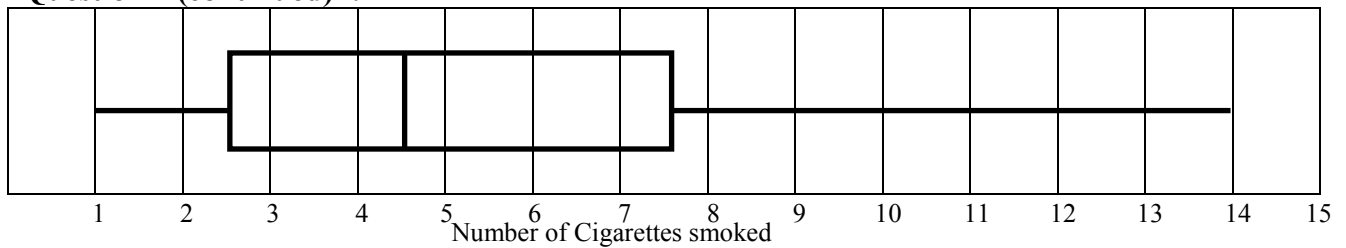
Question 1 a.

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Total
Smoke	4	16	21	36	39	50	166
Do not Smoke	71	59	54	39	36	25	284

$\frac{1}{2}$  mark for each correct value

<p><b>b.</b> <math>\frac{93}{150} \times 100 = 62\%</math>  (1 mark)</p>	<p><b>c.</b> Smoking/non smoking is a categorical variable (1 mark)</p>
<p><b>Question 2 a.</b> On graphics calculator enter data for number of cigarettes smoked for 12 children in Stat Edit in <math>L_1</math>. Go to Stat calc 1 Var Stats <math>L_1</math> Enter and read off the value for the median <math>Med=4.5</math>  <math>\left(\frac{1}{2} \text{ mark}\right)</math></p>	<p><b>b.</b> Using the same screen on the calculator read off <math>Q_1</math>, the lower quartile = 2.5  <math>\left(\frac{1}{2} \text{ mark}\right)</math></p>
<p><b>c.</b> Using the same screen on the calculator read off <math>Q_3</math>, the upper quartile = 7.5  <math>\left(\frac{1}{2} \text{ mark}\right)</math></p>	<p><b>d.</b> Interquartile range = <math>Q_3 - Q_1 = 7.5 - 2.5 = 5</math>  <math>\left(\frac{1}{2} \text{ mark}\right)</math></p>
<p><b>e.</b> <math>1.5 \times 5 = 7.5</math> <math>Q_1 - 7.5 &lt; 0</math> <math>Q_3 + 7.5 = 15</math> No data lies inside the range <math>0 &lt; x &lt; 15</math> <math>\therefore</math> no outliers  (1 mark)</p>	

Question 1 (continued) f.



(1 mark)

g. 75%

(1 mark)

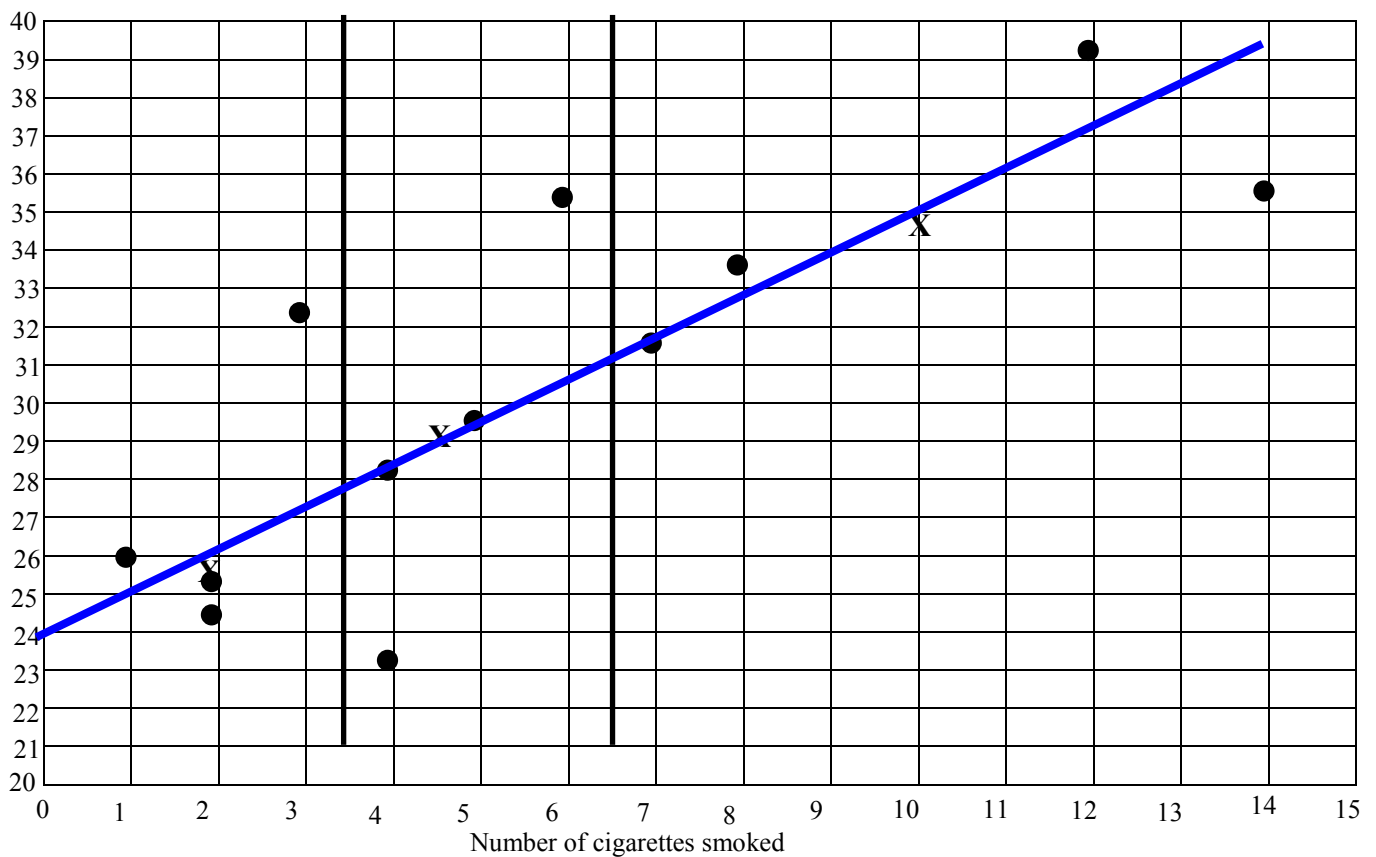
Question 3

a. On graphics calculator enter data for the time taken to run 200 m for 12 children in Stat Edit in  $L_2$ . Go to Stat calc 1 Var Stats  $L_2$  Enter and read off the value for the mean, 30.5 and the standard deviation, 5.0

(1 mark)

b. On graphics calculator go to 2<sup>nd</sup> Dist normal cdf Enter  $-1, 2.5$  enter. this gives  $0.835 = 83.5\%$   
(1 mark)

c.



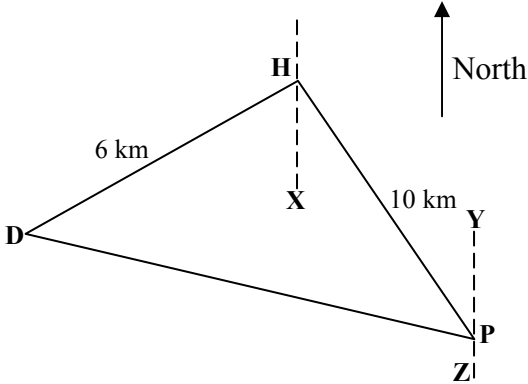
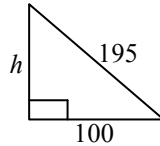
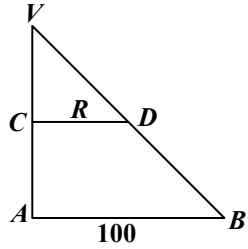
(1 mark)

Question 3 (continued)

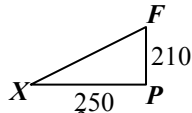
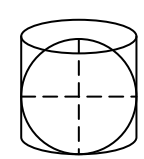
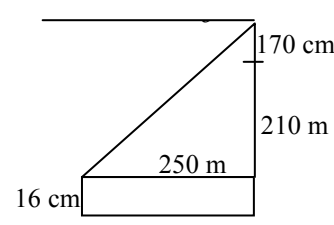
<p><b>d.</b></p> $\text{gradient} = \frac{y_u - y_l}{x_u - x_l}$ $x_l = 2$ $y_l = \frac{25.4 + 26}{2} = 25.7$ $x_u = \frac{8 + 12}{2} = 10$ $y_u = \frac{33.9 + 35.6}{2} = 34.75 \text{ (1 mark)}$ $\text{gradient} = \frac{34.75 - 25.7}{10 - 2}$ $= 1.13 \text{ to two decimal places. (1 mark)}$	<p><b>e.</b></p> <p>Put ruler on line joining points (2, 25.7) and (10, 34.75). Move ruler one third of the way towards (4.5, 29.05). This is</p> $x_m = \frac{4 + 5}{2} = 4.5$ <p>and</p> $y_m = \frac{28.3 + 29.8}{2} = 29.05$ <p>(1 mark)</p>
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<p><b>Question 1 a.</b>                  Customers increase by 30 each year.  <math>2004 = 140 + 30 = 170</math>  <math>2005 = 170 + 30 = 200</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>b.</b>                  Arithmetic sequence  <math>t_n = a + (n - 1)d</math>  <math>t_{11} = 80 + 10 \times 30</math>  <math>t_{11} = 80 + 300</math>  <math>t_{11} = 380</math>                  or use graphics calculator in sequence mode.  <math>y =</math>                  enter  <math>nMin = 1</math>  <math>m_n = 80 + (n - 1)30</math>  <math>m(nMin) = 80</math>                  Press 2nd table                  Go to <math>n = 11</math>, to find <math>m(n) = 380</math></p> <p style="text-align: right;">(1 mark)</p>
<p><b>c.</b>                  Use sequence mode <math>y =</math>  <math>nMin = 1</math>  <math>\mu_n = 80 + (n - 1)30</math>  <math>\mu(nMin) = 80</math>                  Press 2nd table                  Go to <math>\mu_n = 500</math>, to find <math>n = 15</math>                  Year = 2015</p> <p style="text-align: right;">(1 mark)</p>	<p><b>d.</b>                  From the table in (c)                  Number of customers in 2009 = 320                  Number of customers in 2019 = 620  <math>S_n = \frac{n}{2}(a + l) = \frac{11}{2}(320 + 620) = 5170</math></p> <p style="text-align: right;">(1 mark)</p>
<p><b>Question 2 a.</b>  <math>4\% = 0.04</math>  <math>3.00 + 0.04 \times 3.00 = \\$3.12</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>b.</b>                  This is a geometric sequence with  <math>r = 1.04</math>  <math>a = 3.00</math>  <math>C_n = 3.00(1.04)^{n-1}</math></p> <p style="text-align: right;">(1 mark)</p>

<p><b>Question 2 c.</b>  <math>t_{10} = 3(1.04)^9</math>  <math>t_4 = 3(1.04)^3</math>  <math>t_{10} - t_4 = 3(1.04)^9 - 3(1.04)^3 = 0.8953</math>  <math>= 90</math> cents                  or use graphics calculator sequence mode with equation  <math>m(n) = 3(1.04)^{\delta n}</math>                  This gives <math>m(n) = 4.27</math> when <math>n = 10</math>                  and <math>m(n) = 3.37</math> when <math>n = 4</math>  <math>4.27 - 3.37 = 0.90 = 90</math> cents.                  (1 mark)</p>	<p><b>d.</b>                  Total cost if she sells one rose per year  <math>S_n = \frac{a(r^n - 1)}{r - 1}</math>  <math>S_6 = \frac{3(1.04^{10} - 1)}{(1.04 - 1)} = 36.01832137</math> (1 mark)                  total cost for 8000 per year  <math>= 8000 \times 36.01832137 = \\$288,146.57</math> (1 mark)</p>
<p><b>Question 3 a.</b>  <math>a = 1 + \frac{20}{100} = 1.2</math>                  (1 mark)</p>	<p><b>b.</b>                  A minus sign is necessary because overheads decrease the profit.  <math>- 10,000</math> (1 mark)</p>
<p><b>c.</b>                  Use graphics calculator in sequence mode.  <math>y =</math>                  enter  <math>nMin = 1</math>  <math>\mu(n) = 1.2 \mu(n - 1) - 10000</math>  <math>\mu(nMin) = 65000</math>                  Press 2nd table                  Go to <math>n = 8</math>, to find <math>\mu(n) = 103748</math>                  Profit = \$103,748                  (1 mark)</p>	<p><b>d.</b>                  Equation is now <math>\mu_n = 1.2\mu(n - 1) - 30000</math> (1 mark)                  Use graphics calculator in sequence mode.  <math>y =</math>                  enter  <math>nMin = 1</math>  <math>\mu(n) = 1.2 \mu(n - 1) - 30000</math>  <math>\mu(nMin) = 103748</math>                  Press 2nd table and look for the first negative value in <math>\mu(n)</math>.                  8 years later she will make her first loss.                  This is the year 2016.                  (1 mark)</p>

<p><b>Question 1 a.</b></p>  <p><math>\angle DHX = 40^\circ</math>  <math>\angle XHP = \angle HPY = 30^\circ</math> (alternate angles)  <math>\therefore \angle DHP = 40^\circ + 30^\circ = 70^\circ</math></p> <p>(1 mark)</p>	<p><b>b.</b>              Using cosine rule  <math>DP^2 = 6^2 + 10^2 - 2 \times 6 \times 10 \cos 70^\circ</math>  <math>DP = \sqrt{6^2 + 10^2 - 2 \times 6 \times 10 \cos 70^\circ}</math>  <math>DP = 9.74 \text{ km}</math></p> <p>(1 mark)</p>
<p><b>d.</b></p> <p>Area = <math>\frac{1}{2}bc \sin A</math>              Area = <math>\frac{1}{2} \times 6 \times 10 \sin 70^\circ = 28.19 \text{ km}^2</math></p> <p>(1 mark)</p>	<p><b>c.</b></p> <p><math>\frac{\sin \angle HPD}{6} = \frac{\sin 70^\circ}{9.74461845}</math>  <math>\sin \angle HPD = \frac{6 \sin 70^\circ}{9.74461845}</math>  <math>\angle HPD = \sin^{-1} \left( \frac{6 \sin 70^\circ}{9.74461845} \right) = 35^\circ</math> (1 mark)  <math>\angle DPZ = 360 - (30 + 35) = 295^\circ T</math> (1 mark)</p> <p><b>Question 2 a.</b></p>  <p><math>h^2 = 195^2 - 100^2</math>  <math>h = \sqrt{195^2 - 100^2}</math>  <math>h = 167.4 \text{ m to one decimal place}</math></p> <p>(1 mark)</p>
<p><b>b.</b></p> <p>Triangles <math>VCD</math> and <math>VAB</math> are similar AAA  <math>\therefore \frac{R}{100} = \frac{3}{4}</math>  <math>\therefore R = 75 \text{ m.}</math></p> <p>(1 mark)</p>	<p><b>c.</b></p>  <p>(1 mark)</p>

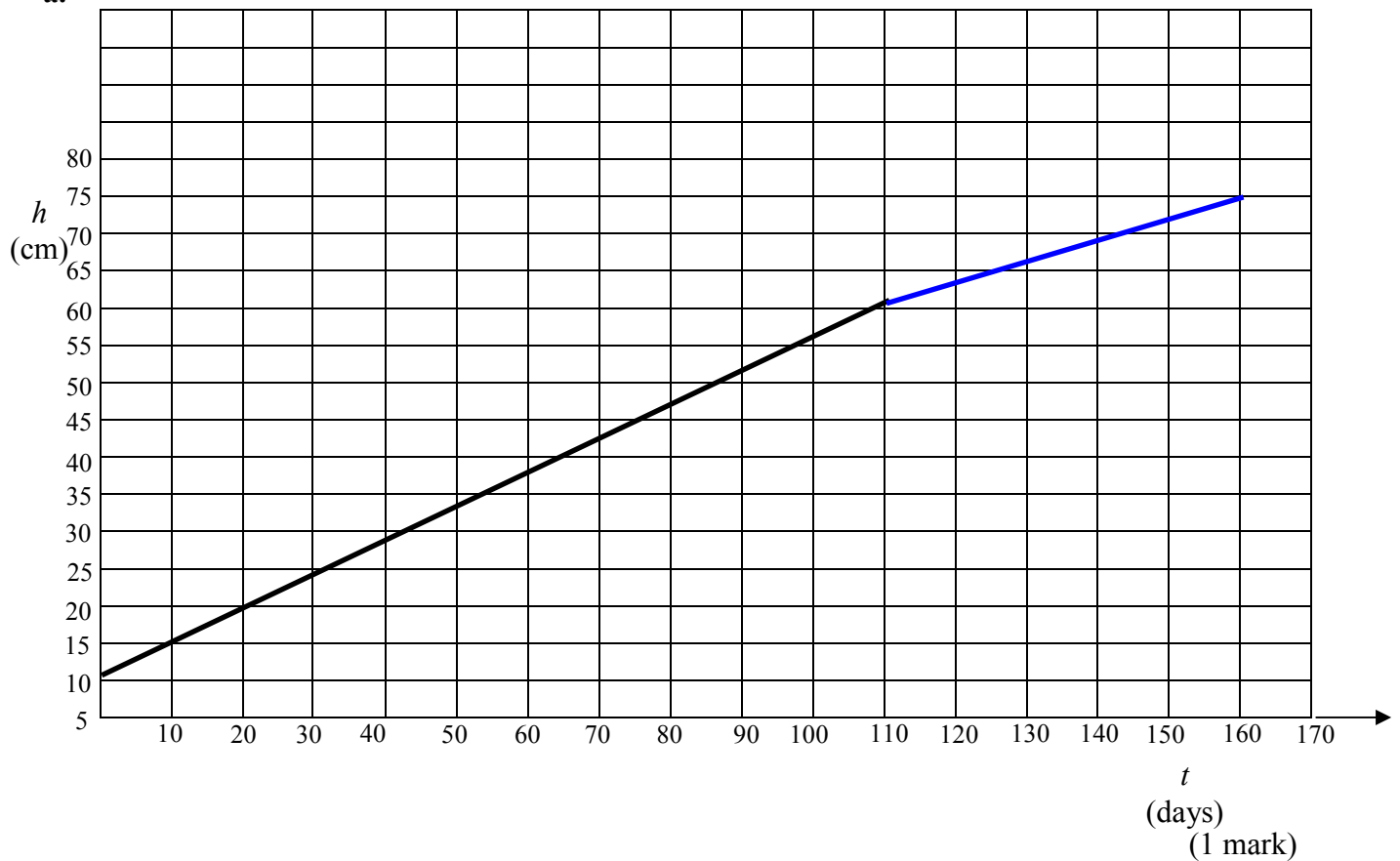


<p><b>Question 2 (continued) c.</b></p> <p>Original volume = <math>\frac{1}{3}\pi r^2 h</math></p> <p>Original volume = <math>\frac{1}{3}\pi \times 100^2 \times 167.4</math>  <math>= 1753008.701</math></p> <p>Volume removed = <math>\frac{1}{3}\pi \times 75^2 \times 125.55</math>  <math>= 739550.5456</math> (1 mark)</p> <p>Volume of coal remaining  <math>= 1753008.701 - 739550.5456</math>  <math>= 1013458.2 \text{ m}^3</math></p> <p>(1 mark)</p>	<p><b>Question 3 a.</b></p>  <p><math>XF^2 = 210^2 + 250^2</math></p> <p><math>XF = \sqrt{210^2 + 250^2}</math>  <math>= 326.5 \text{ m}</math></p> <p>(1 mark)</p>
<p><b>b.</b></p> <p>Radius of sphere = 8</p>  <p><math>V</math> of sphere = <math>\frac{4}{3}\pi r^3</math>  <math>= \frac{4}{3}\pi 8^3 = 2144.66 \text{ cm}^3</math></p> <p>(1 mark)</p> <p><math>R</math> of cylinder = 8</p> <p><math>V</math> of cylinder = <math>\pi r^2 h = \pi \times 8^2 \times 16 = 3216.99</math></p> <p>Space = <math>3216.99 - 2144.66 = 1072 \text{ cm}^3</math>          to the nearest <math>\text{cm}^3</math></p> <p>(1 mark)</p>	<p><b>c.</b></p>  <p>(1 mark)</p> <p><b>Question 3 d.</b></p> <p><math>\tan \theta = \frac{210 + 1.7 - 0.16}{250} = \frac{211.54}{250}</math></p> <p>(1 mark)</p> <p><math>\theta = \tan^{-1}\left(\frac{211.54}{250}\right) = 40^{\circ}14'</math></p> <p>(1 mark)</p>

<p><b>Question 1 a.</b>                  30 cm.                  (1 mark)</p>	<p><b>b.</b>                  One complete cycle = 4 secs.                  (1 mark)</p>
<p><b>c.</b>                  30 cm to the right of the rest position.                  (1 mark)</p>	

**Question 2**

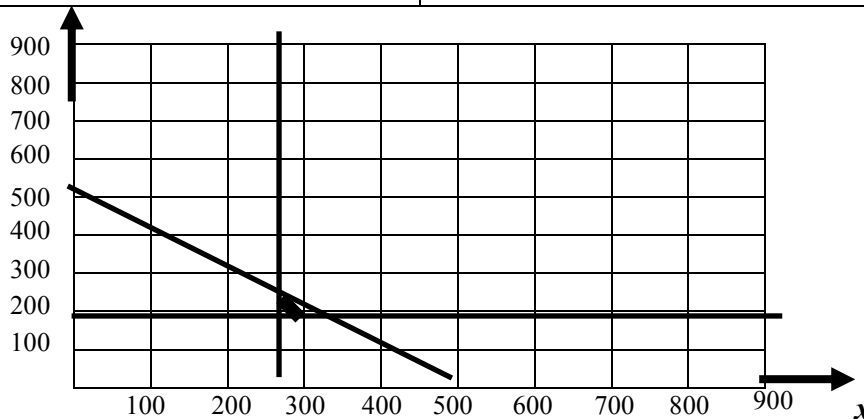
**a.**



<p><b>b.</b>                  Plant grows 50 cm in 110 days.  <math>\frac{50}{110} = 0.45 \dot{\text{cm}}/\text{day}</math>                  (1 mark)</p>	<p><b>c.</b>  <math>h = 0.45t + 10</math>                  (1 mark)</p>
<p><b>d.</b>                  Value of <math>a</math> is <math>h</math> value at end of first period of growth = 60                  (1 mark)</p>	<p><b>e.</b>  <math>h = 0.1t + 60</math>  <math>t = 160</math>  <math>h = 0.1 \times 160 + 60 = 76 \text{ cm.}</math>                  Join (110,60) and (160,76) on graph.                  (1 mark)</p>

<p><b>Question 3 a.</b>  <math>y \geq 180</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>b.</b>  <math>x + y \leq 500</math></p> <p style="text-align: right;">(1 mark)</p>
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**c.**



( $\frac{1}{2}$  mark for horizontal line) , ( $\frac{1}{2}$  mark for vertical line) , ( $\frac{1}{2}$  mark for line  $x + y = 500$ )

( $\frac{1}{2}$  mark for shading)

<p><b>d.</b>  <math>P = 45x + 60y</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>e.</b>                  Points of intersection on graph are                  (260,180), (260,240) and (320,180)                  At (260,180) <math>P = 45 \times 260 + 60 \times 180 = 22,500</math>                  At (260,240) <math>P = 45 \times 260 + 60 \times 240 = 26,100</math>                  At (320,180) <math>P = 45 \times 320 + 60 \times 180 = 25,200</math>  <math>\therefore</math> 260 kg. of day cream and 240 kg. of night cream.                  (1 mark)</p>
<p><b>f.</b>                  From (e), maximum profit is \$26,100</p> <p style="text-align: right;">(1 mark)</p>	

<p><b>Question 1 a.</b>                  \$14,0247                  (1 mark)</p>	<p><b>b.</b>  <math>140247 + 17335 - 12036.55 + 8642</math>  <math>= \\$154187.45</math>                  (1 mark)</p>
<p><b>c.</b>                  Minimum monthly balance for December  <math>= 140247</math>                  Interest for December =  <math>140247 \times \frac{8}{12 \times 100} \times 1 = 934.98</math>                  (1 mark)                  Minimum monthly balance for January  <math>= 142150.9</math>                  Interest for January =  <math>142150.9 \times \frac{8}{12 \times 100} \times 1 = 947.67</math>                  Minimum monthly balance for February  <math>= 142150.9</math>                  Interest for February =  <math>142150.9 \times \frac{8}{12 \times 100} \times 1 = 947.67</math>                  Total interest = <math>934.98 + 2 \times 947.67 = \\$2829.52</math>                  (1 mark)</p>	<p><b>d.</b>  <math>112\% = 160677</math>  <math>12\% = \frac{160677 \times 12}{112} = \\$17215.39</math>                  (1 mark)</p>
<p><b>Question 2 a.</b>                  Increase = <math>38150 - 35000 = 3150</math>  <math>\% \text{ increase} = \frac{3150}{35000} \times 100 = 9\%</math>                  (1 mark)</p>	<p><b>b.</b>  <math>35000(1.09)^4 = \\$49,405</math>                  (1 mark)</p>
<p><b>c.</b>                  Enter formula <math>y = 35000(1.09)^x</math>                  in graphics calculator. Go to table to where  <math>x = 21, y = 213808</math> (1 mark)                  So in 21st year, where 2004 is year 0.  <math>\therefore 2025</math> (1 mark)</p>	<p><b>d.</b>  <math>35000 + \frac{35000 \times 16 \times 5}{100} = \\$63,000</math>                  (1 mark)</p>

<p><b>Question 2 (continued) e.</b>                  Enter <math>y_2 = 35000 + \frac{35000 \times 16 \times x}{100}</math>                  in the graphics calculator. (1 mark)                  Keep the <math>y_1</math> equation from (c) in the calculator.                  Go to table.                  When <math>x = 14, y_1 &gt; y_2 \therefore 2018</math> (1 mark)</p>	
<p><b>Question 3</b>  <b>a. i.</b>                  \$2000                  (1 mark)</p>	<p><b>a. ii.</b>  <math>1 + \frac{9.8}{12 \times 100}</math>  <math>= 1.008</math>                  (1 mark)</p>
<p><b>b.</b>                  Use graphics calculator                  Press Apps Finance Enter TVM Solver Enter  <math>N =</math>  <math>I = 9.8</math>  <math>PV = 200000</math>  <math>PMT = -2000</math>  <math>FV = 0</math>  <math>P / Y = 12</math>  <math>C / Y = 12</math>                  Put cursor on <math>FV</math> and press alpha solve  <math>N = 204.22</math> months = 17 years.                  (1 mark)</p>	<p><b>c.</b>                  Amount repaid  <math>= 204.2172486 \times 2000 = 408434.4972</math>                  Interest = <math>408434.4972 - 200000</math>  <math>= \\$208,434.50</math>                  (1 mark)</p>

<p><b>Question 1 a.</b>                  A = 2, B = 3, C = 3, D = 3, E = 1  <math>2 + 3 + 3 + 3 + 1 = 12</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>b.</b>                  D.</p> <p style="text-align: right;">(1 mark)</p> <p>It is the only town that can be reached from A, B, C and E</p> <p style="text-align: right;">(1 mark)</p>																																			
<p><b>c.</b>                  A, C and D</p> <p style="text-align: right;">(1 mark)</p>	<p><b>d.</b></p> <p style="text-align: center;">To</p> <table style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <tr> <td style="padding: 0 10px;">A</td> <td style="padding: 0 5px;">B</td> <td style="padding: 0 5px;">C</td> <td style="padding: 0 5px;">D</td> <td style="padding: 0 5px;">E</td> </tr> <tr> <td style="padding: 0 5px;">A</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">2</td> <td style="padding: 0 5px;">0</td> </tr> <tr> <td style="padding: 0 5px;">B</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">2</td> <td style="padding: 0 5px;">0</td> </tr> <tr> <td style="padding: 0 5px;">From C</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">2</td> <td style="padding: 0 5px;">0</td> </tr> <tr> <td style="padding: 0 5px;">D</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> </tr> <tr> <td style="padding: 0 5px;">E</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">0</td> <td style="padding: 0 5px;">1</td> <td style="padding: 0 5px;">0</td> </tr> </table> <p>e.g. D can be reached from A in 2 ways, ABD or ABCD                  (1 mark) for getting any two rows correct                  (1 mark) for getting remaining rows correct.</p>	A	B	C	D	E	A	0	1	1	2	0	B	1	0	1	2	0	From C	1	1	0	2	0	D	0	0	0	0	0	E	0	0	0	1	0
A	B	C	D	E																																
A	0	1	1	2	0																															
B	1	0	1	2	0																															
From C	1	1	0	2	0																															
D	0	0	0	0	0																															
E	0	0	0	1	0																															
<b>Question 2 a.</b>	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>	Step1 – Min. in rows	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>																											
<b>R</b>	6	7	5	11	<b>R</b>	$6-5=1$	$7-5=2$	$5-5=0$	$11-5=6$																											
<b>WS</b>	10	5	3	12	<b>WS</b>	$10-3=7$	$5-3=2$	$3-3=0$	$12-3=9$																											
<b>CP</b>	11	3	4	13	<b>CP</b>	$11-3=8$	$3-3=0$	$4-3=1$	$13-3=10$																											
<b>WP</b>	8	4	6	10	<b>WP</b>	$8-4=4$	$4-4=0$	$6-4=2$	$10-4=6$																											
Step 2 – Minimum in columns					(1 mark)																															
	<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>		<b>J</b>	<b>K</b>	<b>L</b>	<b>M</b>																											
<b>R</b>	$1-1=0$	$2-0=2$	$0-0=0$	$6-6=0$	<b>R</b>	0	2	0	0																											
<b>WS</b>	$7-1=6$	$2-0=2$	$0-0=0$	$9-6=3$	<b>WS</b>	6	2	0	3																											
<b>CP</b>	$8-1=7$	$0-0=0$	$1-1=0$	$10-6=4$	<b>CP</b>	7	0	0	4																											
<b>WP</b>	$4-1=3$	$0-0=0$	$2-0=2$	$6-6=0$	<b>WP</b>	3	0	2	0																											
(1 mark)																																				

<p><b>Question 2 a. (continued)</b>                  Allocating jobs.  <math>R \longrightarrow J</math>  <math>CP \longrightarrow K</math>  <math>WS \longrightarrow L</math>  <math>WP \longrightarrow M</math></p> <p style="text-align: right;">(1 mark)</p>		<p><b>b.</b>                  Minimum time = <math>6 + 3 + 3 + 10 = 22</math> hours                  (1 mark)</p>																				
<p><b>Question 3 a.</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Activity</th> <th style="width: 50%;">Immediate Predecessor</th> </tr> </thead> <tbody> <tr> <td><i>A</i></td> <td>-----</td> </tr> <tr> <td><i>B</i></td> <td><i>A</i></td> </tr> <tr> <td><i>C</i></td> <td><i>A</i></td> </tr> <tr> <td><i>D</i></td> <td><i>B</i></td> </tr> <tr> <td><i>E</i></td> <td><i>C</i></td> </tr> <tr> <td><i>F</i></td> <td><i>E</i></td> </tr> <tr> <td><i>G</i></td> <td><i>A, B</i></td> </tr> <tr> <td><i>H</i></td> <td>-----</td> </tr> <tr> <td><i>I</i></td> <td><i>D, F, G, H</i></td> </tr> </tbody> </table> <p style="text-align: right;">(1 mark)</p>		Activity	Immediate Predecessor	<i>A</i>	-----	<i>B</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>D</i>	<i>B</i>	<i>E</i>	<i>C</i>	<i>F</i>	<i>E</i>	<i>G</i>	<i>A, B</i>	<i>H</i>	-----	<i>I</i>	<i>D, F, G, H</i>	<p><b>b.</b>                  The critical path is the longest path.                  ACDI                  (1 mark)</p>
Activity	Immediate Predecessor																					
<i>A</i>	-----																					
<i>B</i>	<i>A</i>																					
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<i>H</i>	-----																					
<i>I</i>	<i>D, F, G, H</i>																					
<p><b>c.</b>  <math>5 + 8 + 12 + 8 = 33</math> hours.                  (1 mark)</p>		<p><b>d.</b>                  This will alter the critical path to ABEFI                  Time taken = <math>5 + 6 + 4 + 14 + 8 = 37</math> hours.                  This means it will take four hours longer to finish the project.                  (1 mark)</p>																				
<p><b>e.</b>                  No effect, as F is not on the critical path.                  (1 mark)</p>																						

<p><b>Question 1 a.</b></p> $M = \begin{matrix} & R & W & C \\ X & a & b & c \\ Y & d & e & f \end{matrix}$ <p>(1 mark)</p>	<p><b>b.</b></p> <p>2 rows and 3 columns so <math>2 \times 3</math></p> <p>(1 mark)</p>
<p><b>c.</b></p> $N = \begin{bmatrix} P \\ Q \\ R \end{bmatrix}$ <p>(1 mark)</p>	<p><b>d.</b></p> $MN = \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \begin{bmatrix} P \\ Q \\ R \end{bmatrix} = \begin{bmatrix} aP + bQ + cR \\ dP + eQ + fR \end{bmatrix}$ <p>(1 mark)</p>
<p><b>e.</b></p> <p><math>dP + eQ + fR</math> represents the selling price of wines for company <math>Y</math></p> <p>(1 mark)</p>	
<p><b>Question 2 a.</b></p> $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -\frac{7}{31} & \frac{2}{31} & \frac{8}{31} \\ \frac{8}{31} & \frac{11}{31} & -\frac{18}{31} \\ \frac{9}{31} & -\frac{7}{31} & \frac{3}{31} \end{bmatrix} \begin{bmatrix} 36.1 \\ 30.65 \\ 32.45 \end{bmatrix} = \begin{bmatrix} 2.20 \\ 30.65 \\ 32.45 \end{bmatrix}$ <p>Use graphics calculator to get inverse matrix of</p> <p>matrix <math>\begin{bmatrix} 3 &amp; 2 &amp; 4 \\ 6 &amp; 3 &amp; 2 \\ 5 &amp; 1 &amp; 3 \end{bmatrix}</math> which is <math>\begin{bmatrix} -\frac{7}{31} &amp; \frac{2}{31} &amp; \frac{8}{31} \\ \frac{8}{31} &amp; \frac{11}{31} &amp; -\frac{18}{31} \\ \frac{9}{31} &amp; -\frac{7}{31} &amp; \frac{3}{31} \end{bmatrix}</math></p> <p>Then use graphics calculator to do the multiplication to get the answer.</p> <p>1 mark for inverse matrix 1 mark for giving answers as fractions 1 mark for correct solution</p> <p>(3 marks)</p>	<p><b>b.</b></p> <p>The cost of a tin of dog food is \$2.20</p> <p>(1 mark)</p>



## Module 6 Matrices

<p><b>Question 3 a.</b></p> <p><math>0.05 = 5\%</math></p> <p style="text-align: right;">(1 mark)</p>	<p><b>b.</b></p> <p style="text-align: center;">Next Purchase</p> <table style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>0.9</td> <td>0.1</td> <td>0.2</td> </tr> <tr> <td>B</td> <td>0.05</td> <td>0.8</td> <td>0.1</td> </tr> <tr> <td>C</td> <td>0.05</td> <td>0.1</td> <td>0.7</td> </tr> </tbody> </table> <p><math>T = \text{Current Purchase}</math></p> <p style="text-align: right;">(1 mark)</p>		A	B	C	A	0.9	0.1	0.2	B	0.05	0.8	0.1	C	0.05	0.1	0.7
	A	B	C														
A	0.9	0.1	0.2														
B	0.05	0.8	0.1														
C	0.05	0.1	0.7														
<p><b>c.</b></p> $\begin{bmatrix} 0.3 \\ 0.6 \\ 0.1 \end{bmatrix}$ <p style="text-align: right;">(1 mark)</p>	<p><b>d. i.</b></p> $\begin{bmatrix} 0.9 & 0.1 & 0.2 \\ 0.05 & 0.8 & 0.1 \\ 0.05 & 0.1 & 0.7 \end{bmatrix} \begin{bmatrix} 0.3 \\ 0.6 \\ 0.1 \end{bmatrix} = \begin{bmatrix} 0.35 \\ 0.505 \\ 0.145 \end{bmatrix}$ <p style="text-align: right;">(1 mark)</p>																
<p><b>d. ii.</b></p> <p>The percentage of customers expected at Charisma pharmacy next week is 14.5%.</p> <p style="text-align: right;">(1 mark)</p>	<p><b>e.</b></p> <p>Find <math>T \wedge 40 S_0</math> and <math>T \wedge 50 S_0</math></p> <p>These both give <math>K = \begin{bmatrix} 0.588 \\ 0.235 \\ 0.176 \end{bmatrix}</math></p> <p>To enter <math>T \wedge 40 K_0</math> into calculator press 2nd matrix A <math>\wedge</math> 40 2nd matrix B enter</p> <p>So expect 17.6% of customers in the Charisma pharmacy in the long term.</p> <p style="text-align: right;">(1 mark)</p>																

### End of suggested solutions 2007 Further Mathematics VCE Trial Examination 2

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