



# Test Answer Sheet

Surname:	Subject:	
Name:	Date:	
ID number:	Time:	

APRIL 2016 EXAM1 memo.

Q1:

$x_1$  = no of type X cabinets 1

$x_2$  = no of type Y cabinets 1

Max  $z$ :  $800x_1 + 1000x_2$  1

s.t:

$$x_1 \geq 2 \quad 1$$

$$x_2 \geq 2 \quad 1$$

$$x_1 \leq 5 \quad 1$$

$$x_2 \leq 6 \quad 1$$

$$4x_1 + 5x_2 \leq 40 \quad 1$$

$$2x_1 + 3x_2 \geq 12 \quad 1$$

$$x_1, x_2 \geq 0 \quad 1$$

⑥ Plotting 7

Feasible Region 2

Labelled Axes 1

⑦ Subs:

$$x_1 = 3 \quad 1 \quad x_2 = 2 \quad 1 \quad z = 4400 \quad 1$$

Q2:

$$\begin{aligned} \textcircled{a} \sum_{k=1}^5 3^k &= 3^1 + 3^2 + 3^3 + 3^4 + 3^5 \\ &= 3 + 9 + 27 + 81 + 243 \quad [1] \\ &= 363 \quad [1] \end{aligned}$$

Do not write in this space, it is provided for marking

⑥  $T_5$   
 $6.4, 5.12, 4.096, 3.2768, 2.62144$

$$T_5 = ar^4 = 6.4 \times 0.8^4$$

$$= 2.62144$$

⑦  $a = 6$   $d = -3$

$$T_n = a + (n-1)d$$

$$= 6 + (n-1)(-3)$$

$$= 6 - 3n + 3$$

$$= 9 - 3n$$

$$\sum_{n=1}^{\infty} 9 - 3n$$

$$\sum_{n=0}^{\infty} 6 - 3n$$

Q3

⑧  $(x-2y)^2 - (2x-y)^2$

Difference of two squares.

$$[(x-2y) + (2x-y)] [(x-2y) - (2x-y)]$$

$$[x-2y+2x-y] [x-2y-2x+y]$$

$$[3x-3y] [-x-y]$$

⑨  $2x-7=4x^2$

$$4x^2 - 2x + 7 = 0$$

$$x^2 - \frac{1}{2}x + \frac{7}{4} = 0$$

$$x^2 - \frac{1}{2}x = -\frac{7}{4}$$

$$x^2 - \frac{1}{2}x + \left(\frac{1}{4}\right)^2 = -\frac{7}{4} + \left(\frac{1}{4}\right)^2$$

$$\left(x - \frac{1}{4}\right)^2 = -\frac{27}{16}$$

$$x - \frac{1}{4} = \pm \sqrt{-\frac{27}{16}}$$

# Test Answer Sheet

Surname:	Subject:	
Name:	Date:	
ID number:	Time:	

$$x = \frac{1}{4} \pm \frac{\sqrt{3}\sqrt{9}\sqrt{-1}}{\sqrt{16}} \quad (1)$$

Invigilated by:

$$x = \frac{1}{4} \pm \frac{3\sqrt{3}i}{4}$$

Marked by:

Date:

Moderated by:

$$x = \frac{1 + 3\sqrt{3}i}{4} \quad (1) \quad \text{or} \quad \frac{1 - 3\sqrt{3}i}{4} \quad (1)$$

Date:

Remarked by:

Date:

Q4

②  $R = 2400 \quad i = \frac{0,087}{12} \quad n = 12 \times 5$

$$= \frac{2400 \left(1 + \frac{0,087}{12}\right) \left[\left(1 + \frac{0,087}{12}\right)^{60} - 1\right]}{\left(1 + \frac{0,087}{12}\right) - 1} \quad \text{Correct formula} \quad (1)$$

$$= 180\,901,6970 \quad (1)$$

$$100\% = 1\,809\,016,97. \quad (1)$$

⑥ SUARQE

$$\frac{5!}{(1)!} \cdot \frac{2!}{(1)!} = 240 \quad (1)$$

③  ${}^3C_1 \times {}^5C_2 = 3 \times 10 = 30 \text{ draws} \quad (1)$

Do not write in this space, it is provided for marking

Q5

$$\begin{pmatrix} 1 & 3 & 2 \\ 2 & -1 & -3 \\ 5 & 2 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix}$$

Determinant:

$$= 1(-1 - (-6)) - 3(2 - (-15)) + 2(4 - (-5)) [1]$$

$$= 5 - 51 + 18$$

$$= -28 [1]$$

Cofactors:

$$\begin{pmatrix} 5 & -17 & 9 \\ 1 & -9 & 13 \\ -7 & 7 & -7 \end{pmatrix} \times \frac{1}{28}$$

Adjoint

$$\begin{pmatrix} 5 & 1 & -7 \\ -17 & -9 & 7 \\ 9 & 13 & -7 \end{pmatrix} [1]$$

Inverse:

$$-\frac{1}{28} \begin{pmatrix} 5 & 1 & -7 \\ -17 & -9 & 7 \\ 9 & 13 & -7 \end{pmatrix} [1] \Rightarrow \begin{pmatrix} -5/28 & -1/28 & 1/4 \\ +17/28 & 9/28 & -1/4 \\ -9/28 & -13/28 & 1/4 \end{pmatrix}$$

Sms

$$-\frac{1}{28} \begin{pmatrix} 5 & 1 & -7 \\ -17 & -9 & 7 \\ 9 & 13 & -7 \end{pmatrix} \begin{pmatrix} 3 \\ -8 \\ 9 \end{pmatrix} [1] = -\frac{1}{28} \begin{pmatrix} -56 \\ 84 \\ -140 \end{pmatrix}$$

$$x = \frac{2}{2} [1] \quad y = -\frac{3}{2} [1] \quad z = \frac{5}{2} [1]$$

Do not write in this space, it is provided for marking



## Test Answer Sheet

Surname:	Subject:	
Name:	Date:	
ID number:	Time:	

Q6:

$$a) \vec{a} \times \vec{b} = \begin{vmatrix} i & j & k \\ 4 & 3 & 7 \\ 2 & 5 & 4 \end{vmatrix} \quad [1]$$

$$= i(12 - 35) - j(16 - 14) + k(20 - 6) \quad [1]$$

$$= -23i - 2j + 14k \quad [1]$$

$$b) \cos \theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|}$$

$$\vec{a} \cdot \vec{b} = 8 + 15 + 28 = 51 \quad (1)$$

$$|\vec{a}| = \sqrt{16 + 9 + 49} = \sqrt{74} \quad (1) = 8,602 \text{ units}$$

$$|\vec{b}| = \sqrt{4 + 25 + 16} = \sqrt{45} \quad (1) = 3\sqrt{5} = 6,708 \text{ units}$$

$$\cos \theta = \frac{51}{\sqrt{74} \sqrt{45}}$$

$$= 0,883787916$$

$$\theta = 27,9^\circ \quad (27,89727103^\circ) \quad [1]$$

Q7:  $\log_2(\log_{16} x) = -2$

$$\log_{16} x = 2^{-2} \quad [1]$$

$$\log_{16} x = \frac{1}{4}$$

$$x = 16^{\frac{1}{4}} \quad [1]$$

$$x = 2 \quad [1]$$

Invigilated by:

Marked by:

Date:

Moderated by:

Date:

Remarked by:

Date:

Do not write in this space, it is provided for marking

$$\begin{aligned}
 & \textcircled{b} \quad \sqrt[3]{27a^6b^{-3}} \times 12(a^4\sqrt{b^{10}c^4})^{-1/2} \div 0,25^0c^{-4} \\
 & = (27a^6b^{-3})^{1/3} \times 12(a^4(b^{10}c^4)^{1/2})^{-1/2} \div c^{-4} \\
 & \quad 27^{1/3} a^{6/3} b^{-3/3} \times 12(a^4(b^{10/2}c^{4/2}))^{-1/2} \div \frac{1}{c^4} \\
 & \quad 3a^2b^{-1} \times 12(a^4b^5c^2)^{-1/2} \times c^4 \\
 & \quad 3a^2b^{-1} \times 12(a^{-4/2}b^{-5/2}c^{-2/2}) \times c^4 \\
 & \quad 3a^2b^{-1} \times 12(a^{-2}b^{-5/2}c^{-1}) \times c^4 \quad (1) \\
 & \quad 3 \times 12 \times a^{2-2} b^{-1-5/2} c^{-1+4} \\
 & = 36a^0b^{-7/2}c^3 \\
 & = \frac{36c^3}{\sqrt{b^7}} \quad (1)
 \end{aligned}$$

$$\textcircled{c} \quad \lim_{x \rightarrow 4} \frac{x - \sqrt{3x+4}}{4-x}$$

$$\lim_{x \rightarrow 4} \frac{(x - \sqrt{3x+4})(x + \sqrt{3x+4})}{(4-x)(x + \sqrt{3x+4})} \quad (1)$$

$$\lim_{x \rightarrow 4} \frac{x^2 - (3x+4)}{(4-x)(x + \sqrt{3x+4})}$$

$$\lim_{x \rightarrow 4} \frac{x^2 - 3x - 4}{(4-x)(x + \sqrt{3x+4})} \quad (1)$$

$$\lim_{x \rightarrow 4} \frac{(x-4)(x+1)}{(4-x)(x + \sqrt{3x+4})}$$

$$\lim_{x \rightarrow 4} \frac{-(4-x)(x+1)}{(4-x)(x + \sqrt{3x+4})} \quad (1)$$

$$= \frac{-5}{4 + \sqrt{12+4}} = -\frac{5}{8} \quad (1)$$