

10. (a) $A^1(-2, -3)$, $B^1(-4, -5)$ and $C^1(-4, -3)$.
 (b) Reflection in the x -axis
 (c) $C^1 A^{11} = 6.32\text{cm}$
 (d) $A^1 \hat{A} A^{11} = 56.3^\circ$
11. (a) (i) $A^1(-2, 3)$, $B^1(-5, 3)$ and $C^1(-5, 7)$
 (ii) $A^{11}(-3, -2)$, $B^{11}(-3, -5)$ and $C^{11}(-7, -5)$
 (c) $R_{90^\circ} M_y = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
12. (a) $A^{11}(4, -4)$, $B^{11}(2, -3)$ and $C^{11}(0, -7)$
 (b) A glide reflection
13. (a) $A^{11}(-1, 0)$, $B^{11}(3, 0)$, $C^{11}(2, -2)$ and $D^{11}(1, -2)$
 (b) A glide reflection
14. (a) $A^1(2, -1)$, $B^1(6, -1)$ and $C^1(2, -4)$
 (b) $A^{11}(-2, -1)$, $B^{11}(-6, -1)$ and $C^{11}(-2, -4)$
 (ii) $Q(1, 0.5)$
 (iii) $\theta = +180^\circ, R_{[(1, 0.5), +180^\circ]}$
 Rotation about the point $Q(1, 0.5)$ through an angle of 180° anti-clockwise (or clockwise)
15. (a) $A^1(-2, 1)$, $B^1(1, 0)$ and $C^1(-2, -3)$
 (b) $A^{11}(2, 0)$, $B^{11}(-1, 0)$ and $C^{11}(2, -3)$
 (ii) $Q(2.5, 1)$
 (iii) $\theta = +180^\circ, R_{[(2.5, 1), +180^\circ]}$
 Rotation about the point $Q(2.5, 1)$ through an angle of 180° anti-clockwise (or clockwise)
16. (a) (i) $A^{11}(3, -2)$, $B^{11}(3, 0)$ and $C^{11}(5, -1)$
 (ii) A glide reflection
- (b) (i) $A^{11}(-4, 5)$, $B^{11}(-4, 7)$ and $C^{11}(-2, 6)$. No
 (ii) A glide reflection
17. (a) $A^{11}(-1, 4)$, $B^{11}(-4, 2)$ and $C^{11}(-6, 1)$
 (b) A glide reflection
18. (a) (i) $\vec{OP} = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$
 (ii) Length of $OP = \sqrt{1.25}$ units = 1.12 units
 (b) (i) $A^1(4, 2)$, $B^1(10, 4)$ and $C^1(6, 8)$
 (ii) $A^{11}(1, 2)$, $B^{11}(2, 5)$ and $C^{11}(4, 3)$
19. (a) (i) $\vec{OQ} = \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \\ 2 \end{pmatrix}$
 (ii) Length of $OQ = \sqrt{1.25}$ units = 1.12 units
 (b) (i) $A^1(4.5, 1.5)$, $B^1(9, 3)$ and $C^1(6, 7.5)$
 (ii) $A^{11}(1, 3)$, $B^{11}(2, 6)$ and $C^{11}(5, 4)$
20. (a) (i) $A^1(0, 3)$, $B^1(2, 0)$ and $C^1(6, 5)$
 (ii) $A^{11}(-3, 0)$, $B^{11}(0, 2)$ and $C^{11}(-5, 6)$
- (b) (i) $P = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
 (ii) P is a reflection in the line $y = x$
21. (a) (i) $A^1(0, -4)$, $B^1(-2, 0)$ and $C^1(-5, 0)$
 (ii) $A^{11}(-4, 0)$, $B^{11}(0, 2)$ and $C^{11}(0, 5)$
- (b) (i) $P = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
 (ii) P is a reflection in the line $y = -x$
22. (a) (i) $A^1(-1, 4)$, $B^1(-2, 1)$ and $C^1(-5, 3)$
 (ii) $A^{11}(-4, -1)$, $B^{11}(-1, -2)$ and $C^{11}(-3, -5)$
- (b) (i) $P = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
 (ii) P is a reflection in the line $y = -x$
23. (i) $A^1(3, -1)$, $B^1(6, -3)$ and $C^1(2, -5)$
 (ii) $A^{11}(-1, -3)$, $B^{11}(-3, -6)$ and $C^{11}(-5, -2)$
- $P = R_{xy} M_y = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
 (ii) Reflection in the line $y = x$
24. (i) $T = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$
 (ii) $U = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
25. (a) (i) $LM = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$
 (ii) $ML = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$. $LM \neq ML$ since $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \neq \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
- (b) (i) $\vec{OA}^1 = \begin{pmatrix} 0 \\ 5 \end{pmatrix}$, $\vec{OB}^1 = \begin{pmatrix} -2 \\ 7 \end{pmatrix}$ and $\vec{OC}^1 = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$
26. (a) (i) $A^1(-2, 3)$, $B^1(-5, 3)$ and $C^1(-5, 7)$
 (ii) $A^{11}(-3, -2)$, $B^{11}(-3, -5)$ and $C^{11}(-7, -5)$
- (c) $R_{90^\circ} M_y = \begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$
- (d) $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} \begin{pmatrix} A & B & C \\ 2 & 5 & 5 \\ 3 & 3 & 7 \end{pmatrix} = \begin{pmatrix} A^{11} & B^{11} & C^{11} \\ -3 & -3 & -7 \\ -2 & -5 & -5 \end{pmatrix}$
27. (a) $A^1(5, 1)$, $B^1(9, 1)$, $C^1(14, 3)$ and $D^1(13, 3)$
 (b) $A^*(2, 5)$, $B^*(6, 13)$, $C^*(5, 13)$ and $D^*(4, 11)$
28. $P^1(-15, -4)$ and $Q^1(-13, -5)$
29. (i) $x^1 = x$ and $y^1 = 3x + y$
 (ii) $A^1(0, 3)$, $B^1(7, 24)$, $C^1(7, 27)$ and $D^1(0, 6)$
30. (a) (i) $A^1(11, 4)$, $B^1(15, 5)$ and $C^1(20, 7)$
 (ii) $A^{11}(33, 6)$, $B^{11}(45, 7.5)$ and $C^{11}(60, 10.5)$
- (c) $P = \begin{pmatrix} 3 & 6 \\ 0 & 1.5 \end{pmatrix}$
- (d) $\begin{pmatrix} P & 6 \\ 0 & 1.5 \end{pmatrix} \begin{pmatrix} A & B & C \\ 3 & 5 & 6 \\ 4 & 5 & 7 \end{pmatrix} = \begin{pmatrix} A^{11} & B^{11} & C^{11} \\ 33 & 45 & 60 \\ 6 & 7.5 & 10.5 \end{pmatrix}$
- Exercise 24i**
1. (ii) $\vec{AD} = 2(\underline{b} - \underline{a})$
2. (iii) (a) $U^{-1} = \begin{pmatrix} 1 & -2 \\ -1 & 3 \end{pmatrix}$ and $V^{-1} = \begin{pmatrix} 5 & -3 \\ -3 & 2 \end{pmatrix}$
 (b) $UV = \begin{pmatrix} 12 & 19 \\ 5 & 8 \end{pmatrix}$
 (c) $(UV)^{-1} = V^{-1} U^{-1} = \begin{pmatrix} 8 & -19 \\ -5 & 12 \end{pmatrix}$
3. (a) (i) S (ii) $\begin{pmatrix} \frac{1}{10} & -\frac{3}{5} \\ \frac{1}{5} & \frac{4}{5} \end{pmatrix}$ (iii) $x = -1, y = 6$
 (b) (i) $\vec{PQ} = 2\underline{a} - 5\underline{b}$ (ii) $\vec{RQ} = 2(2\underline{a} - 5\underline{b})$, $\vec{RP} = 2\underline{a} - 5\underline{b}$ $\Rightarrow \vec{RQ} = 2\vec{RP} = 2(2\underline{a} - 5\underline{b})$
4. (a) (i) $\vec{OA} = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$, $\vec{OB} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$, (b) (i) $\vec{T} = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$
 (ii) $e = -2$ (iii) $ET = \begin{pmatrix} 4 \\ 2 \end{pmatrix}$, $O^{11}(4, 2)$
5. (a) (i) -13 (ii) $\begin{pmatrix} \frac{3}{13} & \frac{2}{13} \\ \frac{2}{13} & -\frac{3}{13} \end{pmatrix}$
 (iii) $x = 1, y = -1$
 (b) (i) $A^1(3, 0)$, $B^1(3, 1)$, $C^1(2, 1)$ and $D^1(2, 0)$
 (ii) S is a reflection in the line $y = 1.5$
6. (a) (i) $T = \begin{pmatrix} 2 & 0 \\ 0 & 3 \end{pmatrix}$ (b) (i) $\vec{BC} = (\underline{b} - \underline{a})$ and
 (ii) $S = \begin{pmatrix} \frac{1}{2} & 0 \\ 0 & -\frac{1}{3} \end{pmatrix}$ $\vec{XY} = 2(\underline{b} - \underline{a})$
 (ii) $|\vec{BC}| = 2 |\vec{XY}|$
7. (a) $\lambda = 14$ (b) (i) $(-7, -2)$ (ii) $y = \frac{2}{7}x$
8. (a) (i) $\vec{PQ} = \begin{pmatrix} 2 \\ -2 \end{pmatrix}$ (ii) $\vec{MN} = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$
 (iii) $\vec{PQ} = 2 \vec{MN}$ They are parallel.
 The magnitude of PQ is twice the magnitude of MN

GENERAL PROFICIENCY
C.X.C. MODEL EXAMINATIONS 1 to 6 - Paper 1

Examination Number

	1	2	3	4	5	6
1.	D	C	C	C	B	A
2.	B	B	A	B	D	C
3.	A	B	A	D	D	D
4.	C	C	B	A	B	C
5.	B	A	C	B	C	C
6.	B	B	C	D	A	B
7.	D	D	C	C	D	D
8.	D	D	C	C	D	D
9.	C	C	C	B	C	C
10.	A	C	C	A	C	A
11.	D	C	C	D	C	C
12.	B	B	A	B	B	B
13.	B	D	D	C	A	D
14.	D	A	D	C	D	C
15.	A	C	C	B	C	A
16.	A	D	D	B	B	D
17.	D	C	A	C	D	B
18.	C	C	B	B	B	D
19.	C	C	A	B	D	C
20.	C	D	B	C	C	D
21.	D	C	B	B	B	C
22.	C	C	D	A	B	B
23.	C	C	A	D	C	C
24.	B	B	D	B	C	B
25.	B	B	B	A	A	A
26.	D	B	A	C	B	D
27.	B	D	C	B	C	B
28.	B	B	C	A	B	C
29.	D	A	A	D	D	C
30.	A	B	B	B	D	C
31.	B	A	D	C	C	C
32.	A	D	B	D	C	C
33.	D	B	A	A	C	B
34.	B	A	D	B	C	D
35.	A	D	C	A	C	C
36.	B	C	D	C	C	A
37.	D	C	A	B	B	C
38.	B	D	C	A	B	B
39.	C	A	A	C	B	A
40.	A	B	B	B	B	C
41.	B	C	D	D	D	D
42.	C	A	A	C	A	A
43.	A	A	B	D	C	C
44.	C	C	B	C	B	A
45.	D	B	D	C	C	D
46.	B	A	B	B	B	B
47.	C	C	C	D	C	A
48.	A	A	A	B	B	B
49.	C	B	B	B	B	B
50.	C	C	D	B	B	A
51.	D	B	C	B	B	D
52.	B	C	A	B	B	B
53.	C	B	A	C	B	A
54.	D	A	A	A	D	D
55.	D	D	C	A	B	C
56.	C	B	A	C	B	D
57.	B	A	D	A	B	C
58.	D	D	C	B	C	D
59.	C	D	C	A	B	C
60.	D	D	C	C	A	D

C. X. C. GENERAL PROFICIENCY MODEL EXAMINATION 1
Paper 2

1. (a) $6\frac{2}{3}$ (b) 45cm (c) (i) C.P. = \$48
(ii) S.P. = \$57.60
2. (a) $x = 35$
(b) (i) $23 - x$
(ii) Members in the sports club who play football and hockey only
(iii) $92 + x = 100$
(iv) $x = 8$ members
3. (a) $x = -3, y = 4$
(b) (i) $(1+2x)(1-2x)$
(ii) $(3x+1)(x-2)$
(c) (i) $\underline{a} = \begin{pmatrix} 3 \\ 3 \end{pmatrix}, \underline{b} = \begin{pmatrix} -7 \\ -6 \end{pmatrix}$
(ii) $\frac{1}{2}(\underline{a} + \underline{b}) = \begin{pmatrix} -2 \\ -1.5 \end{pmatrix}$
4. (a) (i) $DC = 4.44\text{cm}$
(ii) $\widehat{AD}C = 94.2^\circ$
(b) (i) P is an anti-clockwise rotation of 270° about the origin.
(ii) $y = -\frac{2}{3}x + \frac{1}{3}$
5. (a)

x	-1	0	$\frac{1}{2}$	2
$f(x)$	-3	-6	-6	0

(c) (i) $x = -1.5$ and $x = 2$
(ii) $f(x)_{\min} = -6\frac{1}{8}$
6. (c) (i) 55 candidates
(ii) P (candidate scored < 50 marks) = $\frac{13}{20}$
7. (a) $A = 707 \text{ cm}^2$ (c) $A = 97.4 \text{ cm}^2$
(b) $A = 236 \text{ cm}^2$ (d) $l = 31.4 \text{ cm}$
8. (a) (i) $\widehat{EDC} = 90^\circ$
(ii) $\widehat{AEC} = 38^\circ$
(iii) $\widehat{EAB} = 112^\circ$
(b) $ED = 17.8 \text{ cm}$
9. (a) (a) $x + y \leq 30, y \geq 5$ and $y \leq 2x$
(c) $x = 10$ and $y = 20$
 $I_{\max} = \$63\,000$
10.

x	0.5	1.25	1.5	2.5	3.0
$f(x)$	8.0	0.5	0.30	0.06	0.04

(c) (ii) $x = 1.5$ (ii) $(2x)^4 = 5$

$$2x = \sqrt[4]{5} = 1.5$$

$$x = \frac{1.5}{2} = 0.75$$

11. (b) (i) $TF = 50 \text{ m}$ (ii) $\sin \widehat{TPF} = \frac{7}{25}$
(c) (i) $m = 0.073$ (ii) $PK = 2 \text{ m}$

12. (a) $AB = 6\,854.4 \text{ km}$ (b) $AB = 35\,630.2 \text{ km}$
(c) The distance AB measured along the meridian via the North Pole.
 $AB = 4\,453.8 \text{ km}$

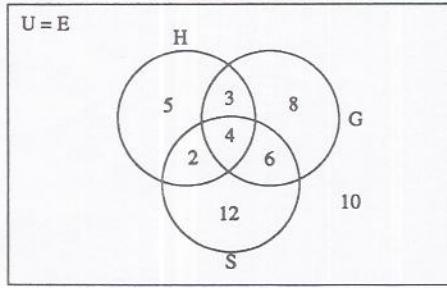
13. (a) $\vec{AO} = \vec{q} - \vec{p} + 5$ (b) $\vec{AD} = 2\vec{q} - 2\vec{p} + 10$
(c) $\vec{AE} = 2\vec{q} - 3\vec{p} + 13$ (d) $\vec{CD} = \vec{q} - 2\vec{p} + 8$

14. (i) (0, 4) and (4, 0)
(ii) T is an enlargement with the origin, O as centre and scale factor 4.
(iii) $A^1(20, 8)$ and $B^1(-14, 93)$
(iv) $m_1 = 0.4$ and $m_2 = -2.5$
(v) $\widehat{OAB} = 90^\circ$
(vi) $AB = 22.9$ units and $A^1B^1 = 91.6$ units
(vii) $A_1 = 61.8$ units² and $A_2 = 988.8$ units²



C.X.C. GENERAL PROFICIENCY MODEL EXAMINATION 2

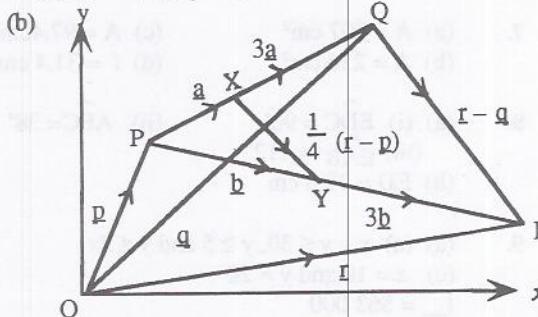
Paper 2

1. (a) $\frac{3}{8}$ (b) $T = 3$ years
 (c) (i) \$1 750
 (ii) \$1 312.50
 (iii) Albert:Christine:Raymond = 1: 3 : 4
 (iv) 12.5%
2. (a) (i) $(1 + 2a + 3b)(1 - 2a - 3b)$
 (ii) $(3x + y)(x - y - 1)$
 (b) $x = 192$
 (c) $x = 9$ when $y = 4$
 $x = -4$ when $y = -9$
3. (a) (i) $Q_2 = 5.5$ (ii) $\bar{x} = 4.9$
 (iii) $s = 2.62$
 (b) (i) $P(\text{competitor's score} = 6) = \frac{1}{5}$
 (ii) $P(\text{competitor's score} \geq 6) = \frac{1}{2}$
4. (a) (i) $PT = 10.8 \text{ cm}$ (iii) $V = 405 \text{ cm}^3$
 (ii) $T.S.A. = 441 \text{ cm}^2$ (iv) $TPU = 33.7^\circ$
 (b) $PR = 14.6 \text{ cm}$
5. 
- (b) 40 students
 (c) $n(H \cup G \cup S)^c = 10$ students
6. (a) (i) $fg = 3 + x^4$ (ii) $g^{-1} = \sqrt[4]{x} = x^{\frac{1}{4}}$
 (b) (i)

t	0	1	4	6	7
S	0	6	36	66	84

 (ii) $S = 29.75 \text{ m}$
 (iv) $V = 15 \text{ m/s}$. Speed of the particle after 5 seconds
7. (a) (i) $\vec{OR} = \begin{pmatrix} 9 \\ 9.5 \end{pmatrix}$ (ii) $OR = 13.1 \text{ units}$
 (b) (i) $y = 0$
 (ii) $(-2, 3)$ (iii) $T = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$
8. (a) $QR = 13.3 \text{ m}$
 (b) (i) $\frac{\Delta PQX}{\Delta RSX}$ (A.A.A)
 (ii) $PQ = 18.75 \text{ cm}$ and $RS = 12.5 \text{ cm}$
 (iii) 9:4
9. (a)

x	20	30	40	50	60
$\sin x$	0.342	0.500	0.643	0.766	0.866
$\cos x$	0.940	0.866	0.766	0.643	0.500

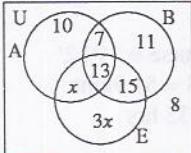
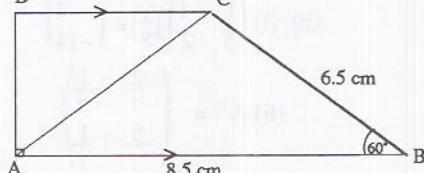
 (d) (i) $x = 45^\circ$ (ii) $x = 225^\circ$
 (iii) $\cos x = \pm 0.707$
10. (a) (i) $\{x : x < -2\} \cup \{x : x > 0\} = \{x : -2 \leq x \leq 0\}^c$
 (ii) $\{x : -5 \leq x \leq 1\}$
 (b) $\{h : 8 \leq h \leq 10\}$ when h is in cm.
 The altitude is between 8cm and 10cm.
11. (a) (i) $\tan \alpha = \frac{3}{\sqrt{k^2 - 9}}$ (ii) $\sin(90^\circ - \alpha) = \frac{\sqrt{k^2 - 9}}{k}$
 (iii) $\cos(90^\circ - \alpha) = \frac{3}{k}$
 (b) (i) $\theta = 45.6^\circ \text{N}$ or S (ii) B($41.3^\circ \text{N}, 60^\circ \text{W}$);
 $\theta = 41.3^\circ \text{N}$
 (iii) C($8^\circ \text{N}, 56.09^\circ \text{W}$), $\theta = 56.09^\circ \text{W}$
12. (i) 369.7m (ii) 231.1m (iii) 68.4m
13. (a) $x^1 = x$ and $y^1 = 3x + y$
 (b) A¹ (0, 3), B¹ (7, 24), C¹ (7, 27) and D¹ (0, 6)
 (c) The transformation T is a shear parallel to the y-axis with $x = 0$ as the invariant line.
14. (a) (i) $B^{-1} = \begin{pmatrix} \frac{1}{9} & \frac{7}{9} \\ \frac{2}{9} & -\frac{5}{9} \end{pmatrix}$ (ii) $BB^{-1} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$
 (ii) $x = -2$ and $y = 8$
 (b) 

$$\vec{QR} = \vec{r} - \vec{q}, \vec{XY} = \vec{b} - \vec{a},$$

$$\vec{a} = \frac{1}{4}(\vec{q} - \vec{p}), \vec{b} = \frac{1}{4}(\vec{r} - \vec{p})$$
(i) $\vec{QR} = \vec{r} - \vec{q}$ and $\vec{XY} = \frac{1}{4}(\vec{r} - \vec{q})$

$$|\vec{XY}| = \frac{1}{4} |\vec{QR}| \Rightarrow XY = \frac{1}{4} QR$$
(ii) $\vec{XY} // \vec{QR} \Rightarrow XY // QR$

C.X.C. GENERAL PROFICIENCY MODEL EXAMINATION 3
Paper 2

1. (a) $\frac{4}{7}$ (b) 5×10^{-6}
 (c) (i) GUY \$1 882.50
 (ii) GUY \$35 767.50
2. (a) (i) 
- (ii) $n(B) = 46$ students
 (iii) $4x + 64 = 100$. $x = 9$
 (b) (i) $\overrightarrow{OA} = 5\mathbf{a} + 3\mathbf{b}$ and $\overrightarrow{OB} = 2\mathbf{a} + 5\mathbf{b}$
 (ii) $|\overrightarrow{OA}| = 5.8$ units
3. (a) Either $x = 2$ or $x = 6$
 (b) $F = 1\frac{1}{4}$
 (c) (i) $5t + d = 473$ (1)
 $7t + 2d = 691$ (2)
 (ii) $2d = \$96$
4. (a) 
- (ii) $AD = 5.63$ cm
 (b)(ii) Enlargement about centre (3.3) with scale factor $\frac{1}{2}$.
5. (a) $S = 471\frac{3}{7}$ km/h
 (b) 4 hours
 (c) (i) 14.3m
 (ii) 48°
6. (c) $\frac{43}{60}$
 (d) $P(\text{student weight} > 50 \text{ kg}) = \frac{23}{40}$
7. (a)

x	-2	0	1
y	-7	3	2

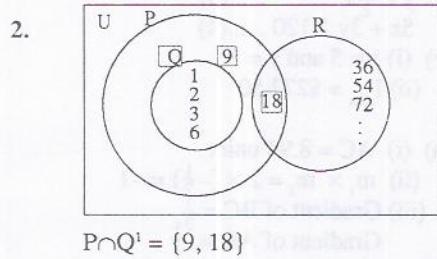
 (c) $\{x : -1.5 < x < 2\}$
8. (b) (i) $r_b = 7$ cm (ii) $h = 12.6$ cm
 (c) $V = 0.6468 l$
9. (a)

x	0	$\frac{\pi}{10}$	$\frac{3\pi}{10}$	$\frac{2\pi}{5}$	$\frac{\pi}{2}$	$\frac{7\pi}{10}$	$\frac{4\pi}{5}$	$\frac{9\pi}{10}$
y	3.00	2.43	-0.93	-2.43	-3.00	-0.93	0.93	2.43

 (c) (i) $y_{\min} = -3$
 (ii) $\{x : \frac{\pi}{4} \leq x \leq \frac{3\pi}{4}\}$
- (iii) $x = \frac{2\pi}{15}$ and $x = \frac{13\pi}{15}$
 $x = 24^\circ$ and $x = 156^\circ$
10. (a) $x + y \leq 40$ (1)
 $x \geq 5$ (2)
 $y \geq \frac{1}{2}x$ (3)
 $5x + 3y \geq 120$ (4)
 (c) (i) $x = 5$ and $y = 35$
 (ii) $I_{\max} = \$272.50$
11. (a) (i) $AC = 8.94$ units
 (ii) $m_1 \times m_2 = 2 \times (-\frac{1}{2}) = -1$
 (iii) Gradient of BC = $\frac{1}{3}$
 Gradient of AD = $\frac{1}{3}$
 (b) (i) $NP = 7.89$ m (ii) $MN = 5.66$ m
12. (b) (i) $PR = 118.8$ m (ii) 13.1°
13. (a) Bearing = 079.7° (b) $T = 3.54$ seconds
14. (a) Course = 56.7°
 (b) G/S = 411.2km
 (c) $t = 3.04$ hours.

C.X.C. GENERAL PROFICIENCY MODEL EXAMINATION 4
Paper 2

1. (a) (i) 0.07 (ii) 10.85
 (b) 331.25 (c) (i) \$3 120
 (ii) \$9 360 (iii) \$11 232
 (iv) \$14 352 (v) \$1 872



$$P \cap Q^c = \{9, 18\}$$

3. (a) (i) $PQ = 8.5$ units (ii) $m = -1$
 (iii) $X(6,4)$
 (b) $y = x - 2$. (2, 0)

4. (a) (i) $-x + y$ (ii) 2
 (b) $x = 0.2$ or $x = 2.8$

5. (a) $\infty = 2$ and $\beta = 1$
 (b) (i) $AF = \frac{v}{0.7}$ and $BF = \frac{v}{0.466}$
 (ii) $v = 1.4m$

6. (c) (i) 18 applicants
 (ii) 20.5
 (iii) $P(21 \leq x \leq 20) = \frac{9}{50}$

7. (a) $f(-4) = 4\frac{2}{3}$ and $gf(-4) = 9\frac{2}{3}$
 (b) $f^{-1}(x) = \frac{x+2}{3-x}$
 (c) $x = -1\frac{5}{12}$
 (d) (i) $x = \frac{2}{3}$ (ii) $x = -1$

8. (a) (iii) $BC = 6.6$ cm and $AX = 7.35$ cm
 (b) (i) $V = 1 131.12\text{cm}^3$ (ii) $m = 7.92\text{kg}$.

9. (a) (i) $f(x) = 16 - (2x - 5)^2$
 (ii) $x = 2\frac{1}{2}$
 (iii) $f(x)_{\max} = 16$
 (b) (i) $f(x) = 3x - 2$ and $g(x) = x^2$
 (ii) $k^{-1}(x) = f^{-1} g^{-1}(x) = \frac{\sqrt{x} + 2}{3}$

10. (a) $19x + 55y \leq 260$... (1)
 $2 < x \leq 5$... (2)
 $y \geq 1$... (3)
 (c) $(x, y) = (5, 3)$
 $A_{\max} = \$1 300$

11. (a) (i) $\widehat{PQR} = 90^\circ$ (ii) $\widehat{RPS} = 15^\circ$
 (iii) $\widehat{SPT} = 75^\circ$ (iv) $\widehat{PTS} = 30^\circ$
 (b) (i) $\sin^2 \beta = 0.16$ (ii) $\beta = 156.4^\circ$
 (iii) $AB = 13.7$ cm

12. (a) (i) Course = 199.2°
 (ii) $R/S = 51.9\text{kmh}^{-1}$
 (iii) 09:35 hrs

13. (b) (i) $P^1(7, 3)$, $Q^1(6, 1)$ and $R^1(9, 2)$

$$(c) \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}^{-1} = \begin{pmatrix} 1 & -2 \\ 0 & 1 \end{pmatrix}$$

14. (a) (i) $\vec{PQ} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$ and $\vec{MN} = \begin{pmatrix} 1 \\ -1.5 \end{pmatrix}$

$$(ii) \vec{PQ} = 2 \vec{MN}$$

They are parallel to each other.

The magnitude of PQ is twice the magnitude of MN . Or, the magnitude of MN is half the magnitude of PQ .

$$(b) (i) \begin{pmatrix} 1 & -1 \\ 5 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -7 \\ -14 \end{pmatrix}$$

$$(ii) A^{-1} = \begin{pmatrix} \frac{2}{7} & \frac{1}{7} \\ \frac{-5}{7} & \frac{1}{7} \end{pmatrix}$$

$$(iii) x = -4 \text{ and } y = 3$$

C.X.C. GENERAL PROFICIENCY MODEL EXAMINATION 5
Paper 2

1. (a) 0.73 (b) 0.7

(c) (i) \$2 100

(ii) \$630

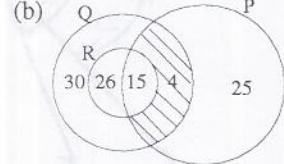
(iii) 20%

2. (a) $y = \frac{2x+5}{1-x}$

(b) $(y-x)(x+y+5) = -(x-y)(x+y+5)$

(c) $x = 9$

3. (a) $x = -1$ or $x = 3.5$



$n[P \cap Q] \cap R^1] = 4$

4. (a) (i) T.S.A. = 125cm^2 (ii) $V = 81\text{cm}^3$

(b) $BC = 7.36\text{ cm}$

5. (a) $\hat{C} = 51.6^\circ$ (b) $A = 3.8\text{ cm}^2$

6. (b) (i) S.I.Q.R. = 8.5 days

(ii) 28 animals

(iii) 22 animals

7. (a) $A^1(0, 3)$ and $B^1(0, 5)$

(b) $A^{11}(-3, 0)$ and $B^{11}(-5, 0)$

(c) $T = M_{x=0} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

(e) $T^{-1} = M_{x=0} = \begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}$

8. (a) (i) $f(2) = 14$ and $gf(2) = 11$

(ii) $x = 3$

(iii) $(gf)^{-1}(18) = 3$

(b) (i) $MN = 20\text{ km}$

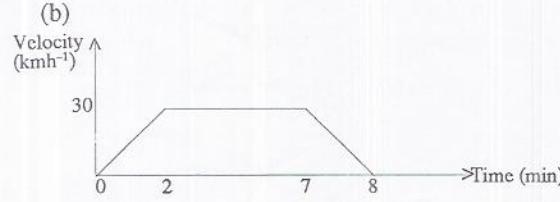
(ii) $t = 125\text{ minutes}$

(iii) 8 km from town P

(iv) Albert was at rest

(v) $5 : 4$

9. (a) (i) $x = -\frac{1}{2}$ (ii) $(5x^2 + 5x + 2)_{\min} = \frac{3}{4}$



(i) $a = 900\text{ kmh}^{-2}$ (ii) $a = -1800\text{ kmh}^{-2}$

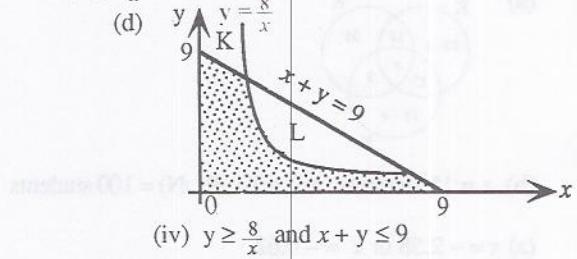
(iii) $d = 3\frac{1}{3}\text{ km}$

(iv) $s = 24\frac{3}{8}\text{ kmh}^{-1}$

10. (a)

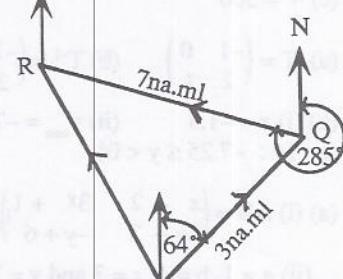
x	1	2	3	4	5	6	7	8
y	8	4	2.67	2	1.6	1.33	1.14	1

(d)



(iv) $y \geq \frac{8}{x}$ and $x+y \leq 9$

11. (b) (i)



(ii) $PR = 5.13$ nautical miles

(iii) Bearing = 127.6°

12. (a) $\tan A \tan B = \frac{2}{9}$

(b) (i) $x^\circ E = 87.7^\circ E$ (ii) $y^\circ N = 57^\circ N$

13. (a) (i) $|A| = -25$

(ii) $A^{-1} = \begin{pmatrix} \frac{3}{25} & \frac{4}{25} \\ \frac{4}{25} & -\frac{3}{25} \end{pmatrix}$

(iii) $x = 2$ and $y = -1$

(b) (i) $A^1(0, 3)$, $B^1(1, 3)$, $C^1(1, 2)$ and $D^1(0, 2)$

(ii) T is a reflection in the line $y = 1.5$

14. (a) (i) $T = \begin{pmatrix} 0 & 1 \\ \frac{1}{2} & 0 \end{pmatrix}$ (ii) $S = \begin{pmatrix} 0 & 2 \\ -1 & 0 \end{pmatrix}$

(b) (i) $\vec{XY} = \vec{b} - \vec{a}$ and $\vec{BC} = 3(\vec{b} - \vec{a})$

$\vec{XY} = \frac{1}{3} \vec{BC}$

(ii) $|\vec{XY}| = \frac{1}{3} |\vec{BC}| \Rightarrow XY = \frac{1}{3} BC$

C.X.C. GENERAL PROFICIENCY MODEL EXAMINATION 6

Paper 2

1. (a) 100 (b) $\frac{1}{2}$

(c) (i) US \$3 000

(ii) $\text{US } \$1.00 = \text{TT } \5.625

$\text{US } \$2\ 800 = \text{TT } \$15\ 750$

$\text{US } \$3\ 000 = \text{TT } \$16\ 875$

2. (a)

(b) $x = 15$ students (c) $n(K \cup R \cup N) = 100$ students

3. (a) $x = -2.58$ or $x = -0.62$

(b) $x = -2$

(c) $V = 500$

4. (a) $T = \begin{pmatrix} -1 & 0 \\ 2 & 1 \end{pmatrix}$ (b) $T^{-1} = \begin{pmatrix} -1 & 0 \\ 2 & 1 \end{pmatrix}$

5. (b) (i) $x = -1.5$ (ii) $y_{\min} = -7.25$

(c) $\{y : -7.25 \leq y < 0\}$

6. (a) (i) $AB = \begin{pmatrix} x-2 & 3x+1 \\ 2y+2 & -y+6 \end{pmatrix}$

(ii) $a = 1$, $b = 4$, $x = 3$ and $y = 2$

(b) (i) $\$ \frac{7}{3} p$

(ii) $p = \$29.40$

(iii) $\$68.60$

7. (a) $\bar{x} = \$79.79$

(c) The measures of dispersion (or spread) such as the standard deviation, the semi-interquartile range or the spread of both frequency polygons can be used to determine which sample had a more equitable distribution of waves.

The sample with a smaller measure of dispersion (or spread) would have a more equitable distribution of wages - provided that their means are approximately the same.

8. (a) (i) $\widehat{ABC} = 120^\circ$ (ii) $\widehat{CDX} = 60^\circ$

(b) (i) $DE = 9 \text{ cm}$ (ii) $AE = 15.6 \text{ cm}$

(c) (i) Volume of sand = 352 cm^3

(ii) $s = \frac{V}{t} = 0.098 \text{ cm}^3/\text{s}$

9. (a) $x = -2.57$ or $x = 0.91$

(b) (i) $d = 75 \text{ km}$ (ii) $t_b = 90.4 \text{ min}$

(iii) $s_b = 13.8 \text{ m/s}$ (iv) $d_b = 49 \text{ km}$

(v) $s = 18.4 \text{ m/s}$

10. (a) $40 \leq x \leq 80 \dots (1)$

$15 \leq y \leq 50 \dots (2)$

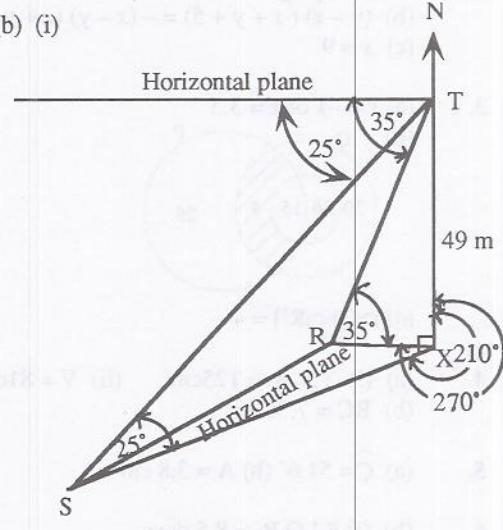
$x + y \leq 110 \dots (3)$

(c) (i) $P = \$ (1.25x + 0.95y)$

(ii) $x = 80$ and $y = 30$

$P_{\max} = \$128.50$

11. (b) (i)



(ii) $RS = 92.8 \text{ m}$

(iii) Bearing = 169.1°

12. (a) (i) $11\ 059.8 \text{ km}$

(ii) $c = 13\ 754.4 \text{ km}$

(b) $T (70^\circ \text{ N}, 50^\circ \text{ W})$

13. (a) $\lambda = 12$

(b) (i) $(14, 5)$

(ii) $y = \frac{5}{14}x$

14. (a) (i) $\vec{AB} = \vec{a} + \vec{b}$ and $\vec{CD} = 5(\vec{a} + \vec{b}) \Rightarrow \vec{CD} = 5 \vec{AB}$

(ii) $AB : CD = 1 : 5$

(b) (i) $\begin{pmatrix} 1 & -2 \\ 3 & 5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 8 \\ -9 \end{pmatrix}$

(ii) $\begin{pmatrix} 1 & -2 \\ 3 & 5 \end{pmatrix}^{-1} = \begin{pmatrix} \frac{5}{11} & \frac{2}{11} \\ -\frac{3}{11} & \frac{1}{11} \end{pmatrix}$

(iii) $x = 2$ and $y = -3$