K.C.S.E 2001 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1. Reciprocal of $0.342 = 2.924$ $\sqrt{0.0625} = 0.25 \times 2.924$ 0.342 $= 0.731$	B1 M1 A1 3 marks	
2. BO - OD $= \sqrt{15^2 - 12^2} = \sqrt{81} - 9$ Area $= 1 \times$ '9' $\times 12 \times 2 + 1 \times$ '9' $\times 18 \times 2$ $= 108 + 162$ $= 270\text{cm}^2$	M1 M1 A1 3 marks	
3. No. | Log. 3.256 | 0.5127 0.0536 | $\bar{2}.7292$ | $\bar{1}.2419 : 3$ | $(\bar{3} + 2.2419) \div 3$ 0.5589 | 1.7473	M1 M1 M1 A1 4 marks	
4. $\frac{1}{3} \times \frac{22}{7} \times 6 \times 6 \times 9 + \frac{1}{2} \times \frac{4}{3} \times \frac{22}{7} \times 6 \times 6 \times 6$ $= 339.4 + 452.6$ $= 792$	M1 M1 A1 3 marks	
5. L1 : $\frac{y - 2}{x - 1} = 5$ $Y = 5x - 3$ L2 at $x = 4, y = 17$ $\frac{y - 17}{x - 4} = \frac{-1}{5}$ $y = \frac{-1}{5}x + \frac{89}{5}$	B1 B1 M1 A1 4 marks	$Y = 5x - 3$ C= 89 or 174 or 17.8 5 5 $y = -1 \times 89$ 5 5
6. $\frac{(3x - y)(x - y)}{(3x - y)(3x - y)}$ $= \frac{x - y}{3x + y}$	M1 M1 A1 3 marks	
7. $x(x + 4) = 32$ $x^2 + 4x - 32 = 0$ $(x - 4)(x + 8) = 0$ $x = 4$ or x length of room is $4 + 4 = 8$m	M1 A1 M1 A1	

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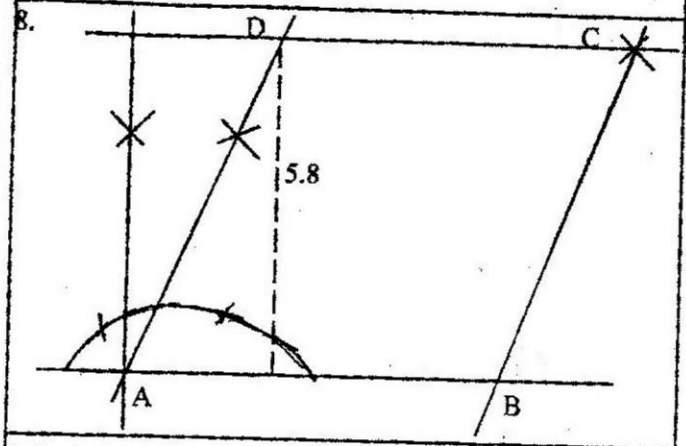
8. 	B1 B1 B1 B1 4 marks	
9. $\frac{5}{100} \times 540 = 27$ $\frac{80}{100} \times 180 = 144$ P (sick) $= \frac{171}{720} = \frac{19}{80} = 0.2375$	M1 M1 A1 3 marks	$\frac{540}{720}$ or $\frac{3}{4}$ $\frac{3}{4} \times 0.05 + 1 \times 0.8$ $= 0.2375$
10. $S^2 = W^2 (a^2 - x^2)$ $\frac{S}{W} = \sqrt{a^2 - x^2}$ $W^2 x^2 = w^2 a^2 - S^2$ $\frac{S^2}{W^2} = a^2 - x^2$ $x^2 = \frac{w^2 a^2 - S^2}{W^2}$ $x^2 = \frac{a^2 - s^2}{W^2}$ $x = \sqrt{\frac{w^2 a^2 - S^2}{W^2}}$ $x \sqrt{\frac{a^2 - s^2}{W^2}}$	M1 M1 A1 3 marks	$\div \sqrt{\frac{W^2 a^2 - S^2}{W^2}}$ OR $+ \sqrt{\frac{W^2 a^2 - S^2}{W^2}}$ $\sqrt{\frac{Wa - S \; Wa + S}{W^2}}$
11. Distance $= \frac{5}{2}\{(2.6 + 2(2.1 + 5.3 + 5.1 + 6.8 + 6.7 + 4.7)\}$ $= \frac{5}{2}(2.6 + 61.4)$ $= 160$ m	M1 M1 A1 3 marks	$\frac{5}{2}(64)$
12. $\cos 2x = \sin (90° - 2x)$ $\sin (x + 30°) = \sin (90° - 2x)$ $x + 30° = 90° - 2x$ $3x = 60°$ $x = 20°$ $\cos 3x = \cos^2 60°$ $= (\frac{1}{2})^2$ $= \frac{1}{4}$ or 0.25	M1 A1 B1 3 marks	

SOLUTION	MARKS	ALTERNATIVE METHOD
13. $\begin{pmatrix}2 & 3\\1 & 2\end{pmatrix}\begin{pmatrix}2 & -3\\-1 & 2\end{pmatrix} = \begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix}\begin{pmatrix}2 & 3\\1 & 2\end{pmatrix}\begin{pmatrix}5\\-3\end{pmatrix}$ $\begin{pmatrix}x\\y\end{pmatrix} = \begin{pmatrix}1\\-1\end{pmatrix}$ $x = 1 \qquad y = -1$	B1 M1 M1 A1 4 marks	
14. $2x + \frac{1}{2} \times 40^\circ + 110^\circ + 130^\circ + 160^\circ - 720^\circ$ $\frac{7x}{2} = 280^\circ$ $x = \frac{280 \times 2}{7} = 80^\circ$ Smallest angle $\frac{1}{2}x = 40^\circ$		
15. Let x be speed of zebra $3.5x = 1.5(x + 20) + 340$ $3.5x = 1.5x + 30 + 340$ $2x = 370$ $x = 185$km/h Buffalo's speed is $185 + 20 = 205$km/h	M1 M1, A1 3 marks	$3.5(x - 20) = 1.5x + 240$ $2x = 410$ $x = 205$ $\frac{340 + x}{3\frac{1}{2}} + 20 = \frac{2x}{3}$ Speed $= \frac{2460}{8} \times \frac{2}{3}$ $= 205$
16. PQ = 3i - 4i - 6j + 6k - 2k $= i - 9j + 4k$ or $4k - 7j - i$ **OR** $-9j + 4k - i$ Length $= \sqrt{(-1)^2 + (-9)^2 + 4}$ $= \sqrt{98}$ $= 7\sqrt{2}$ $\|PQ\| = \sqrt{1^2 + 9^2 + 4^2}$ $= 7\sqrt{2}$	B1 M1 marks	Column vector BO PQ = -i -3j-3k $PQ = \sqrt{1^2 + 8^2 + 3^2}$

SOLUTION	MARKS	ALTERNATIVE METHOD
17. a) Total earnings $\frac{40480}{20}$ = £2024 435 x 2 = 870 435 x 3 = 1305 435 x 4 = 1740 435 x 5 = 2175 284 x 6 = 1704 7794 b) Net tax Sh 7794 - Sh 800 = Sh 6994 c) New earnings .15 x 2024 = 3036 £3036 - £2024 = 1012 excess tax = 1012 x 6 = Sh 6072 % age excess = $\frac{6072}{7794}$ x 100% = 77.91%	M1 M1 M1 A1 B1 M1 M1 A1 8 marks	$\frac{1012 \times 6 \times 100}{7794}$ %
18. $\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} P & Q & R & S \\ 1 & 6 & 6 & 1 \\ 1 & 1 & 4 & 4 \end{bmatrix} = \begin{bmatrix} P^1 & Q^1 & R^1 & S^1 \\ -1 & 4 & -2 & -7 \\ 1 & 1 & 4 & 4 \end{bmatrix}$ $P^1(-1, 1)$ $q^1(4,1)$ $r^1(-2, 4)$ $S^1(-7, 4)$ ii) object drawn Image $P^1 Q^1 R^1 S^1$ drawn (iii) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} P & Q & R & S \\ 1 & 4 & -2 & -7 \\ 1 & 1 & 4 & 4 \end{bmatrix} = \begin{bmatrix} P^{11} & Q^{11} & R^{11} & S^{11} \\ 1 & 1 & 4 & 4 \\ 1 & -4 & 2 & 7 \end{bmatrix}$ $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ Negative Quarter turn about the origin	A1 B1 B1	

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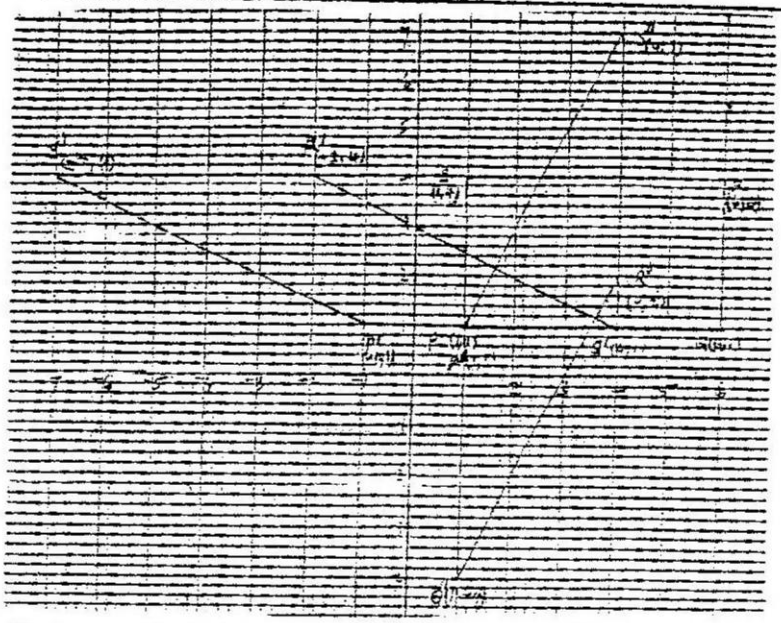


18 (b) Single matrix in the in verse of $\begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 0 \end{bmatrix}$

$\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}\begin{bmatrix} 1 & -2 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ Which is $\begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$

19. a) i) $\underset{\sim}{QQ} = \underset{\sim}{P} + \underset{\sim}{r}$ — B1

ii) $\underset{\sim}{QT} = \underset{\sim}{QR} + 1/5\ \underset{\sim}{RQ}$ — B1

$= \underset{\sim}{r} + 1/5\underset{\sim}{P}$

b) i) $\underset{\sim}{QS} = m\ \underset{\sim}{QQ} = m(\underset{\sim}{p} + \underset{\sim}{r})$ — B1

$= m\underset{\sim}{p} + m\underset{\sim}{r}$

(ii) $\underset{\sim}{QS} = \underset{\sim}{QT} + n\ \underset{\sim}{TP}$ — B1

$= (\underset{\sim}{r} + 1/5\underset{\sim}{P})\ (+ n(-\underset{\sim}{r} - 1/5\underset{\sim}{P} + \underset{\sim}{P})$

$= \underset{\sim}{r}(1-n) + \underset{\sim}{P}(1/5 + 4/5n)$

(iii) $m\underset{\sim}{p} + m\underset{\sim}{r} = \underset{\sim}{r}(\underset{\sim}{r}-n) + \underset{\sim}{p}(1/5 + 4/5n)$ — M1

$m = 1/5 + 4/5n$ .....(1)

$\underline{m = 1-n}$ .....(2) — M1

$5m = 1 + 4n = 1 + 4\ (1-m)$ — A1

$9m = 5$

$m = 5/9$

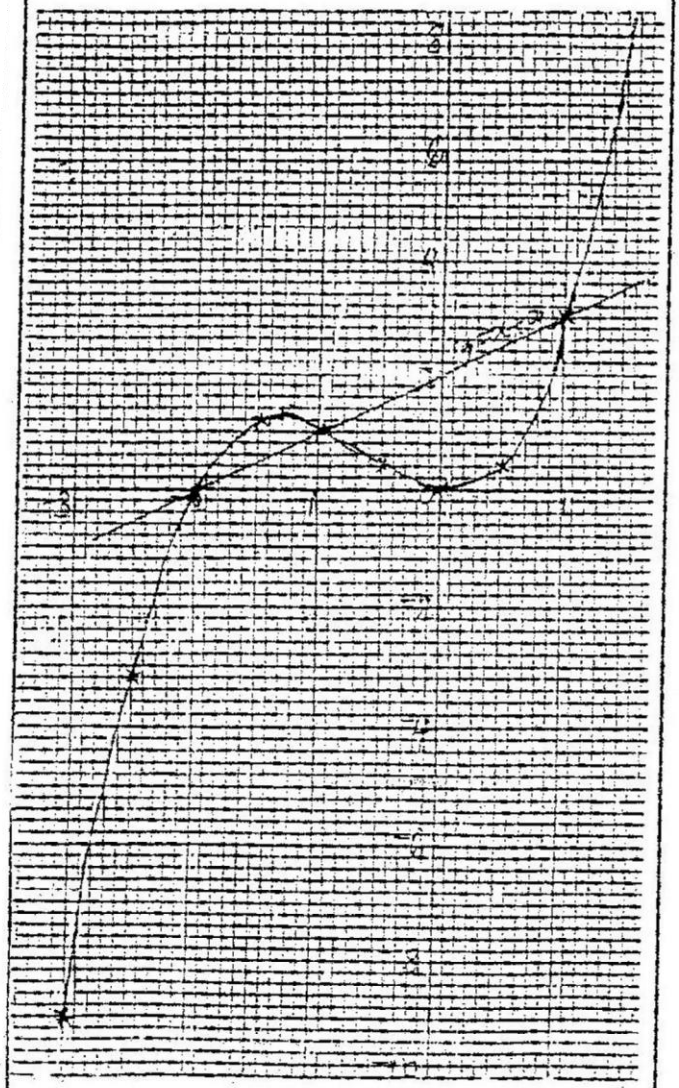
iv) $\underset{\sim}{QS} = {}^{5}/_{9}\underset{\sim}{p} + {}^{5}/_{9}\underset{\sim}{r}$

S divides OQ in the ration 5:4 — B1

8 marks

SOLUTION	MARKS	ALTERNATIVE METHOD

x	-3	-2.5	-1.5	-1	-0.5	0	0.5	1	1.5
x^3			15.06					1	
$2x^2$			12.5					2	
$y=x^3+2x^2$			-3.25					3	



$x = -2, -1, 1$

MARKS	ALTERNATIVE METHOD
B2	all 6 B1 at best 4 entries PA - 1 if values minded off
S1	If Bo, Po.
P1	If B250 tr B8 S0m B15, Uscale be linear
C1	(CAO
B1	$y = x + 2$
L1	Line drawn

B2 S1 P1 C1
B2 S0 P1 C0
B1 S0 P1 C0
B1 S1 P1 C0
B0 S0 P0 C0
B0 S0 P0 C0
B2 S1 P1 C0