K.C.S.E 1997 MATHEMATICS PAPER 121/1 MARKING SCHEME

	SOLUTION	MARKS	ALTERNATIVE METHOD
1.	NO LOG 1934 3.2865 x 2 6.5730 + 0.0324 3.5105 ÷ 2 4 + 4.5105 2 2.75525 5.32825- 436 2.63950 4.884 2.6888 = 488.4 OR 488.5✓	M1 M1 M1 A1 4	all ✓ logs Multiplication and division Addition and subtaction
2.	G.C.F. = XY^2✓ $Xy^2(x^2 - 4y^2)$ ✓ $xy^2(x-2y)(x+2y)$ ✓	B1 B1 B1 3	
3.	SR=RQ .: < QRS = 55° <SQP = 550 ALT to <RSQ <STQ = 90° – 55° = 35° OR 180° – (90° + 55°) ✓ = 35°✓	B1B1 2	
4.	$\frac{ar^2}{a+ar} = \frac{16}{12} = \frac{4}{3}$ ✓ $3r^2 - 4r - 4 - 0$ $3r^2 - 6r - 2r - 4 = 0$✓ $(3r+2)(r-2) = 0$ $r = \frac{-2}{3}$ or $r = 2$ $r = \frac{-2}{3}$ ✓	B1 M1 A1	

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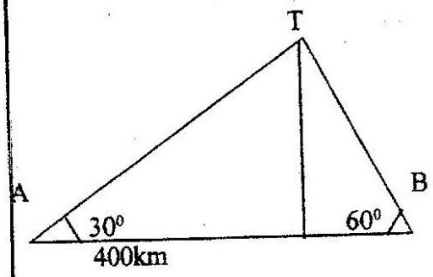 X= 400 cos 60° = 200m H= 200 sin 60° H=200 x 0.8660 = 173.2 m	B1 M1 A1 3	For Sketch ALT. METHOD TAM 30° = h / 400 - x h = (400 - x) tan 30° tan 60° = h .: h = x tan 60° 1.732 x = 400 x 0.5574 - 65774x x = 230.96 / 2.3095 h = 230/96 x 1.7301 = 113.2m
6. Volume of the cone = $^1/_3$x $^{22}/_7$ x 7 x 7 x 18 ✓ = 924 cm^3 Let change in height be H Volume of water displaced = $\frac{22}{7}$ x 14 x 14 x H = 616 cm^2 π x 14x14xH = $^1/_3$ π x 7x7x18 H = $\frac{49 \times 6}{14 \times 14}$ = 1.5 ✓	M1 M1 M1 A1 4	
7. CR = $\frac{4000 \times 100}{24,000}$ = $1^2/_3$ or $^5/_3$% ✓ commission = $\frac{5}{3} \times \frac{98}{100} \times \frac{360,000}{100}$ ✓ = Sh. 5880 ✓	B1 B1 A1 * 3	Accept 5891, 5891.80 When logs are used

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8.	(a) Mode = 934 (b) take any no = a a = 934 – 9 = 925 (ii) $x = 925 + \frac{115}{20}$ x = 930.75	B1 B1 M1 A1 3	
9.	$\begin{pmatrix} 1 & 3 \\ 5 & 3 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 5 & -1 \end{pmatrix}\begin{pmatrix} 3 & 1 \\ 5 & -1 \end{pmatrix}\begin{pmatrix} p & 0 \\ 0 & q \end{pmatrix}$ 18 = 3P 5P = 30 P= 6 P = 6	B1 B1 B1 3	
10	$\frac{dy}{dx} = 3ax^2 - 6x - 2$ $3ax^2 - 6x - 2 = 1$ 3a-6-2=7 at x = 1 3a = 15 a = 5	M1 M1 A1	
11.	$\sin\theta = \frac{4}{5}$ or -0.8 3rd Quadrant 180 + 53.13 = 233.13 4th Quadrant 360 - 53.5 = 306.87	B1 B1 B1 2	
12.	Let the buying price be x Profit = (1040 - x) Loss = (x-880) 1040 - x = 3(x - 880) 4x = 3680 x = Sh. 920	B1 M1 A1 3	
13.	$y(cx^2 - a) = b - bx^2$ $bx^2(b+yc) = b + ya$ $x^2 = \frac{b+ya}{b+yc}$ $x = \sqrt{\frac{b+ya}{b+yc}}$	M1 M1 A1 3	

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14. (a) $\frac{300}{t-1}$ (b) Speed of the bus = $\frac{500}{t-1}$ $\frac{500}{t-1} : \frac{300}{t-1} = 5:3$	B1 B1 A1	
	3	
15. Let the cost be sh c - cup s - spoons $3x + 4s = 324$ $5c - 2s = 228$ $15c + 20s = 1620$ $15 - 6s = 684$ $26s = 936$ $s = 36$ $c = 60$	 M1 M1 A1	
16(a) $R = \frac{1}{0.000016} = \frac{1}{1.6} \times 10^5$ $= 62500$ (b) (1) Approximate value = $\frac{1}{0.00315 - 0.00313}$ $= \frac{1}{0.00002} = {}^1/_2 \times 10^5$ $= 50000$ (ii) Error = 62500 - 50000 = 12500	M1 A1 M1 A1 B1	
	3	

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17.	(a) (i) $(0.8 \times 1.2) + (1.2) \times 2 + (0.8 \times 1\ 2) + 1/2 \times 0.8 \times 0.3 \times 2$ $= 0.96 + 2.4 + 1.6 + 0.24$ ✓ $= 5.2\ m^2$ ✓	M1	
	(ii) $0.6 \times 1.2 \times 2$ ✓ $= 1.44$ ✓	A1 M1 M1	
	(b) 300×144 ✓ 350×5.2 $= 432 + 1830 = Sh.\ 225^2$ ✓	A1	
	(c) $432\ (1.5)^2$ ✓ $= Sh.\ 972$ ✓	M1 A1 8	
18.	(a) (i) 120×27 ✓ $= 3240$ ✓	M1 A1	
	(ii) $120 \times 27 \times 1.853 = 6003.72$ km✓	M1	
	(b) Speed in km/h $\frac{6003.72}{120} = 50.031$ km/h ✓✓	M1/A1	(c) ALT. METHOD
	(c) $\frac{\theta}{360} \times \frac{2 \times 22}{7} 6370 \cos 5 = 6003.72$		$\theta \times 60 \cos 5^o = 3240$ M1 $\theta = \frac{32409}{60 \cos 5^o}$
	$\theta = \frac{6003.72 \times 360 \times 7}{2 \times 22 \times 6370 \cos 5}$ ✓ $= 54.19^0$ Position $(5^oN\ .\ 99.\ 19^o\ E)$✓	A1 8	$(50^oN, 99.21^oE)$ A1
20.			

x	-4	-3	-2	-1	0	-0.5	1	2	3	4	5
y	-14	-6	0	4	6	0.25	6	4	0	-6	-14

B1 for all values corect

Line graph : $y=2-2x$ ✓	L1	- should be correctly read from the table
(b) $x=1 \quad x=4$ ✓	B1	
(c) $6 + x^2 - x = 2-2x$	B1	- working be shown
$x^2 - 3x - 4 = 0$ ✓	B1	
Suitable scale	B1	
plotting	B1	
Smooth curve	B1	- No Turning point of the curve must be with drawn.
$x = -1$ or		

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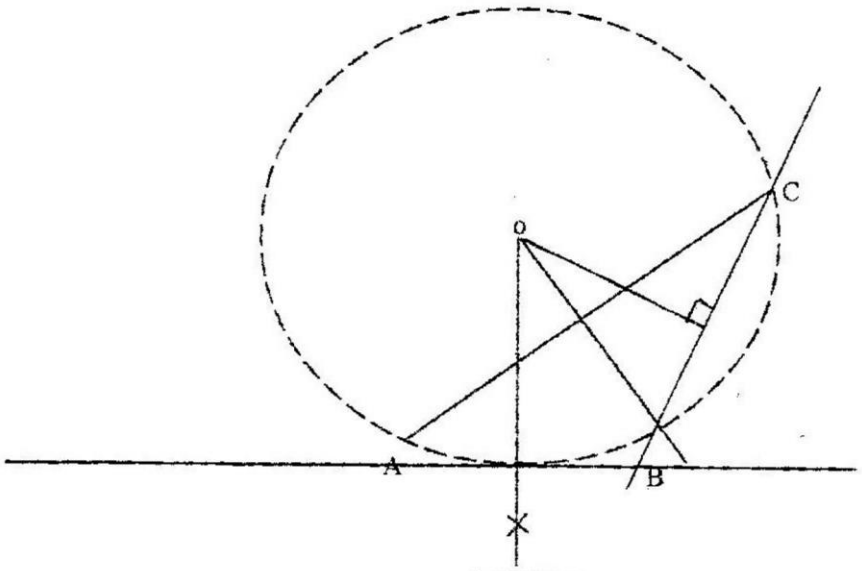
19. Using a ruler and compasses only construct triangle ABC such that AB = 4 cm, BC = 5 cm and <ABC = 120°, measure AC.

On the diagram, construct a circle which passes through the vertices of the trangle ABC measure the radius of the circle.

Measure the shortest distance from the centre of the circle to the line BC = 5 cm and <ABC = 1200 measure AC.



Constr. 60° /120°	B1
Complete D AB = 4 cm, BC = 5 cm	B1
Length of AC = 1.8 + 0.1 cm	B1
Bisectors /mediators	B1
Locating O	B1
Complete O drawn pasting	B1
through vertical A1B1C	B1
Radius 4.5 ± 0.1 cm	B1
Shortest distance 3.8 ± o.1 cm	B1

SOLUTION	MARKS	ALTERNATIVE METHOD
21.(a) 0.9 x 0.8 = 0.72 (b) 0.1 x 0.2 = 0.02 (c) 0.9 x 0.2 + 0.8 x 0.1 or (0.9 x 0.2 + (0.8 x 0.1) = 0.26 (d) 1-0.02 = 0.95	M1 A1 M1 A1 M1 A1 M1	
22. (a) (i) $\underline{AB} = \underline{OB} - \underline{OA} = \underline{b}-\underline{a}$ (ii) $\underline{CD} = \underline{CB} + \underline{BD}$ $= (\underline{a}-\underline{b}) + {}^{1}/_{2}\,\underline{b}$ ..... $= \underline{a} - {}^{2}/_{3}\,\underline{b}$..... (b) (i) $\underline{DE} = K\underline{CD}$ $= K(\underline{a} - {}^{2}/_{3}\,\underline{b})$ ..... (ii) In Δ ODE $\underline{OD} + \underline{DE} = \underline{OE}$ $4/3\,\underline{b} + K(\underline{a} - 2/3\,\underline{b} = \underline{a} + m\underline{a}$ $(4/3 - 2/3K)\underline{b} = 0$ $K = 2$ $K\underline{a} = \underline{a} + m\underline{a}$ $K = 1 + m$ $2 = 1 + m$ $m = 1$	B1 B1 B1 B1 M1 A1 M1 A1 8	
23. (a) $\pm 180^0$ rotation centre origin Matix M = $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ $\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} 2 & 4 & 4 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} -2 & 4 & 4 \\ 0 & -1 & -3 \end{bmatrix}$ $\begin{bmatrix} 2a+0 & 4a+b & 4a+8b \\ 2c+0 & 4c+d & 4c+d \end{bmatrix} = \begin{bmatrix} -2 & 4 & 4 \\ 0 & -1 & -3 \end{bmatrix}$ $2a = -2$ $\quad$ $4c + d = -1$ $a = -1$ $\quad$ $d = -1$ $4a + h = 4$ $\quad$ $m\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ $b = 4 - 4$ $b = 0$ $2c - 0 \quad c = 0$	B1 B1 B1 B1	

SOLUTION	MARKS	ALTERNATIVE METHOD
(b) $\begin{bmatrix}2 & 1\\1 & 1\end{bmatrix}\begin{bmatrix}2 & 4 & 4\\0 & 1 & 3\end{bmatrix}\ \begin{bmatrix}4 & 9 & 11\\2 & 5 & 7\end{bmatrix}$ $\begin{bmatrix}2\times2+0\\2\times1+0\end{bmatrix}\ \begin{bmatrix}2\times4+1\\1\times4+1\end{bmatrix}\ \begin{bmatrix}2\times4+3\\4+3\end{bmatrix}\begin{bmatrix}4 & 9 & 11\\2 & 5 & 7\end{bmatrix}$ A" (4.2) B" (9.5) C" (11.7)		
(c) Area of $\triangle$ ABC $= 1/2 \times 2 \times 2 = 2\ cm^2$✓ Determinant of $\begin{bmatrix}2 & 1\\1 & 1\end{bmatrix} = 2 - 1 = 1$✓ Area of $\triangle$ A" B" C" $= 1 \times 2 = 2\ cm^2$✓		
24. (a) OT $= 1\begin{bmatrix}1\\-2\end{bmatrix} + \frac{2}{3}\begin{bmatrix}4\\10\end{bmatrix} = \begin{bmatrix}3\\6\end{bmatrix}$ ✓ T [3,6]	M1 A1 2	
(b) Gradient PQ $= 4$ Gradient Normal $= -1/4$	M1 A1	
(ii) $\frac{y-6}{x-3} = -4/4$	B1	
$4(y-6) = (x-3)$ $4y - 24 = -x + 3$ $4y = -x + 27$	A1	
(iii) $(6\ 3/4 - 6)^2 \div (3-0)^2$ $= \sqrt{9.5625}$ $= 3.092$ $= 3.09$ (Sig. Fig) or 3.093	B1 A1	