K.C.S.E 1995 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE
1. $\sqrt{\frac{384.16 \times 0.0625}{96.04}}$ $\sqrt{\frac{2^4 \times 7^4 \times 10^2 \times 5^4 \times 10^4}{2^3 \times 7^4 \times 10^{-2}}}$ $\sqrt{2^2 \times 5^4 \times 10^4}$ $2^2 \times 5^4 \times 10^4$ $= 0.5$	 m1 m1 A1 3 marks	Alternative methods 4×0.0625 m1 2×0.25 m1 $= 0.5$ $\sqrt{\frac{24.01}{96.04}}$ m1 $= \sqrt{0.25}$ m1 $= 0.5$ A1 *Long method* $\sqrt{384.16} = 19.6$ $\sqrt{0.0625} = 0.25$ } m1 $\sqrt{96.04} = 9.8$ $\frac{19.6 \times 0.25}{9.8}$ m1 $= 0.5$ A1 Long checking method must be seen to score 1st mark
2. $\frac{2x-2}{6x^2-x-12} + \frac{x-1}{2x-3}$ $= \frac{2(x-1)}{(3x+4)(2x-3)} \times \frac{(2x-3)}{x-1}$ $= \frac{2}{3x+4}$	m1 m1 A1 3 marks	For of question completely For concellation
3. Median $= 7.5 + \frac{5}{8} \times 4$ $= 10$	m1 A1 2 marks	Cumulative graph m1 median = 10 A1 $7.5 + \frac{5}{8} \times 4$ m0 9.75 A0
4. Manyatta 5.3 cm, 34°, 7 cm Bearing of Chamwe from Manyatta 169 ± 1 5. $\frac{y-5}{x+8} = \frac{1}{4}$ $y = -\frac{1}{4}x + 3$	S1 B1 B1 m1 A1 2 marks	Appropriate scale Scale drawing (completely)

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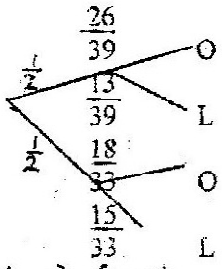
6. $\frac{1}{S^{\frac{2}{3}}} = \frac{3V+2}{2\pi r^3}$ $C^{\frac{2}{3}} = \frac{2\pi r^3}{3SV + 4\pi r^3 S}$ $C = \sqrt{\frac{2\pi r}{3SV + 4\pi r^3 S}}$	m1 m1 A1 3 marks	
7. $A = \left[2x^2 - \frac{1}{3}x^3\right]_1^4$ $= 8 - \frac{8}{3} - 2 + \frac{1}{3}$ $= \frac{32}{3}$	m1 m1 A1 3 marks	correct integration without limits Substitution of limits
8.  $P(0) = \left(\frac{1}{2} \times \frac{2}{3}\right) + \left(\frac{1}{2} \times \frac{6}{11}\right)$ $= \frac{20}{33}$ or $\frac{260}{429} = \frac{780}{1287}$	m1 m1 m1 A1 4 marks	Tree diagram need not be drawn Or equivalent for addition Or equivalent for addition
9. $\frac{4}{3} \times \frac{22}{7} \times r^3 = \frac{1}{2} \times \frac{22}{7} \times 9 \times 9 \times 12$ $r^3 = 243$ $r = 6.24$ or equivalent $A = 4\pi r^2 = 4 \times \frac{22}{7} \times 6.24 \times 6.24 = 489.5 cm^2$	m1 A1 4 marks	If A1 lost.
10. 10, 10 + 2d, 10 + 6d $\frac{10+2d}{10} = \frac{10+6d}{10+2d}$ $100 + 40d + 4d^2 = 100 + 60d$ $4d^2 - 20d = 0$ $d = 5$ or $d = 0$ Alternative $4d^2 = 20d$ $\quad 4d^2 - 20d = 0$ $4d = 20$ $\quad 4d(d-5) = 0$ $d = 5$ $\quad d - 5 = 0$ or $4d = 0$ $d = 5$ or $d = 0$	B1 m1 m1 m1 marks	A.P. identified G.P. ratio equated Simplified quadratic equation $d = 0$ must be disqualified

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11. $\frac{4x\ 21 + 3 \times 42}{7} = 30$ $\frac{130 \times 30}{100} = 39$	m1 A1 m1 Al 4 marks	Accept $\frac{210}{7} \times \frac{130}{100}$ m2 -39 A2
12. $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ Inverse $\frac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix}$ $\frac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix}\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} S \\ T \end{pmatrix}$ $= \frac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix}\begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ $\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 120 \\ 240 \end{pmatrix}$ Shirt Sh. 120, Trousers Sh. 240	B1 B1 B1 ml Al 4 marks	For mainly equation Or equivalent $\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 1 & 5 & -2 \\ 7 & -4 & 3 \end{pmatrix}\begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ If transposed used B0 B0
13. $\frac{27 \times 4 \times 60}{60 \times 30}$ = 3.6 cm height = 23.6 cm	ml ml Al 3 marks	For division quantity through if log used
14. <ACE = 60° cyclic quadrilateral <CDA = 100° <sum of triangle or <ABE = 100° ext <equal <FED = 40°	B1 B1 B1 3 marks	or <DCE or <BEA or <EBC = 80° or <EDF = 80° *40° must be worked for NOT just seen*
15. 2.5000 - 3750 = 21250 Amount to pay 21250 + 21250 x $\frac{40 \times 2}{100}$ = 38250 One instalment = $\frac{38250}{24}$ = Sh 1,593,75	ml Al 4 marks	Working 5.1 + 21250 From 5.1 from amount owing If A1, lost
16. $\frac{(2x + 30^0 \times 60}{195} = x - 20$ x = 76 km Actual distance = 182 km	B1 3 marks	
17. a) 10000 x 1.2 = 12000 22000 x 1.2 = 26400 36400 x 1.2 = 43680 b) $A = 43680\ (1.2)^8$ No Log 43680 = 4.6403 1.2^8 0.0792 x 8 = 0.6403 1.879×10^5 5.2739 = Sh. 187900 Sh. 187900 - Sh 30000 = Sh. 157900	ml ml m1 A1 ml ml Al m1 Al 8 marks	For logs and operations Follow through if logs used

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18. a) (i) $AV = AD + DV = a + c$ (ii) $BV = BA + AV = a + c - b$	B1 m1 A1	0w - 1 vector sign not used Follow the route
b) $BO = \frac{1}{2} BD = \frac{1}{2}(a - b)$ $OV = OB + BV$ $= \frac{1}{2}(b - a) + a + c - b$ $-\frac{1}{2}a + c - \frac{1}{2}b$	m1 m1	
$OM = \frac{3}{7} OV$ $= \frac{3}{7}\left(\frac{1}{2}a + c - \frac{1}{2}b\right)$ $BM = BO + OM$ $= \frac{1}{2}(a - b) + \frac{3}{7}\left(\frac{1}{2}a + c - \frac{1}{2}b\right)$ $= \frac{7a - 7b + 3a + 6c - 3b}{14}$ $= \frac{10a + 10b + 6c}{14}$ $= \frac{1}{7}(5a - 5b + 3c)$	m1 A1 8 marks	or - $BV + Vm$ $= a + c - b + \frac{4}{7} - \frac{1a}{2} - c + \frac{1b}{2}$ $= \frac{10a - 10b + 6c}{14}$ $= \frac{1}{7}(5a - 5b + 3c)$ Accep $\frac{5a}{7} - \frac{5b}{7} + \frac{3c}{7}$
19. a) $\text{Sin } 1/2\ \theta = 0.8$ $1/2\ \theta = 53.13°$ $\theta = 106.26$ $= 106.3°$ Area of segment = $\frac{253.7}{360} \times \frac{22}{7} \times 5 + \frac{1}{2} \times 5 \times 5 \text{ Sin } 106.3°$ $= 55.37 + 12$ $= 67.37 \text{ cm}^2$ b) $\frac{300}{60} \times 2\pi = 10\pi$ radians	m1 A1 M1 m1 m1 m1 m1 A1 8 marks	Alternative $\frac{300}{60} \times \frac{360}{180} \pi = 10\pi$ Accept A = r2 - $\frac{106.3}{360} \times \frac{22}{7}$ 25 - m1 $\frac{1}{2} \times 25 \text{ Sin } 106.3$ m1 = 78.57 - (23.2 - 120) = 78.57 - 11.2 m1 = 67.37 cm2 A1 If A1 lost
20. a) (i) $b - a = 35.1$ .....(i) $7b - 490a = 39.9$ ..... (ii) $a = 4.9 \quad b = 40$ (ii) $5 = -4.9t^2 + 40t + 10$	m1 A1	

t	0	1	2	3	4	5	6	7	8	9	10
x	10		70.4	85.9	91.6	87.5	73.6		16.4	26.9	

	B1	If A1, lost
b) i) Suitable scale	S1	
Plotting	P1	
Curve	C1	
(ii) Tangent at t = 5	T1	If C1 lost or A1 lost
Velocity = -9.0 ± 0.5m/s	B1	
	8 marks	

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21. a) | x | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | | y | 6 | 0 | -1 | -6 | -6 | -1 | 0 | 6 |	B2	Give B1 for 6 values
b) Suitable scale Plotting ✓Curve	S1 P1 C1	If B1 of S0
c) $y = -3x - 4$ line drawn roots -2.70 ± 0.1 or 0.70 ± 0.1	B1 L1 B1 8 marks	If PO for equation lost For both roots
22. a) $BD = \frac{60 \sin 120}{\sin 30} = 103.92$	m1 A1	Expression with BD $BD^2 = 60^2 + 60^2 - 2(60)B0$ $= 10800$ $BD = 10800 = .103.9$
$AB = \frac{103.92 \sin 55}{\sin 80} = \frac{103.92 \times 0.8192}{0.9848}$	m1	$AD = 86.40$ $AD = 74.56$
$= 86.44m$		For the two divisions by 3 (2.44)
$AD = \frac{103.92 \sin 45}{\sin 80} = \frac{103.92 \times 0.7071}{0.9848}$	M1	(2.62)
$= 74.62$ cm ∴ B to D via A is $86.44 + 74.60 = 161.06m$	A1	Award by B1 B1 if all in m1 scored
b) "$\frac{86.44}{3}$" = 28 rem 2.44	B1	
"$\frac{74.62}{3}$" = 24 rem 2.62 ∴ distance are 2.44 m and 2.62m	B1	
	8 marks	
23. (a) Plotting $A^1 B^1 C^1 D^1$ and drawing $A^1 B^1 C^1 D^1$	B1	In case the centre is not (0,0) award and mark out doing the last A1 Accept Positive $\frac{1}{4}$ turn
(b) (i) $\begin{pmatrix} -2 & -1 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 0 & 0 & -5 & -2 \\ 2 & 6 & 6 & 2 \end{pmatrix}$ A" B" C" D" matrix $\begin{pmatrix} -2 & -6 & 4 & 2 \\ -2 & -6 & -11 & -4 \end{pmatrix}$	A1	$\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ m1
(ii) Plotting of A" B"C"D"	B1	$\begin{pmatrix} -2 & -1 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ or $\begin{pmatrix} -1+2 \\ -1 & -1 \end{pmatrix}$ m1
(c) $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} -2 & -6 & 4 & 2 \\ -2 & -6 & -11 & -4 \end{pmatrix} \quad \begin{pmatrix} 2 & 6 & 6 & 2 \\ 0 & 0 & 5 & 2 \end{pmatrix}$	m1	
$-2a - 2b = 2$ ..... (i) $-2c - 2d$....(i) $4a - 11b = 6$..... (ii) $2c - 4d = 2$ ... (ii)	m1	Matrix is $\frac{1}{3}\begin{pmatrix} 1+2 \\ +1 & -1 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ 3 & 3 \\ 1 & 1 \\ 3 & 3 \end{pmatrix}$
$a = \frac{-1}{3}$ $b = \frac{-2}{3}$ $c = \frac{1}{3}$ $d = \frac{1}{3}$	A1	Follow through if different centre of ration is used.
Matrix in $\begin{pmatrix} \frac{1}{3} & \frac{2}{3} \\ \frac{1}{3} & \frac{1}{3} \end{pmatrix}$	A1 8 marks	

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24. (a) Lat of B = 43.75° 43.45¹	B1	
(ii) r = 6370 Cos 43.75°	ml	Only when subtraction in done to 43o . 45
angle between B and C = 60°	B1	37° + 23° = 60°
BC = $\frac{60}{360}$ x 2 x $\frac{22}{7}$ 6370 Cos 43.75"	ml	Cos 43.75 = 1.8587
= $\frac{60}{360}$ x 2 x $\frac{22}{7}$ 6370 x "0.7224°	ml	Must be correct 0.7224
=4820.816 km	A1	Either both B1 or one B1 lost
b) $\frac{60 \times 4 - 4}{60}$ hrs		Follow through logs
local time at C in 2100 hours or 9.00 pm	A1 8 marks	