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

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

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SOLUTION	MARKS	ALTERNATIVE METHOD
6. $\dfrac{1}{Sc^2} = \dfrac{3V+2}{2\pi\, r^3}$ $C^2 = \dfrac{2\pi r^3}{3SV + 4\pi r^3 S}$ $C = \sqrt{\dfrac{2\pi r}{3SV + 4\pi r^3 S}}$ $\sqrt{3SV + 4\pi r^3 S}$	m1 m1 A1 3 marks	
7. $A = \left\| 2x^2 - \dfrac{1}{3}x^3 \right\|_{1}^{2}$ $= 8 - \dfrac{8}{3} - 2 + \dfrac{1}{3}$ $= \dfrac{32}{3}$	m1 m1 A1 3 marks	correct integration without limits Substitution of limits
8. $\dfrac{26}{39}$ O $\dfrac{1}{2}$ $\dfrac{13}{39}$ L $\dfrac{1}{2}$ $\dfrac{18}{33}$ O $\dfrac{15}{33}$ L $P(0) = \left(\dfrac{1}{2}\times\dfrac{2}{3}\right) + \left(\dfrac{1}{2}\times\dfrac{6}{11}\right)$ $= \dfrac{20}{33}$ or $\dfrac{260}{429} = \dfrac{780}{1287}$	m1 m1 m1 A1 4 marks	Tree diagram need not be drawn Or equivalent for addition Or equivalent for addition
9. $\dfrac{4}{3}\times\dfrac{22}{7}\times r^3 = \dfrac{1}{3}\times\dfrac{22}{7}\times 9\times 9\times 12$ $r^3 = 243$ $r = 6.24$ or equivalent $A = 4\, r^2 = 4\times\dfrac{22}{7}\times 6.24\times 6.24 = 489.5\,cm^2$	m1 A1 4 marks	If A1 lost.
10. $10, 10 + 2d, 10 + 6d$ $\dfrac{10+2d}{10} = \dfrac{10+6d}{10+2d}$ $100 + 40d + 4d^2 = 100 + 60d$ $4d^2 - 20d = 0$ $d = 5$ or $d = 0$ Alternative $4d^2 = 20d \qquad 4d^2 - 20d = 0$ $4d = 20 \qquad 4d(d-5) = 0$ $d = 5 \quad d - 5 = 0$ 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
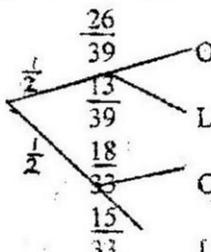
SOLUTION	MARKS	ALTERNATIVE METHOD
11. $\dfrac{4 \times 21 + 3 \times 42}{7}$ $= 30$	m1 A1	Accept $\dfrac{210}{7} \times \dfrac{130}{100}$ m2
$\dfrac{130 \times 30}{100}$ $= 39$	m1 A1 **4 marks**	-39 A2
12. $\begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ Inverse $\dfrac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix}$ $\dfrac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 3 & 2 \\ 4 & 5 \end{pmatrix}\begin{pmatrix} S \\ T \end{pmatrix}$ $= \dfrac{1}{7}\begin{pmatrix} 5 & -2 \\ -4 & 3 \end{pmatrix} \begin{pmatrix} 840 \\ 1680 \end{pmatrix}$ $\begin{pmatrix} S \\ T \end{pmatrix} = \begin{pmatrix} 120 \\ 240 \end{pmatrix}$ Shirt Sh. 120, Trousers Sh. 240	B1 B1 B1 m1 A1 **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. $\dfrac{27 \times 4 \times 60}{60 \times 30}$ $= 3.6$ cm height $= 23.6$ cm	m1 m1 A1 **3 marks**	For division quantity through if log used
14. $\angle ACE = 60°$ cyclic quadrilateral $\angle CDA = 100°$ $\angle$sum of triangle or $\angle ABE = 100°$ ext $\angle$equal $\angle FED = 40°$	B1 B1 B1 **3 marks**	or $\angle DCE$ or $\angle BEA$ or $\angle EBC = 80°$ or $\angle EDF = 80°$ *40° must be worked for NOT just seen*
15. $2.5000 - 3750 = 21250$ Amount to pay $21250 + 21250 \times \dfrac{40 \times 2}{100}$ $= 38250$ One instalment $= \dfrac{38250}{24} = $ Sh 1,593,75	m1 A1 **4 marks**	Working 5.1 + 21250 From 5.i from amount owing If A1, lost
16. $\dfrac{(2x + 30° \times 60)}{195} = x - 20$ $x = 76$ km Actual distance $= 182$ km	B1 **3 marks**	

17. a) $10000 \times 1.2 = 12000$
 $22000 \times 1.2 = 26400$
 $36400 \times 1.2 = 43680$
 b) $A = 43680 (1.2)^8$
    No   Log
    43680 $= 4.6403$
    1.2^8 $0.0792 \times 8 = 0.6403$
    1.879×10^5 5.2739
      $= $ Sh. 187900
 Sh. 187900 $-$ Sh 30000 $=$ Sh. 157900
	m1
	 m1
	 m1 A1
	 m1
	
	 m1
	
	 A1
	 m1 A1
	 8 marks
		For logs and operations
		 Follow through if logs used

SOLUTION	MARKS	ALTERNATIVE METHOD
18. a) (i) AV = AD + DV = a + c	B1	0w - 1 vector sign not used
(ii) BV = BA + AV = a + c - b	m1 A1	Follow the route

$$18. \text{ b) } BO = \tfrac{1}{2}BD = \tfrac{1}{2}(a - b)$$ — m1

$$OV = OB + BV$$ — m1
$$= \tfrac{1}{2}(b - a) + a + c - b$$
$$\tfrac{-1}{2}a + c - \tfrac{1}{2}b$$

$$OM = \frac{3}{7} OV$$
$$= \frac{3}{7}\left(\tfrac{1}{2}a + c - \tfrac{1}{2}b\right)$$

$$BM = BO + OM$$ — m1
$$= \tfrac{1}{2}(a - b) + \tfrac{3}{7}\left(\tfrac{1}{2}a + c - \tfrac{1}{2}b\right)$$
$$= \frac{7a - 7b + 3a + 6c - 3b}{14}$$

$$= \frac{10a + 10b + 6c}{14}$$

$$= \tfrac{1}{7}(5a - 5b + 3c)$$ — A1, 8 marks

Alternative Method:

$$\text{or } - BV + Vm$$
$$= a + c - b + \frac{4}{7} - \tfrac{1}{2}a - c + \tfrac{1}{2}b$$
$$= \frac{10a - 10b + 6c}{14}$$
$$= \tfrac{1}{7}(5a - 5b + 3c)$$
$$\text{Accept } \frac{5a}{7} - \frac{5b}{7} + \frac{3c}{7}$$

19. a) Sin 1/2 θ = 0.8	m1	Alternative

$$\tfrac{1}{2}\theta = 53.13°$$
$$\theta = 106.26$$
$$= 106.3°$$ — A1

$$\frac{300}{60} \times \frac{360}{180}\pi = 10\pi$$

Accept
$$A = r^2 - \frac{106.3}{360} \times \frac{22}{7} 25 - m1$$

Area of segment = — M1, m1
$$\frac{253.7}{360} \times \frac{22}{7} \times 5 + \tfrac{1}{2} \times 5 \times 5 \ Sin\ 106.3°$$

$$\tfrac{1}{2} \times 25\ Sin\ 106.3 \quad m1$$
$$= 78.57 - (23.2 - 120)$$

$$= 55.37 + 12$$ — m1
$$= 67.37\ cm^2$$ — m1
b) $\frac{300 \times 2\pi}{60} = 10\pi$ radians — m1 A1, 8 marks

$$= 78.57 - 11.2 \quad m1$$
$$= 67.37\ cm2 \quad A1$$
If A1 lost

20. a) (i) b - a = 35.1 ....(i)		
7b - 490a = 39.9 ....(ii)	m1	
a = 4.9 b = 40	A1	
(ii) 5 = -4.9t² + 40t + 10		

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
Velocity = -9.0 ± 0.5m/s — B1

If C1 lost or A1 lost

8 marks

SOLUTION	MARKS	ALTERNATIVE METHOD

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 — S1

Plotting — P1 — If B1 of S0

✓Curve — C1

c) $y = -3x - 4$ — B1 — If P0 for equation lost

✓ line drawn — L1

roots -2.70 ± 0.1 or — B1 — For both roots

0.70 ± 0.1

8 marks

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22. a) $BD = \dfrac{60 \sin 120}{\sin 30} = 103.92$ — m1 A1 — Expression with BD

$$BD^2 = \dfrac{60^2 + 60^2 - 2(60)B0}{\ \ } = 10800$$

$$BD = \sqrt{10800} = 103.9$$

$AB = \dfrac{103.92 \sin 55}{\sin 80} = \dfrac{103.92 \times 0.8192}{0.9848}$ — m1 — AD = 86.40

$= 86.44m$ — AD = 74.56

$AD = \dfrac{103.92 \sin 45}{\sin 80} = \dfrac{103.92 \times 0.7071}{0.9848}$ — M1

For the two divisions by 3

(2.44)   (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) $\dfrac{"86.44"}{3} = 28$ rem 2.44 — B1

$\dfrac{"74.62"}{3} = 24$ rem 2.62 — B1

∴ distance are 2.44 m and 2.62m

8 marks

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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

(b) (i) $\begin{pmatrix} -2 & -1 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 0 & 0 & -5 & -2 \\ 2 & 6 & 6 & 2 \end{pmatrix}$

Accept

Positive ¼ turn

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

(c) $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} -2 & -6 & 4 & 2 \\ -2 & -6 & -11 & -4 \end{pmatrix}$ $\begin{pmatrix} 2 & 6 & 6 & 2 \\ 0 & 0 & 5 & 2 \end{pmatrix}$ — m1

$\begin{pmatrix} -2 & -1 \\ 1 & -1 \end{pmatrix}\begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$ or $\begin{pmatrix} -1 + 2 \\ -1 & -1 \end{pmatrix}$ m1

$-2a - 2b = 2 ..... (i)$ $-2c - 2d....(i)$

$4a - 11b = 6...... (ii)$ $2c - 4d = 2 ... (ii)$ — m1

$a = \dfrac{-1}{3}$ $b = \dfrac{-2}{3}$ $c = \dfrac{1}{3}$ $d = \dfrac{1}{3}$ — A1

Matrix is $\frac{1}{3}\begin{pmatrix} 1 & +2 \\ +1 & -1 \end{pmatrix} = \begin{pmatrix} \frac{1}{3} & \frac{2}{3} \\ \frac{1}{3} & \frac{1}{3} \end{pmatrix}$

Matrix in $\begin{pmatrix} \frac{1}{3} & \frac{2}{3} \\ \frac{1}{3} & \frac{1}{3} \end{pmatrix}$ — A1

Follow through if different centre of ration is used.

8 marks

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Revision K.C.S.E Maths 1995-2005

SOLUTION	MARKS	ALTERNATIVE METHOD
24. (a) Lat of B = 43.75° 43.45¹	B1	
(ii) r = 6370 Cos 43.75°	m1	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"	m1	Cos 43.75 = 1.8587
= $\frac{60}{360}$ x 2 x $\frac{22}{7}$ 6370 x "0.7224°	m1	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	