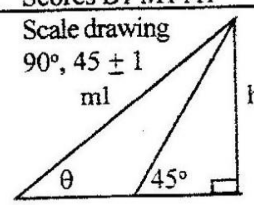
K.C.S.E 1996 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1. No. | Log 36.15 | 1.5581 0.02573 | $\bar{2}.4104$ | $\bar{1}.9685$ 1.938 | 0.2874 | $\bar{1}.6811 \div 3$ | $(\bar{3} + 2.6811) \div 3$ 7,829 x 10^1 1.8937 = 0.7829 or 0.7828	ml ml A1 3 marks	✓ ✓ 3 log (All logs) Additional, subtraction & division by 3 for -ve characteristic division by 3 Accept 0.78.28 or standard form
2. $3x^2 - 3xy + xy - x^2$ 3x (x-y) + y (x-y) (x-y) (3x + y)	ml A1	Award marks for working by inspection be (x - y) 3x = y) m1 A1
3. 5s + 3b = 1750.........................(i) 3s + b = 850 ....(ii) 5s + 3b = 1750 .... (iii) 9s + 3b = 2550 .... (iv) 4s = 800 S = 200 b = 250	B1 ml A1 3 marks	For forming simultaneous equations Elimination of equivalent T/E evidence Scores B1 M1 A1
4. tan 45° = $\frac{h}{60}$ or h = 60 m tan θ = $\frac{60}{240}$ = 0.25 = 14.04° (14° 2')	ml ml A1 3 marks	Scale drawing 90°, 45 ± 1 ml  √80°m com⊥ ml θ = 14° ± 1° A1
5. 67° = <ADB = 180° - (45 + 68) 31° = <ABD = 180° - 67 + 82 68° - 31 <DBC = 37°	ml A1 ml A1 4 marks	98 <DCB ml 37O <DBC A1 68° - 37° ABD ml = 31°
6. a = 6000 n = 5 S_5 = 32400 32400 = $\frac{5}{2}$ (12000 + 20d) 64800 = 60000 + 20d 20d = 4800 d = 240	B1 ml A1 3 marks	1st year = 6000 2nd year = 6000 + d 3rd year = 6000 + 2d 4th year = 40000 + 3d 5th year = 6000 + 4d 30000 + 10d = 32400

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7. (a) 21000 x 48 - 560000 10080000 - 560000 = 448000 (b0 448000 = $\frac{560000 \times R \times 4}{100}$ r = $\frac{44800 \times 100}{560000 \times 4}$ = 20%	ml A1 ml A1 4 marks	
8. Cap of the tank = 2.4 x 2.8 x 3 x 1000 = 20160 litres Amount needed = 20160 - 3600 = 16560 litres Time = $\frac{16560}{0.5 \times 60 \times 60}$ = 9h 12 minutes	ml ml ml ml A1 4 marks	When converting to litres For the subtraction 2.4 x 2.8 x y x 100 = 3600 y = 0.5357
9. 17500 x $\frac{95}{5}$ = Sh 332500	ml A1 2 marks	
10. 25, 289, 4, 484, 4 806 o = $\sqrt{\frac{806}{5}}$ = $\sqrt{161.2}$ = 12.7	B1 ml A1 4 marks	B0 if item missing For $\frac{806}{5}$ For sqrt. method of S.D. manipulation if B0
11. $A^2 = \begin{Bmatrix} 1 & 2 \\ 4 & 3 \end{Bmatrix} \begin{Bmatrix} 1 & 2 \\ 4 & 3 \end{Bmatrix} = \begin{Bmatrix} 9 & 8 \\ 16 & 17 \end{Bmatrix}$ $B = \begin{Bmatrix} 9 & 8 \\ 6 & 17 \end{Bmatrix} = \begin{Bmatrix} 1 & 2 \\ 4 & 3 \end{Bmatrix} = \begin{Bmatrix} 8 & 6 \\ 12 & 14 \end{Bmatrix}$	m1 A1 m1 A1 A1 4 marks	 If A1 above lost But first must be second
12. $\frac{5}{2}\theta$ - 210°, 330 $\theta = \frac{420°}{5}, \frac{660°}{5}$ = 8[illegible], 132°	B1 B1 2 m[illegible]	

13. B.P $= \frac{144}{6} \times 100$ S.P $= \frac{165}{100} \times \frac{144}{6} \times 100$ $= 3960$ Let pineapple sole at Sh.72 for every 3 be x and at Sh.60 for every 2 be $144 - x$ $\frac{144-x}{2} \times 60 + \frac{x}{3} \times 72 = 3960$ $4320 - 30x + 24x = 3960$ $60x = 360$ $x = 60$	m1 m1 A1 3 marks	ALT $BP = \frac{144}{6} \times 100$ $SP = \frac{x}{3} \times 72 + \frac{144x}{2} \times 60$ $24x + (144-x)\,30$ $24x + (144 - x)30 = 2400$ $= 24.00$ m1 $= 55$ m1
14. $\frac{2T}{m} = U^2 - V^2$ $V^2 = U^2 - \frac{2T}{m}$ $V = \sqrt{U^2 - \frac{2T}{m}}$	m1 m1 A1 3 marks	$Mu^2 - Mv^2 = 2T$ m1 $MV^2 = Mu^2 - 2T$ $V^2 = Mv^2 - 2T$ m1 $V_2 = \frac{Mu - 2T}{M}$ $V = \sqrt{\frac{Mu^2 - 2T}{M}}$ A1
15. $R = 8.5$ $r = 5.5$ $V = \pi R^2 h - \pi r^2 h$ $= \frac{22}{7} \times 14\,(8.5 - 5.5)(8.5 + 5.5)$ $= 44\ (3)\ (14)$ $= 1848$	B1 m1 A1 3 marks	Award m1 for $(8.5 - 6.5)(8.5 + 6.5)$ only CAO
16. Let speed of B be x km/h and " " A be $(x + 5)$ km/h Time for A $= \frac{3120}{x+5}$ Time for B $= \frac{3120}{x}$ $= \frac{3120}{x} - 4 = \frac{3120}{x+5}$ $3120(x + 5) - 4x(x + 5) = 3120x$ $3120x + 15600 - 4x^2 - 20x = 3120x$ $4x^2 + 20x - 15600 = 0$ $x2 + 5x - 3900 = 0$ $(x - 60)(x + 65) = 0$ $x = 60$km/h	B1 m1 m1 A1 5 marks	Speed A is x B is $x - 5$ $A = \frac{3120}{x}$ $B = \frac{3120}{x-5}$ } B1 $\frac{3120}{x} + 4 = \frac{3120}{x-5}$ m1 $3120(x - 5) + 4x(x-5) = 3120x$ m1 $x^2 - 5x - 39600 = 0$ m1 $(x - 65)(x + 60)$ $x = 60$km/h A1

SOLUTION	MARKS	ALTERNATIVE METHOD
21. a) $\begin{array}{c\|cccc} x & -5.5 & -5 & -4.25 & -3.75 \\ \hline y & 16.25 & 12 & 6.56 & 3.56 \end{array}$ $y = x^2 + 2x - 3$ b) $A = 0.5\,(18.56 + 14.06 + 10.06 + 6.56 + 3.56 + 106)$ $0.5 \times$ '53 x '53.86' $= 26.93$s1 units c) (i) $= \frac{x^3}{3} + x^2 - 3x \Big\|_{-6}^{3}$ $= 9 + 18$ $= 27$ sq units (ii) $\frac{27 - 26.93 \times 100}{27}$ $= \frac{0.07 \times 100}{27}$ $= (0.2592\%, 0.2593\%)$	B1 m1 A1 m1 A1 m1 A1 8 marks	
22. a) (1) $AC = OA + OC$ $= -a + b$ b) $BN = BA + AN$ $= -b - \frac{2}{3}a$ c) (i) $AX = hAC$, $BX = kBN$ $OX = OA + AX = a + h(b - a)$ ..... (1) $OX = OA + AB + BX$ $a + b + K(-b - \frac{2}{3}a)$ ..... (2) $a - ha + hb = a - \frac{2}{3}ka + b - kb$ $(1 - h)a + hb = \frac{(1 - 2k)}{3}a + (1 - k)b$ $(1 - h)a + hb = \frac{(1-2k)}{3}a + (1 - k)b$ $1 - h \; 1 - 2 - k$ .....(3) $h = 1 - k$ ..... (4) $h \frac{2}{5} \qquad k = \frac{3}{5}$ b) (ii) $OX = a + \frac{2}{5}(b - a)$ $= \frac{3}{5}a + \frac{2}{5}b$	B1 m1 A1 m1 m1 A1 B1 8 marks	

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23 a Bisecting < BAD	B1	
b) Construction of 1 at B and at A	B1	
" " 45° or 135° at B	B1	
Bisecting 45° or 135° to get $67\frac{1}{2}°$ at B	B1	A construction of $67\frac{1}{2}$ at A
Construction of 1 bisector of AB	B1	
Identification of AB	B1	
Identification of the centre O	B1	If complete circle drawn B0 unless otherwise illustrate
identification of the locus P	B1	
(c) Size of the <ABC = 131° ± 1°	8 marks	
24. (a) (i) P (B) = $\frac{8}{15}$	B1	
(ii) P (G or R) = $\frac{7}{15}$	B1	
	B1	For tree diagram branches required For both b(i) and (ii) follow through a multiple of ratio 8:2:5
(b) (i) P (first two pens picked are both green) $\frac{2}{15} \times \frac{1}{14} = \frac{1}{105}$ or 2 any other multiples $\frac{}{210}$	m 1 A1	
(ii) $\frac{8}{15} \times \frac{5}{14} + \frac{2}{15} \times \frac{5}{14} + \frac{5}{15} \times \frac{8}{14} + \frac{1}{15} \times \frac{2}{14}$		ml All produces
$\frac{40 + 10 + 40 + 10}{15 \times 14}$	ml	For summary products
$= \frac{10}{21}$	Ap	It tree diagram missing Ow -1