K.C.S.E 1996 MATHEMATICS PAPER 121/2 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1 $\sqrt{\frac{62.5 \times 25.6}{25 \times 8 \times 5}}$ $=\sqrt{16}$ $= 4$ $\sqrt{\frac{605 \times 25.6}{25 \times 80 \times 5}}$	m1 m1 A1 4 marks	Removal of dp in denominator Mt - 2 Use of log
2. $R = \frac{k}{d^4} - 2 = \frac{k}{3^2}$ $k = 18$ When $d = 4$ $R = \frac{18}{4^2}$ $= \frac{18}{16}$ $= 1\frac{1}{8}$ or $1\frac{1}{8}$	m1 m1 A1 3 marks	See constant K- m1 But first m0 Use 'his' k but A0 or $\frac{9}{8}$ C AO
3) Let Ali have a goats $= a + a + 2 + 3(a + 2) + a + 2 + 3(a + 2) - 10$ $= 9a + 6$ $9a + 6 - 17 \times 3$ $9a = 45$ $a = 5$ Odupoy sold 28 - 10 = 18 goats	B1 m1 A1 4 marks	or the total must be for all or equivalent 9m - 12, 3k - 12 m-7, k=12 Allow if B1 and m1 are earned
4. Ksh. bought = 98 x 84 = 77112 £ bought = $\left\{\frac{918 \times 84}{85}\right\}$ = £907.2 £ lost = £ 918 - £907.2 = £10 Use of log 10.6	m1 m1 A1	$\frac{77112}{85}$ m1 $\frac{918}{85}$ $918\ \frac{92.81}{85} = 10.8$ $\frac{918}{85}\left(\frac{155 - 84}{85}\right) = \frac{918}{85} = 10.8$ Constructing segment centre B Identifying second centre D Constructing segment with new centre D Note : apply Ow - 1 circles are complete and lock not identified
6. P (both winning) = $\frac{3}{8} \times \frac{4}{7} = \frac{12}{56}$ $= \frac{3}{14}$ P (at least one winning) $= 1 - \frac{5}{8} \times \frac{3}{7} = 1 - \frac{15}{56}$ $\frac{11}{56}$	m1 A1 m1 4 marks	$\frac{3}{8}$ V $\frac{4}{7}$ L $\frac{8}{7}$ $\frac{3}{7}$ or $\frac{5}{8} \times \frac{3}{7} = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$

SOLUTION	MARKS	ALTERNATIVE METHOD
13 a) b) $AC^3 - 2(a)^2 + (2a)^2 - 8a^2$ $AC = 2a\sqrt{2} \quad = {}^1/_2\, AC = a\sqrt{2}$ $\text{Cos}\,\theta = a\sqrt{2} \quad = 1.414 = 0.4713$ $\theta = 61^{a}\ 53^{'}$ (61.88°)	B1 m1 A1 4 marks	$\text{Cos} = \frac{AC^2 + VC^2\ VA^2}{2\ AC\ VC}$ $\frac{2}{3\sqrt{2}}$ = 0.476
14. $x^3 = 57 \times 3 - (55 + 56) = 60$ $x^4 = 59 \times 3 - (56 + 60) = 61$ $av3 = \frac{60 + 61}{3} : 62 = 61$ $av5 = \frac{62 + 60 + 70}{3} = 64$		
15. $\text{Sin}\,\theta = \frac{10}{20} = 0.5$ $\theta = 30°$ course = 030° or N30E	M1 A1 B1 3 marks	
16. $(1 + \sqrt{3})(1 - \sqrt{3}) = 1 - 3 = -2$ $\frac{1}{1+\sqrt{3}} = \frac{1}{1+\sqrt{3}} \times \frac{1-\sqrt{3}}{1-\sqrt{3}} = \frac{1 - 1.7321}{-2}$ $\frac{-0.7321}{-2} = 0.366$	B1 B2 2 marks	Must make use of -2
17 a) (i) Total collection = Sh. 80 x 25 x 6 = Sh. 12,000 (ii) Net profit = 1200 - (1500 + 200 + 150 + 4000) = Sh. 12000 - 5850 = Sh. 6150 b) The day's collections = $\frac{80}{100} \times 2000$ = Sh. 9.600 The net profit = Sh.9600 - 5850 = Sh 3750 Shares $\frac{2}{5} \times 3700$ or $\frac{3}{5} \times 3750$ Sh 1500 and Sh 2250	ml A1 ml A1 ml ml ml A1 8 marks	MRE - 34 trip used (i) 6000 (ii) 150 $\frac{80}{100} \times 600 = 4800$ $\frac{80 \times 25 - 80 \times 6}{100}$ 9.600 C.A.O. 4800 5850 $\frac{2}{3}(-10.50)$ ml $\frac{3}{5}(-10.50)$ ml for both CAO

SOLUTION	MARKS	ALTERNATIVE METHOD
18. a) (i) $<BAC$ or $<BCA = \frac{1}{2} \times 90^\circ = 45^\circ$ $<CAD = 180 - (90 + 25)$ or $\frac{1}{2} \times (180 - 2 \times 25)$ $= 65^\circ$ $<BAD = 45^\circ + 65^\circ = 110^\circ$ (ii) Obtuse $<BOD = 2(45 + 25)$ $= 140^\circ$ (iii) $<ACB = <BAC = 45^\circ$ base $<ABE = <ACB = 45^\circ <S$ in all segment $<CBF = <BAC = 45^\circ <S$ in all segment $\therefore <ABE = <CBF$	m1 m1 A1 B1 B1 B1 B1 B1	Can be indicated on diagram or BAD - 180 (25 + 45) 110° m1, m1 A1 140° m1, a1, 0w - 1 Allow B1 to ABE - 45O - CBF Adequate reason
19.		

Md x	f	fx	fx^2
9	4	36	324
12	7	84	1008
15	11	165	2475
18	15	270	4860
21	8	168	3528
24	5	120	2880
	Σ fx=843		15075

x	f	d	fd	fd2
9	4	-6	-24	144
12	7	-3	-21	63
15	11	0	0	0
18	15	3	45	135
21	8	6	48	388
24	5	9	45	405
fd = 93			Σfd2	103

FX : 36. 84, 165, 270, 168, 120

a) Mean $= \frac{843}{50}$

$= 16.86$

(b) (i) fx^2 : 324, 1008, 2475, 4860, 3528
2880

Variance $= \frac{15075 - 16.86^2}{50}$

$= 301.5 - 284.2$

$= 17.3$ (17.24)

(ii) S.D. $= \sqrt{17.3}$

$= 4.159$ or (4.152)

M1
m1

A1

m1

m1

m1
A1
8 marks

For at least 5 values

$15 + \frac{93}{50} = 16.86$

$15 + 1.86 = 16.86$

$15 + 1.86 = 16.86$

20. Location of T Location of K Location of G a) Distance TK = 80 ± km Bearing of t from K; 043° ± 1 b) Distance GT = 72 ± 2 km Bearing of G from T : 245° ± 2° c) Bearing of R from G: 130° ± 2°	B1 B1 B1 B1 B1 B1 B1 B1 8 marks	Measure length 8.4.+1 cm 6.0 + 1 cm 30 + 0.1 cm Apply if either K of G is positively located If the diagram initially constructed

SOLUTION	MARKS	ALTERNATIVE METHOD
21 a) 2nd year saving = $2000 \times \frac{115}{100}$ = Sh. 2300	B1	Compound interest formula used will earn the candidate B1B1
b) 3rd year saving = $2300 \times \frac{115}{100}$ = Sh. 2645	B1	
c) Common ratio = $\frac{115}{100}$ or $\frac{23}{20}$	B1	or Equivalent $\frac{2300 - 15}{2000}$
d) $\frac{2000\ 9\ 1.15^{\circ} - 1)}{1.15 - 1} = 58000$ $2000 \times 1.15^{\circ} = 8700 + 2000$ $1.15^{\circ} = 8700 + 2000$ nlog 1.15 = log 5.35 0.0607n = 0.7284 $n = \frac{0.7284}{0.0607} = 11.99$ = 12	m1 m1 A1	m0 wrong use of formula $\frac{\log 29}{\log 1.15} = \frac{\text{log arithms}}{\log}$ $n = \frac{\text{log arthms}}{\log} = 1.4$
e) $S30 = \frac{2000 \times 1.1520 - 2000}{0.15}$ $= \frac{2000 \times 16.37 - 2000}{0.15} = \frac{30730}{1.15}$ = 204800 = 204933	m1 A1 8 marks	Numerical simplification of $\frac{2000 \times 1.1520 - 2000}{0.15}$
22. a) x > 0 and y > 0 x + y = 7 $64x + 48y \geq 384$ or $(4x + 3y \geq 24)$	B1	
b) x + y - 7 drawn 64x + 48y = 389 Shading	L1 B1	
c) No. of buses for minimum cost 3 type of x and 4 type y or for x = 3 and y = 4	B1 B1	

SOLUTION	MARKS	ALTERNATIVE METHOD

23.

x	20	40	80	120	140	160	180
-3 Cos 28°	-2.30	-0.52	2.82	1.50	-0.52	-2.30	-3.00
2 Sin ($^1/_2$ + 30o)	1.73	2	1.00	-1.00	-1	-2.00	-1.73

All values B2
Allow B1 for all least 5 values
Use of the scale S1
Plotting - 3 Cos 2xo values P1
Plotting of 2 sin (3.2xo + 30o) P1
Cuves C1

Roots x = 62 ± 2° B1
x = 156 ± 2° B1
8 marks

24.

x	1.1	1.2	1.3	1.4	1.5	1.6
y	-0.3	0.5	1.4	2.5	3.8	5.2
x3	1.331	1.728	2.197	2.744	3.375	4.096

(a) All values of x^3 B2
Allow B1 for at least 4 or if all values are correct to 1 or 2d p
Linear scale used S1
(b) (i) Line of best fit drawn 4 of his points correctly plotted P1
Plotting points B1
a = 2 B1
b= -3 B1
(ii) $y = 2x^3 - 3$ B1