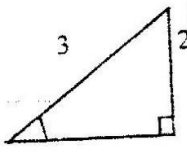
K.C.S.E 2000 MATHEMATICS PAPER 121/1 MARKING SCHEME

SOLUTION	MARKS	ALTERNATIVE METHOD
1. $\frac{28+18}{-2} - \frac{15-12}{3}$ $= -23 - 1$ $= -24$	m1 m1 A1 3 marks	Removal of each bracket Removal of denominators
2. $\frac{(3a+b)(a+b)}{(4a-b)(a+b)}$ $= \frac{3a+b}{4a-b}$	m1 m1 A1 3 marks	Numerator factorised Domoninator factorised
3. a) $\angle BAE = \frac{540^\circ}{5} = 108^\circ$ b) $\angle BAE - 108^\circ - 36^\circ - 72^\circ$ c) $\angle BNM = 90^\circ - 36^\circ = 54^\circ$	B1 B1 B1 3 marks	Award angle seen on diagram
4. a) Modal class is 150 - 154 b) Median $= 149.5 + \frac{7}{19} \times 5$ $= 151.34$ $= 151\frac{13}{38}$	B1 m1 A1 3 marks	Accept $\frac{25th - 26th}{2} \quad \frac{57}{2}$ $= 151.475$
5. c) $(x+5)(x+2) = 4$ $x^2 + 7x + 6 - 0$ $(x+6)(x+1) = 0$ $x = -6$ or -1 $x = -1$	m1 m1 A1	$= x + 5 \quad 4$ Dropping of logs or equivalent Factorisation $10(s+5)(x+2) = 10^2$ Must disquality $x = -6$ to score
6. a) $29 + \frac{28}{2} = 43\ cm^2$ b) 43: $1075 \times 10^4 \times 10^4$ $1: 25 \times 10^8$ $1:5 \times 10^4 = 1:50000$	B1 m1 A1 3 marks	Accept 45, 46, 48 a.s.f. follow through a.s.f.
7. a) $x = \sqrt{3^2 - 2^2}$ $\tan\theta = \frac{2}{\sqrt{5}}$ b) $\sec^2\theta = \tan^2\theta + 1$ $= \frac{4}{5} + 1$ $= 1.8$  	m1 A1 B1 3 marks	$\sqrt{5}$ seen $\frac{2\sqrt{5}}{5}$ $\sec^2\theta + \left(\frac{3}{\sqrt{5}}\right)^2$ $=1.8$

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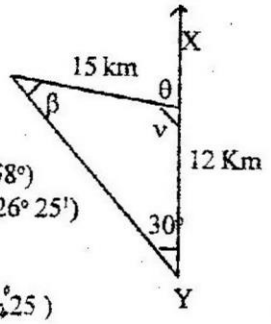
8. $\frac{\sin\beta}{12} = \frac{\sin 30^\circ}{15}$ $\sin\beta = \frac{0.5 \times 12}{15} = 0.4$ $\beta = 23.58^\circ$ ($23^\circ\ 35'$) $\alpha = 180^\circ - (30^\circ + 23.58^\circ)$ $= 126.42^\circ$ ($126^\circ\ 25'$) Bearing of Z from X $180^\circ + 126.42^\circ$ $= 306.42^\circ$ ($306^\circ 25'$) N53° 25'w  	ml ml A1 3 marks	After getting $= 23.50^\circ$ $53.58 = (30 + 23.58)$ $= 360 - 53.58$ $= 306.42$
9. Area of rectangle $= 19.5 \times 16.5$ cm $= 321.75$ cm² Area of 4 triangles $= \frac{1}{2} \times 6 \times 4.5 \times 4$ $= 54$ cm² Area of octagon $= 321.75 - 54$ $= 267.75$ cm²	ml A1 3 marks	Accept equivanlent methods 267.8cm2 when log used
10. Maximum perimeter $2(18.5 + 12.5) = 62$ cm Minimum perimeter $2(17.5 + 11.5) = 58$ cm Indicated perimeter $2(18 + 12) = 60$ cm Absolute error $= \frac{62 - 58}{2} = 2$ $= \frac{2}{60} \times 100$ $= 3\frac{1}{3}\%$ Avoid $\frac{10}{3}\%$	ml ml A1 3 marks	Accept $100 - \frac{58 \times 100}{60}$ $100 - 96\frac{2}{3} = 3\frac{1}{3}$ Accept $62 - 60$ or $58 - 60$ 3.3, 3.333 avoid 3.3 or 3.33
11. Volume $= \frac{1}{3} \times 12 \times 9 \times 6$ $= 216$ cm²	ml A1 2 marks	Accept step by step
12. 12% used - n = 4 A - 48000 (1.12) substituting No | Log 48000 | 4.6812 $(1.12)^4$ | 0.1968 7.55×10^4 | +.8780 Amount payable = Sh. 75510	ml ml A1 A2 3 4 A1 marks	Accept step by step 75520 follow through

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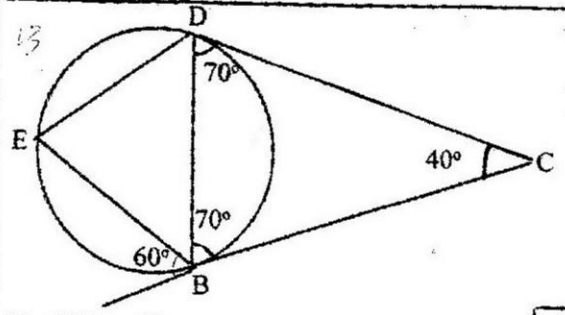
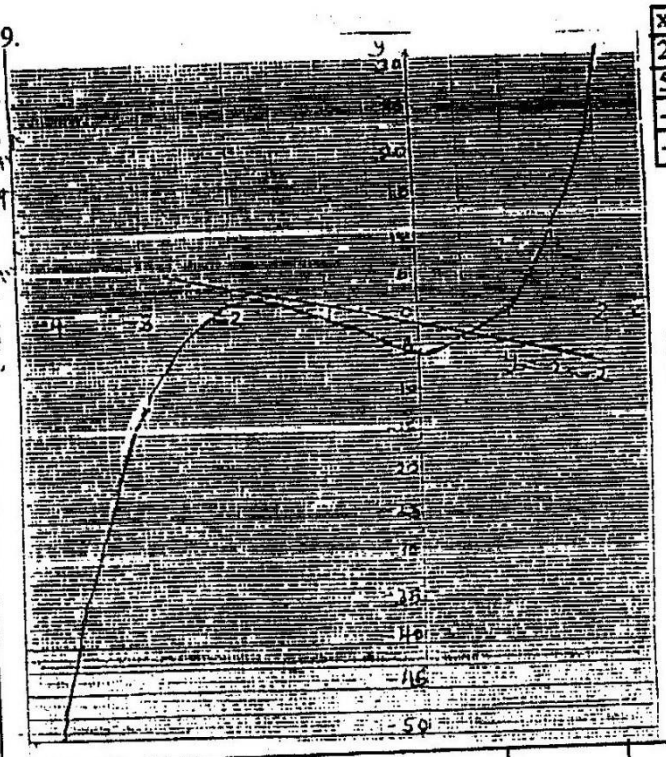
 (a) <CBD = 70° Base angles isosceles triangles avoid (b) <CDE = 130° Alternate segment theorem	B1 B1 B1 B1 4 marks	
14. a) $V = 9t^2 - 4t + c$ Initial velocity : t = o when V = 2ms-1 .: c =2 $V = 9t^2 - 4t + 2$ b) $9t^2 - 4t + 2$ $9t^2 - 4t = 0$ t(9t - 4) = 0 allow transfer of measures here t = 0 or t = $^4/_9$ can be given early $\therefore t = \frac{4}{9}$ sec	M1 A1 B1 3 marks	
15. Korir, Wangari, Hassan $\frac{1}{4}x$ $\frac{2}{5}x\frac{3}{4}x$ or $\frac{3}{10}x$ $\frac{3}{2}x\frac{1}{4}x$ or $\frac{3}{8}x$ Bank $x - \left\{\frac{1}{4}x - \frac{3}{10}x + \frac{3}{8}x\right\}$ $= \frac{3}{40}x$ $\frac{3}{8}x - \frac{3}{40}x = 60000$ $x = 200000$	ml ml ml A1 4 marks	He can use number instead of unknown trials and errors accepted. Korir = Who gave $\frac{3}{10}x$ Hassan $\frac{3}{8}x$ Bank = $^3/_8$x - 60,000 $x = {}^1/_4x - {}^3/_8x\ 1\ {}^1/_8x\ {}^{13}/_8x + {}^3/_8x$ $x = {}^{37}/_{40}x + {}^3/_8 - 60000$
16. (a) 4p + 6b = 66 2p + 5b = 51 4p + 6b = 66 4p + 10b = 102 4b = 36 b = 9 p = 3 b) Let the number of pencils be x 3x + 9 (x +4) = 228 12x = 192	ml ml A1 ml 5 marks	

SOLUTION	MARKS	ALTERNATIVE METHOD
17. a) $S = \frac{1}{2}(36 + 40 + 42)$	ml	59 seen
(i) Area $= \sqrt{59(59 - 36)(59 - 40)59 - 42)}$	ml	Substitute
$= \sqrt{438311}$		Tables used $\sqrt{438300}$
$= 662.1\ m^2$	A1	$= 662m^2$
	ml	2 x 49 x 36 cos β
(ii) 1/2 x 36 x 40 Sinβ = 662.1	ml	= 402 + 362 -422
$\sin\beta = \frac{662.1 \times 2}{36 \times 40}$		Cos = 402 + 362 - 4 = 1132
		2403
= 0.9195		If 662.1 was lo**
β - 66.9°	A1	2R = 42
Accept 66.8°		Sin 66.9
b) $\frac{OA}{\sin 23.1} = \frac{42}{\sin 133.8^\circ}$	ml	= 42.66
		R = 22.83 if logs used follow through
OA = 22.83 Accept 22.84	A1	
	8 marks	
18. a) (i) $\frac{18}{40} \times \frac{2}{3} = \frac{3}{10}$	ml A1	Accept equivalents
(ii) $\left(\frac{18}{40} \times \frac{2}{3}\right) + \left(\frac{22}{40} \times \frac{3}{5}\right) = \frac{63}{100}$	ml A1	
b) $\frac{2}{5} \times \frac{1}{3}\left(\frac{18}{40} \times \frac{22}{39}\right) + \frac{2}{5} \times \frac{1}{3}\left(\frac{22}{40} \times \frac{18}{39}\right)$	ml A1	
	ml	
	ml	
$= \frac{22}{325}$	ml	
	ml	
	A1	For addition work out
	8 marks	

SOLUTION	MARKS	ALTERNATIVE METHOD

19.



x	1	-1	-2	-1	0	1	2
$2x^2$		-16					
5x2							
-x			2	1			-2
-6		-12	0	-2			28

$y = 2x - 2$ B1

$x = 0.7 \pm 0.1$ B1

Line must cut curve at any one point.

20 a) (i) $A = \frac{22}{7} \times 4.2 \times 4.2 = 55.44\ cm^2$ B1

(ii) Let stanting length cone be L

$\therefore \frac{L}{L} - \frac{8}{4.2} - \frac{3.5}{}$ or equivalent ml

$L = 48$ cm

Curved area of frustum

$= \frac{22}{7}(4.2 \times 48 - 3.5 \times 40)$

$= 193.6 cm^2$ A1

(ii) Hemispherical surface area

$= \frac{1}{2} \times 4 \times \frac{22}{7} \times 3.5 \times 3.5$ ml

$= 77\ cm2$

(c) Ratio of areas = 81.51:326.04

$= 1:4$ A1

Ratio of lengths = 1:2

Radius of base $= \frac{4.2}{2}$ ml

$= 2.1$ cm A1

8 marks

3.142 used

$A = 55.42$ cm

CS.A $= \pi (Rr)1$

22 (4 Cos 3.5)8

$= 193.6$

ALTERNATIVE

$\frac{H}{36} \times \frac{22}{7} \times 4.2 \times 4.8$ m

$= 193.6$

$2 \times \frac{22}{7} \times 3.5 \times 3.5 + 2 \times \frac{22}{7} \times 4.2$

$= 77 + 110.00 = 187.88$

187.85 + 193.6

SOLUTION	MARKS	ALTERNATIVE METHOD
21. a) $AN = ON - OA$ $= \frac{4b}{5} - a$	B1	Use ratio theorem
b) $BM = OM - OB$ $= \frac{2b}{5} - ad$	B1	
22. (a) Angle change 52 - 38.5 $S = 2 \times \frac{22}{7} \times 6370 \times \frac{13.5}{360}$ $= 1501.5$ km	ml ml ml A1	13.5o seen circumference O" expression whole expression 13.5 x 60 = 810
(b) $\frac{\theta}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 52° = 2400$ $\theta = \frac{2400 \times 7 \times 360}{2 \times 22 \times 6370 \cos 52°}$ - 35.05° C=(52°N 21°W)	ml ml A1 B1 8 marks	for 6400 -34.04" If second A is lost Follow through
23. a) $\Delta = -3$ $P1 = \frac{1}{3}\begin{pmatrix} 8 & -7 \\ -5 & 4 \end{pmatrix}$		$\begin{pmatrix} \frac{8}{3} & \frac{7}{3} \\ \frac{5}{3} & \frac{4}{3} \end{pmatrix}$
b) (i) $\begin{pmatrix} 8 & 14 \\ 10 & 16 \end{pmatrix}\begin{pmatrix} b \\ m \end{pmatrix} = \begin{pmatrix} 47600 \\ 57400 \end{pmatrix}$		B1 Accept $\begin{pmatrix} 4 & 7 \\ 7 & 8 \end{pmatrix}\begin{pmatrix} b \\ m \end{pmatrix}\begin{pmatrix} 23800 \\ 23700 \end{pmatrix}$
(ii) $\begin{pmatrix} \frac{8}{3} & \frac{7}{3} \\ \frac{5}{3} & \frac{4}{3} \end{pmatrix}\begin{pmatrix} 8 & 14 \\ 10 & 16 \end{pmatrix}\begin{pmatrix} b \\ m \end{pmatrix} = \begin{pmatrix} \frac{8}{3} & \frac{7}{3} \\ \frac{5}{3} & \frac{4}{3} \end{pmatrix}\begin{pmatrix} 47600 \\ 57400 \end{pmatrix}$ $\begin{pmatrix} 2b \\ 2m \end{pmatrix} = \begin{pmatrix} 7000 \\ 2800 \end{pmatrix}$	ml	pre -multiplication by p-1 $\frac{1}{-12}\begin{pmatrix} 16 & -14 \\ 10 & 8 \end{pmatrix}\begin{pmatrix} 8 & 14 \\ 0 & 16 \end{pmatrix}\begin{pmatrix} b \\ m \end{pmatrix}$ ml $\frac{1}{-12}\begin{pmatrix} 16 & -14 \\ -10 & 8 \end{pmatrix}\begin{pmatrix} 47600 \\ 57400 \end{pmatrix}$ ml $\begin{pmatrix} 3500 \\ 1400 \end{pmatrix}$ $= \begin{pmatrix} 3500 \\ 1400 \end{pmatrix}$
Beans: Sh. 3500, maize Sh. 1400		= 350 = 1400
(c) New price of beans = $\frac{105 \times 3500 \times 5}{100}$ = 29400		
Balance of maize = 47600 - 29400 = 18200		
Bags of = $\frac{18200}{1400} = 1.3$	A1	