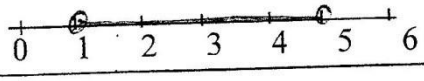
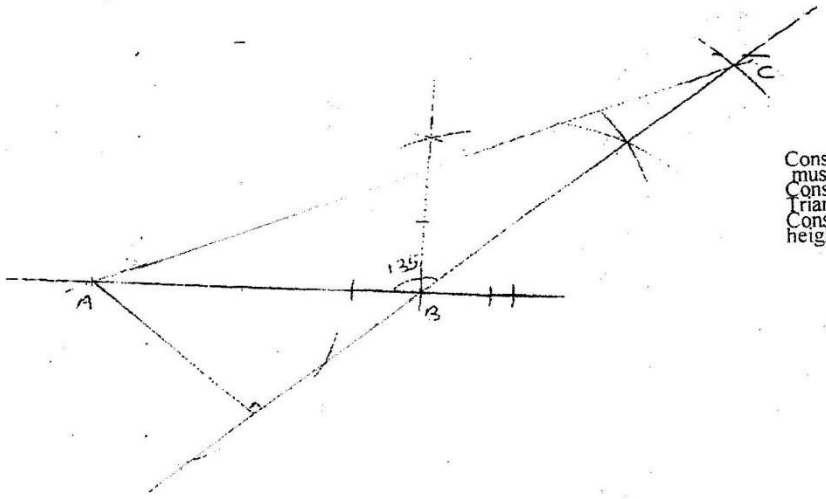
K.C.S.E MARKING SCHEME 2006 PAPER 121/1

SECTION 1 (50 marks)

1. $\frac{3\sqrt{675 \times 135}}{\sqrt{2025}} = 3\frac{\sqrt{3^3 \times 5^2 \times 5}}{\sqrt{3^4 \times 5^2}} = \frac{3^2 \times 5}{3^2 \times 5} = 1$	M1 A1 2	$\sqrt[3]{91125} = 45$ working must be shown $x^3 = \sqrt[3]{\frac{675 \times 135}{45}} = \frac{675 \times 135}{45 \times 45 \times 45}$ $x = 1$
2. a) 7532 b) 500	B1 B1	
3. $\frac{(p+q)(p+q)}{p(p^2-q^2)+q(p^2-q^2)} = \frac{(p+q)(p+q)}{(p+q)(p+q)(p-q)} = \frac{1}{p+q}$	M1 M1 M1 A1	Full factorisation Partial factorisation Full factorisation denominator $(p+q)(p^2+q^2)$------m1 $(p+q)(p^2+q^2)$----m1 $\frac{1}{p-q}$----------m1
4. a) $\angle ADE = \frac{180^0-108}{2} = 36^0$ b) $\angle AEF = \{180^0 - (108^0-60^0\} \div 2$ $= 66^0$ c) $\angle DAE = 108^0 - (60^0+36^0)$ $= 12^0$	B1 B1 B1 3	Mark the diagram $48^0 - 36^0 = 12^0$
5. $3-2x < x$ $3 < 3x$ $1 < x$ $x \leq \frac{2x+5}{3}$ $3x \leq 2x + 5$ $3x - 2x \leq 5$ or $x \leq 5$ $1 < x \leq 5$  	M1 M1 A1	A_1 can be implied in numberline graph
6. $(3x+1)(3x-2) = 28$ $3x^2 - x - 10 = 0$ $(3x+5)(x-2) = 0$ $x = 2$ or $x = -5/3$ Length $3x\,2 + 1$ $= 7$cm	M1 M1 A1	$L_1(l-3) = 28$ .....m_1 $L^2-3L-28=0$ $(l-7)(l+4) = 0$.....M_1 $l = 7$.....A_1
7. 10500×9.74 = sh 1022700 $\frac{1022700 - 403879}{12.11} = \frac{618821}{12.11}$ = 51000 rands	M1 M1 A1	



Construction marks must be seen
Construction of 135°
Triangle
Construction ⊥or height

9. $\frac{k-8}{3-k} = -3 \quad k = {}^1/_2 \qquad \frac{y-8}{x-{}^1/_2} = -3$ M1 B1 A1

$\frac{8-k}{k-3} = -3$

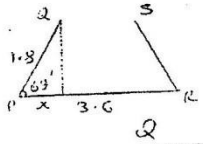
$6x + 2y = 19$

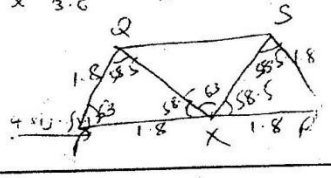
$3x + y = 9\frac{1}{2}$

10. $6\log_2 \sqrt[3]{2^6} + 10\log_3 \sqrt[5]{3^5}$
$= 6\log_2 2^2 + 10\log_3 3$
$= 6x2 + 10x1$
$= 12+10$
$= 22$

M1
M1
A1

11. $x = 1.8 \cos 63^0$
$= 1.8 \times 0.454$
$= 0.8172$
$QS = 3.6 - 2 \times 0.8172$
$= 3.6 - 1.6344$
$= 1.9656$
$= 1.966m$





M1
M1
A1

12. a) $p(-2,3)\ P^1\ (10,10)$

$T = \begin{pmatrix} 10-2 \\ 10-3 \end{pmatrix}$

$= \begin{pmatrix} 12 \\ 7 \end{pmatrix}$

$Q^1 = (1+12, 3+7)$
$= (13,10)$

b) $m\begin{pmatrix} -2 \\ 3 \end{pmatrix} - n\begin{pmatrix} 1 \\ 3 \end{pmatrix} = \begin{pmatrix} -12 \\ 9 \end{pmatrix}$

$-2m - n = -12$
$3m - 3n = 9$
$m = n+3$
$2(n+3)+n = 12 \qquad 3n = 6 \qquad m = 5$
$n = 2$

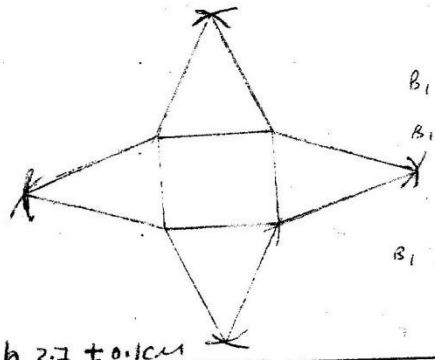
M1
M1
A1
B1
M1
A1

$\frac{QX}{\sin 63} = \frac{1.8}{\sin 58.5}$

$QX = \frac{18 \sin 63}{\sin 58.5}$

$QS = \frac{1.8810 \sin 63^0}{\sin 83.5^0}$
$= 1.966$

13.



B_1 ✓ by drawn triangle

B_1 ✓ net

B_1 3.7 ± 0.1cm

b 3.7 ± 0.1cm

14. $2p + 3b = 78$-------- (i)
$3p + 4b = 108$------ (ii)
$8p+12b = 312$
$9p+12b = 324$
$p = 12$
$b = 18$

M1

M1
A1

4

attempt to eliminate one unknown

for both A or B accept equivalent

15. Area A = 5 x 3.2
B = 10 x 1.2
16:12 = f::6
12f = 96
f = 8

M1

M1

A1

3

Area B = 10 x 1.2 = 12
12k = 6
$k = {}^{1}/_{2}$
Area A = 3.2 x 5 = 16
$f = {}^{1}/_{2} \times 16$
$= 8$

16.

x	0	0.4	0.8	1.2	1.6	2.0
$y=\sqrt{4-x}$	2.00	1.96	1.83	1.60	1.20	0

b) Area of $^{1}/_{4}$ circle
$^{1}/_{2}(0.4)x\ (2+0)+2(1.96$
$+1.83+1.60+1.20)$
$= 3.036cm^2$
= Area of a circle
$= 4 \times 3.036$
$= 12.144cm^2$

M1

A1

M1
A1
4

SECTION II (50 marks)

17 a) 24 0 x 12000
= sh 2 880 000

bi) Total sides
12 000 x 1.25 x 0.9x240
= sh 3 240 000

%ge increase
$= \frac{324\,000 - 2\,880\,000}{2\,880\,000} \times 100$ M1
= 12.5%

ii) New price
$= 12000 \times 1.25 \times {}^{16}/_{15}$
= 15000 x 16/15
= shs 16 000

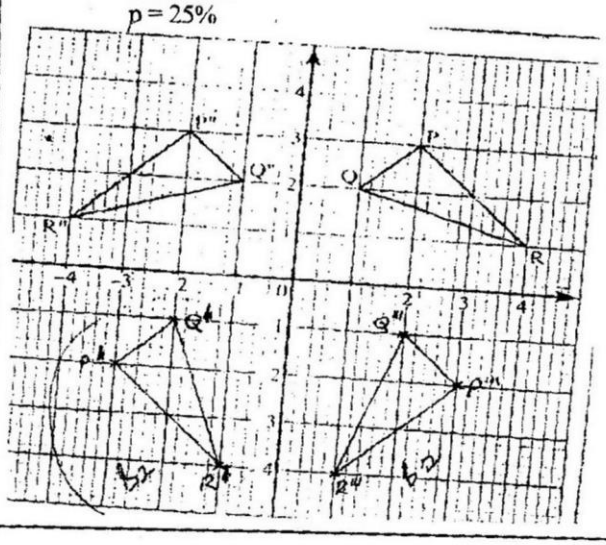
M1
A1

M1

A1

B1

1.25 x 0.9 = 1.125
1.125 - 1 = 0.125
0.125 x 100 ---- M1 M1
12.5%------A1

c) New number of sets $\frac{240\,(100-p)}{100}$ New amount $\frac{16000 \times 240\,(100-p)}{100}$ $16000 \times \frac{240\,(100-p)}{100}$ $= 2\,880\,000$ $p = 25\%$ 	M1 M1 M1 A1	Let number of sets be y $10000y = 2\,880\,000$ $y = 180$ $\frac{240 + 80}{240} \times 100$----M1 M1 $\frac{100-p \times 240}{100} \times 26000$ = 25%------A1 matrix not acceptable
18. a) Reflection on y axis (or line x = 0) b) image of Δ P'Q'R' of ΔPQR c) -ve quarter turn about (0,0) or about origin d) image of ΔP'''Q'''R''' e) Pair Δs of that are oppositely congruent ΔPQR and ΔP"Q"R" ΔP'Q'R' and ΔP'''Q'''R''' ΔPQR and ΔP'Q'R' ΔP"Q"R"and ΔP'''Q'''R'''	B2 B2 B2 B2 B2	+ve three quarter twin about (0.0) or about origin all 4 pairs B1 for any two pairs Accept P'Q'R' ≡ P"R"Q"
19.a) Height = $\sqrt{3^2-1.8^2}$ = 2.4 x-sectional area = 2.4 (2+5.6) = 9.12cm² Volume = 9.12 x 8 = 72.96cm² b) Mass mg = 72.96 x 5.75 = 419.52 c) v.s.f. = $\frac{246.24}{72.96}$ = 3.375 l s f = $\sqrt[3]{3.375}$ ∴ a s f = 1:2.25 ii) $\frac{5}{2}$ x $\frac{419.52g}{246.24cm2}$ M1 Area of x solution = 4.259g/cm3 A1 = 9.12 x 2.25 = 20.52cm² 10	M1 M1 A1 M1 A1 M1 A1	

20.a)Distance of bus from Nairobi 500 - 2.5 x 60 =350km ii) Let distance be xkm for bus x = 150 +60t for car x = 100t ∴ 100 t = 150+60t t = $^3/_4$h = 375KM b) Yet to be covered 500 - 375 = 125km time bus takes = $^{125}/_{60}$ = 2h 15min or 125 minutes New speed of car $\frac{125}{125-25}$ $\frac{125}{60} = \frac{100}{x}$ $x = 75$km/hr **or** Distance from Nairobi 500 - 60 x 25 =350km relative velocity 100 - 60 = 40km/hr time car takes to reach bus $^{150}/_{40}$ = $3^3/_4$h Distance covered $3^3/_4$ x 100 = 375km b) time taken by car for remaining distance 25min = 2h 5min 1hr 40 min average speed $\frac{125}{1^2/_3}$ = 75km/hr	**M1** **A1** **B1** **M1** **M1** **A1** **B1** **B1** **M1** **A1** **10** M1 **A1** **B1** **M1** **A1** **B1** **M1** **A1**	B1 for x = 150 + 60t or x = 100t a) ii Bus $^x/_{60}$ h or Car $^x/_{100}$h $^x/_{60} = {}^x/_{100} + {}^5/_2$ $\frac{10x-6x}{600} = 5/2$ 20x-12x= 3000 8x=3000 x=375km Thy B = $^x/_{60}$ Thy C = $\frac{150+x}{100}$ $\frac{x}{60} = \frac{150+x}{100}$ x=225 Total D 150+225 = 375km time taken by bus for remaining distance $^{125}/_{60}$ = 2h 5 min If $^{125}/_{1.67}$ book fo PA $^{125}/_{1.667}$ accept to give 74.99km
21. ai) Length At =100 tan 30^0 = 100 x 0.5774 = 57.74 ii = Length AD AC = $\sqrt{57.74^2 + 57.74^2}$ =81.66 OR 81.65 AD^2 = 51.66+80^2 =2x8166x80COS 100^0 = 6668 +6400 - 2x81.66x80 x(-0.1736) AD =$\sqrt{15336}$ =123.8 iii) perimeter AB+B+CC+CD+DA AB=$\sqrt{100^2+57.74^2}$ = $\sqrt{13334}$ = 115.5	**M1** **A1** **M1** **A1** **M1** **M1**	x tan 60^0 - 100 AC - $^{57.740}/_{\text{Sin }45}$ AC = $^{57.74}/_{\cos 45^0}$ $^{100}/_{\cos 30}$ or $^{100}/_{\sin 60}$ AB $^{57.74}/_{\sin 30}$ = $^{57.74}/_{\cos 60^0}$ Accept 57.73 of table model

Perimeter = 11.55+100+57.74+80+123.8 = 477.04 = 477.0(4sf) b) Rolls of wire Length - 477.04 +57.74+81.66 = 666.44 = 616.4 Roles to be bought $\frac{(616.4 - 3 \times 2.8) \times 5}{480}$ = 6.333 = 7 rolls			A1 M1 M1 A1 10	477.1 in case 123.84 is used 6.3375if 4477.1 used
22 a) $\underset{\sim}{OL} = 3\begin{pmatrix}1\\6\end{pmatrix}$ $= \begin{pmatrix}3\\18\end{pmatrix}$ B1 $\underset{\sim}{ON} = \frac{2}{3}\begin{pmatrix}15\\6\end{pmatrix}$ B1 $= \begin{pmatrix}10\\4\end{pmatrix}$ $\underset{\sim}{LN} = \underset{\sim}{ON} - \underset{\sim}{OL}$ $= \begin{pmatrix}10\\4\end{pmatrix} - \begin{pmatrix}3\\18\end{pmatrix}$ B1 $= \begin{pmatrix}7\\-14\end{pmatrix}$ b) $\underset{\sim}{OM} = \underset{\sim}{OL} + \frac{3}{7}\underset{\sim}{LN}$ $= \begin{pmatrix}3\\18\end{pmatrix} + \frac{3}{7}\begin{pmatrix}7\\-14\end{pmatrix}$ M1 $= \begin{pmatrix}3\\18\end{pmatrix} + \begin{pmatrix}3\\6\end{pmatrix}$ $= \begin{pmatrix}6\\12\end{pmatrix}$ = M(6,12) A1 c)i $\underset{\sim}{OT} = \frac{7}{6}OM$ $= \frac{7}{6}\begin{pmatrix}6\\12\end{pmatrix}$ $= \begin{pmatrix}7\\14\end{pmatrix}$ B1 ii) $\underset{\sim}{LT} = \begin{pmatrix}7\\14\end{pmatrix} - \begin{pmatrix}3\\18\end{pmatrix}$ B1 $= \begin{pmatrix}4\\-4\end{pmatrix}$ $\underset{\sim}{LB} = \begin{pmatrix}15\\6\end{pmatrix} - \begin{pmatrix}3\\18\end{pmatrix}$ B1				using ratio theorem

$= \begin{pmatrix} 12 \\ -12 \end{pmatrix}$ $\underset{\sim}{LB} = 3\underset{\sim}{LT}$ L is common point	B1	
23. a) Slant height $L = \sqrt{3^2+4^2}$ $= 5cm$ Surface area C Cone $\pi \times 3 \times 5$ Cylinder $= \pi\, 6 \times 8$ Hemisphere $= 2\pi \times 3 \times 3$ Total surface area $= 15\pi + 48\pi + 18\pi$ $= 81\pi$ or $254.5cm^2$ b) 15cm: 600cm 1:40 a.s.f. $= 40^2$ $= 1600$ Area of container $= 1600 \times 254.5cm^2$ $= \frac{1600 \times 254.5}{10000}$ $= 40.72m^2$ Paint needed $\frac{40.72}{20} \times 0.75$ $= 1.527$ litres Total = 24.13 + 9.05 + 2.54m1 $= 40.73m2$ Paint needed $= \frac{40.73}{20} \times 0.75ml$ $= 1.527$	B1 M1 M1 A1 B1 B1 M1 M1 M1 A1	56 57.13 150.816 Accept 254.6 when $\pi = {}^{22}/_{7}$ 1.s.f. = 1cm:0.4m $= 1cm^2:0.16m^2$ 254.5x0.16 40.72 Conversion $40.74m^2$ if 254.6 used Accept 1.5281 if $\pi = {}^{22}/_{7}$ b) ${}^{15}/_{6} = {}^{2}/_{x}$ $x = 1.2m$ ${}^{15}/_{6} = {}^{4}/_{y}$ $y = 1.6m$ Cylinder $= 2 \times {}^{22}/_{7} \times 1.2 \times 3.2 = 24.12$ Cone $= {}^{22}/_{7} \times 1.2 \times 2 = 7.54$ Hemisphere $= 2 \times {}^{22}/_{7} \times 1.2 = 9.05$
24. a) $S = 5^3 - 5 \times 5^2 + 3 \times 5 + 4$ $= 19m$ b) $V = {}^{ds}/_{dt} = 3t^2 - 10t + 3$ $3x5^2 - 10x5x3$ $= 2.5m/s$ c) Momentarily at rest $v = 0$ $3t^2 - 10t + 3 = 0$ $(3t-1)(t-3) = 0$ $t = {}^{1}/_{3}$ or $= 3$ d) Acceleration when $t = 2$ $a = {}^{dv}/_{dt}$ $= 6t - 10$ $6x2 - 10$ $= 2m/s^2$	M1 A1 M1 M1 A1 M1 M1 A1 M1 A1	Substitution Differenciation Substitution