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

SECTION 1 (50 marks)

1. $\frac{3\sqrt{675 \times 135}}{\sqrt{2025}} = 3\sqrt{\frac{3^3 \times 5^2 \times 5}{3^4 \times 5^2}} = \frac{3^2 \times 5}{3^2 \times 5} = 1$

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
$p-q$----------m1

4. a) $\angle ADE = \frac{180^0 - 108}{2} = 36^0$

b) $\angle AEF = \{180^0 - (108^0 - 60^0)\} \div 2$
$= 66^0$

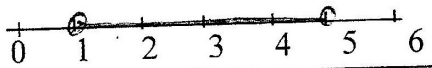
c) $\angle DAE = 108^0 - (60^0 + 36^0)$
$= 12^0$

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

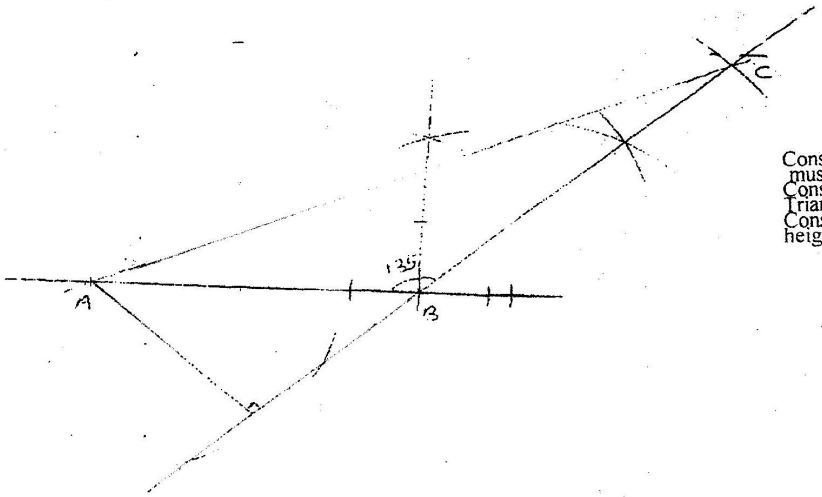
6. $(3x+1)(3x-2) = 28$
$3x^2 - x - 10 = 0$
$(3x+5)(x-2) = 0$
$x = 2$ or $x = -\frac{5}{3}$
Length $3x2 + 1$
$= 7$cm

M1 M1 A1

$L_1(l-3) = 28$ .....m_1
$L^2 - 3L - 28 = 0$
$(l-7)(l+4) = 0$.....$A_1 M_1$
$l = 7$.....A_1

7. 10500×9.74
$=$ sh 1022700
$\frac{1022700 - 403879}{12.11} = \frac{618821}{12.11}$
$= 51000$ rands

M1 M1 A1



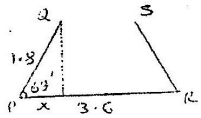
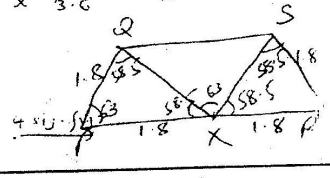
Construction marks must be seen
Construction of 135°
Triangle
Construction ⊥or height

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

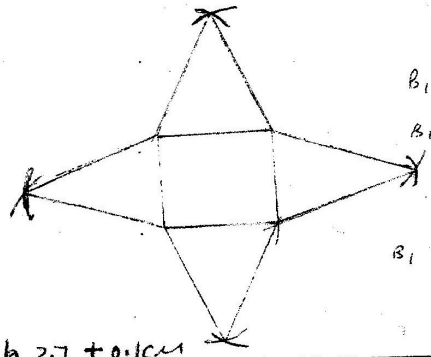
$\frac{8-k}{k-3} = -3$

$6x + 2y = 19$

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

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 $= 3.6 - 2 \times 0.8172$ $= 3.6 - 1.6344$ $= 1.9656$ $= 1.966$m  	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

Area B = 10 x 1.2 = 12
12k = 6
k = $^1/_2$
Area A = 3.2 x 5 = 16
f = $^1/_2$ x 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

3

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 x 3.036
$= 12.144cm^2$

M1

A1

M1
A1
4

SECTION II (50 marks)

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

M1
A1

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

M1

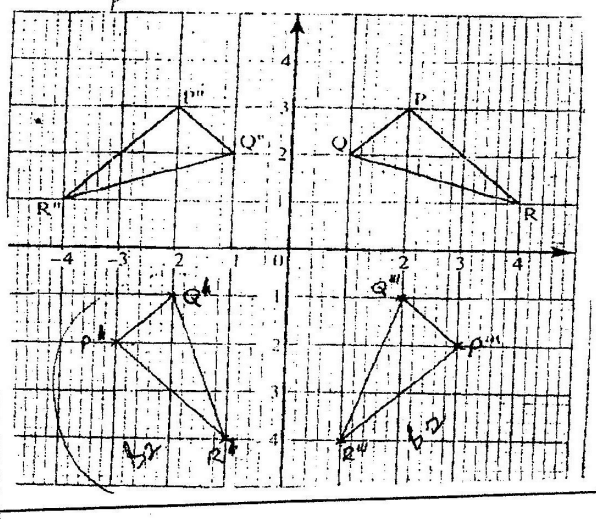
%ge increase
$= \frac{324\,000 - 2\,880\,000}{2\,880\,000} \times 100$ M1
= 12.5%

A1

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

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

B1

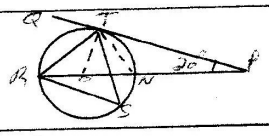
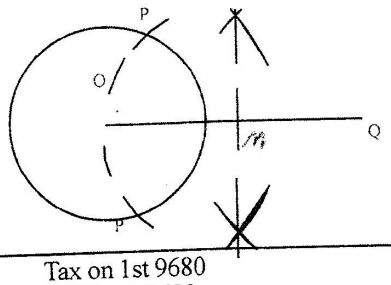
c) New number of sets $\frac{240\,(100-p)}{100}$ New amount $\frac{16000 \times 240\,(100-p)}{100}$ $16000 \times \frac{240\,(100-p)}{100}$ $= 2\,880\,000$ $p = 25\%$  	M1 M1 M1 A1	Let number of sets be y $10000y = 2\,880\,000$ $y = 180$ $\frac{240 + 80}{240} \times 100$----M1 M1 $\frac{100-p}{100} \times 240 \times 26000$ $= 25\%$------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 $= 2.4\,(2+5.6)$ $= 9.12\text{cm}^2$ Volume = 9.12 x 8 $= 72.96\text{cm}^2$ 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 Area of x solution $= 9.12 \times 2.25$ $= 20.52\text{cm}^2$ ii) $\frac{5}{2}$ x $\frac{419.52\text{g}}{246.24\text{cm}2}$ M1 $= 4.259\text{g/cm}3$ A1 10	**M1** **M1** **A1** **M1** **A1** **M1** **A1**	

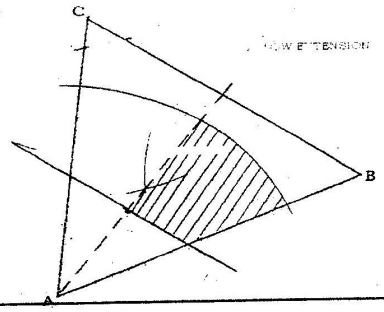
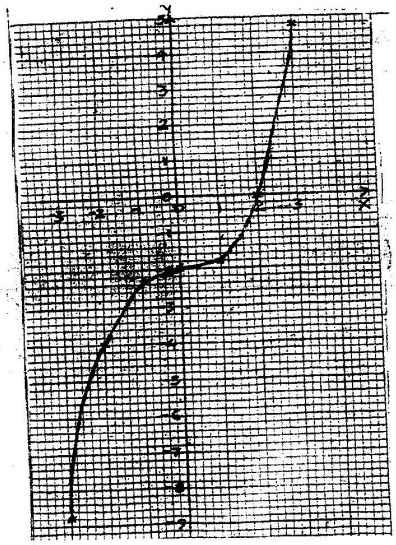
20.a)Distance of bus from Nairobi 500 - 2.5 x 60 =350km ii) Let distance be xkm for bus x = 150 +60t for car x = 100t $\therefore$ 100 t = 150+60t t = $^3/_4$h = 375KM b) Yet to be covered 500 - 375 = 125km time bus takes = $^{125}/_{60}$ = 2h 15min or 125 minutes New speed of car $\frac{125}{\frac{125-25}{60}}$ $\frac{125}{x} = \frac{100}{10}$ x = 75km/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** **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=$\sqrt{100^3+57.74^2}$ = $\sqrt{13334}$ = 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

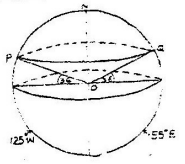
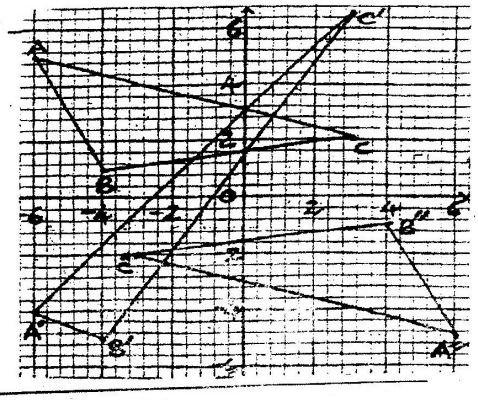
Perimeter = 11.55+100+57.74+80+123.8 = 477.04 = 477.0(4sf) b) Rolls of wire Length - 477.04 +57.74+81.66 = 666.44 = 616.4 Roles to be bought $\frac{(616.4 - 3 \times 2.8) \times 5}{480}$ = 6.333 = 7 rolls			**A1** **M1** **M1** **A1** **10**	477.1 in case 123.84 is used 6.3375if 4477.1 used
22 a) $\underset{\sim}{OL}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

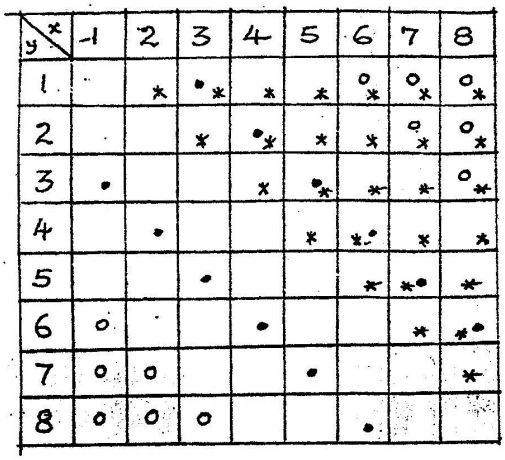
$= \begin{pmatrix} 12 \\ -12 \end{pmatrix}$ $\underset{\sim}{LB} = 3\underset{\sim}{LT}$ L is common point	**B1**	
23. a) Slant height $L = \sqrt{3^2+4^2}$ $= 5cm$ Surface area C Cone $\pi \times 3 \times 5$ Cylinder $= \pi 6 \times 8$ Hemisphere $= 2\pi \times 3 \times 3$ Total surface area $= 15\pi + 48\pi + 18\pi$ $= 81\pi$ 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 $\pi = {}^{22}/_{7}$ l.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

MATHS P2

1. No. → Log 36.72 → 1.5649 0.46^2 → $2(\bar{1}.6628)$ = $\bar{1}.3256$ 0.8905 $\bar{2}.2682$ 185.4 → 2.6223 (4) $\frac{\bar{2}.6223}{3} = \frac{\bar{3}+1.6223}{3}$ 3.474×10^{-1} ← $\bar{1}.5408$ (3) $= 0.3474$	M1 M1 M1 A1 4	all 3 logs operations (x3, +,-) correct attempt accept standard form
2. $P = r^2(1 - as^2)$ $s^2 = \frac{1}{a}(1 - \frac{p}{r^2})$ $s = \pm\sqrt{1/a(1 - p/r^2)}$	M1 M1 A1 3	for squaring both sides or equivalent for s^2 subject CAO $\pm\sqrt{\frac{r^2-p}{ar^2}}$
3. $\angle PTO = 90^0$ or $\angle RTN = 90^0$ $\angle TOR = 110^0$ or $\angle TOP = 70^0$ $\angle RST = 55^0$	B1 B1 A1 3	
4. $800 \times 0.006 = 4.8$ % error = $\frac{4.8 - (788 \times 0.006)}{788 \times 0.006} \times 100\%$ $= \frac{0.072}{4.728} \times 100\%$ $= 1.523\%$	B1 M1 A1	Accept 1.52284264% rounded off to at least 3dp
5. $\bar{x} = \frac{9 + 11 + 12 + 13 + 11 + 10}{6}$ $(X-\bar{X})^2 = 4,0,1,4,0,1 \quad = 11$ $S^2 = \frac{4 + 0 + 1 + 4 + 0 + 1}{6}$ $1.6 \prec X = 10 \div 6 = 1\frac{2}{3}$	M1 M1 A1	or equivalent CAO
6. $\frac{(3\sqrt{2} - \sqrt{3})(2\sqrt{3} + \sqrt{2})}{(2\sqrt{3} - \sqrt{2})(2\sqrt{3} + \sqrt{2})}$ $= \frac{6\sqrt{6} + 6 - 6 - \sqrt{6}}{12 - 2}$ $= \frac{1}{2}\sqrt{6}$	M1 M1 A1 3	
7. 	B1 B1	mid point OQ determined by construction arc centre M. radius OM cutting circle at P
8. Tax on 1st 9680 $= \frac{10}{100} \times 9680$ $= 968$ Monthly income (shs) $\frac{(1916 - 968)100 + 9680}{15}$ $= 6320 + 9680$ $= 16000$	M1 A1 A1	or equivalent

9. $q^2 + (1/3)^2 + (2/3)^2 = 1^2$ $q^2 = 1 - 5/9 = 4/9$ $q = \pm 2/3$	**M1** **A1**	
10. Coordinates of A: (a) $\left(\frac{5+-3}{2}, \frac{5/2+-1}{2}\right)$ = A(1, 2) (b) $r^2 = (5-2)^2 + (5-1)^2$ $r = 5$ Equ. $(x-1)^2 + (y-2)^2 = 5^2$ $x^2 - 2x + 1 + y^2 - 4y + 4 = 25$ $x^2 + y^2 - 2x - 4y - 20 = 0$	**B1** **M1** **M1** **A1**	
11. $(2+1/2)^5 = 2^5 + 5(2^4)(1/2) + 10(2^3)(1/2)^2 + 10(2^2)(1/\sqrt{2})^3 + 5(2)(1/\sqrt{2})^4 + (1/2)^5$ $(2-1/\sqrt{2})^5 = 2^5 - 5(2^4)(1/\sqrt{2}) + 10(2^3)(1/\sqrt{2})^2 - 10(2^2)(1/\sqrt{2})^3 + 5(2)(1/\sqrt{2})^4 - (1/\sqrt{2})^5$ $= 2[2^5 + 10(2^3)(1/\sqrt{2})^2 + 5(2)(1/\sqrt{2})^4]$ $= 64 + 80 + 5$ $= 149$	**M1** **M1** **M1** **A1**	
12. $t = k\,x/\sqrt{y}$ $t_1 = k\,0.96x/\sqrt{1.44y}$ $= 0.8t$ Decrease $= t - 0.8t$ $= 0.2t$ % decrease $= \frac{0.2t}{t} \times 100\%$ $= 20\%$	**M1** **M1** **M1** **A1** **4**	
13. 	B1 B1 B1 B1	arc centre A radius 6cm drawn bisector of BC drawn & dotted parrallel 4cm from BC drawn region shaded. Apply if to BC is a full line NB: All boundaries must enclose the required region
14. 	P1 C1 B1	plotting of all points smooth curve for $x = 2.5 \pm 0.1$ at $y = 2$

15. $V = \int a\,dt = 10t - {}^{2}/_{2}t^2 + c$ at $t = 0$, $v = 9 \Rightarrow c = 9$ $\therefore = 10t - t^2 + 9$ at $t=3$, $v=10(3) - 3^2+9$ $= 30$m/s	**M1** **M1** **A1**	
16. $\angle POG = 180 - (36 \times 2)$ $= 108^0$ Dist PQ = 108 x 60 = 6480 mm	**B1** **M1** **A1** **3**	
17. **Section II** a) i) Principal = 358400 - (12800 x 3) = 320000 ii) $r = \frac{12800}{320000} \times 100\%$ b = 4% i) Deposit = ${}^{25}/_{100}$ x 56000 = 14000 Instalments = $\frac{56000 - 14000}{2625}$ =16 ii) Cash price $\frac{100 - 12.5}{100} \times 4000 = 35000$ % difference = $\frac{56000 - 35000}{35000} \times 100\%$ = 60%	**M1** **A1** **M1** **A1** **M1** **M1** **A1** **M1** **M1** **M1** **10**	
18. Let width of the path be x Area=(10+2x)(8+2x) = 168 $\Leftrightarrow 80 + 20x + 16x + 4x^2 = 168$ $4x^2+36x-88=0$ $\Leftrightarrow x^2+9x-22=0$ $(x-2)(x+11)=0$ $(x-2)(x+11)=0$ x=2 or -11 Width of path = 2m b) Area covered by small slabs = 14 x 12 - (10x8+4(2x2)) = 72m^2 No of slabs = ${}^{72}/_{0.5 \times 0.5}$ =288 Cost of slabs Large = 600 x 4 = 2400 Small 50 x 288 = 14400 Total cost = 2400 + 14400 = 16,800	**M1** **M1** **M1** **A1** **M1** **M1** **A1** **M1** **M1** **A1** **10**	or equivalent or equivalent
19. 	**B1** **B1** **B1**	B'(-4,-5) plotted C' (3,61/2) plotted A'B'C' drawn

Shear maps I(1,0) - I(1,11/2) ii) shear maps I(1,0) $I(1,1^1/_2)$ matrix = $\begin{pmatrix} 1 & 0 \\ 1^1/_2 & 1 \end{pmatrix}$ b)i) $\begin{pmatrix} -1 & 0 \\ 1^1/_2 & -1 \end{pmatrix}$ $\overset{A1\ \ B1\ \ C1}{\begin{pmatrix} -6 & -4 & 3 \\ 4 & -1 & -2 \end{pmatrix}}$ $\overset{A11\ \ B11\ \ C11}{= \begin{pmatrix} 6 & 4 & -3 \\ -5 & -1 & -2 \end{pmatrix}}$ ii. Half turn, about (0,0)	**M1** **A1** **M1** **A1** **B1** **B1** **B1** **10**	OR $\begin{pmatrix} 1 & 0 \\ k & 1 \end{pmatrix}\begin{pmatrix} -6 \\ 5 \end{pmatrix} = \begin{pmatrix} -6 \\ -4 \end{pmatrix}$ accept geral form after formation of 4 possible equation A"B"C" drawn & labbelled
20  i. p(1x-y1=2) favourable outcomes =12 $p(1x-y1=2) = {}^{12}/_{64} = {}^{3}/_{16}$ ii. p(1x-y/5) favourable outcomes $p(1x-y5) = {}^{12}/_{64} = {}^{3}/_{16}$ iii. p (x > y) favourable outcomes $p(x > y) = {}^{28}/_{64} = {}^{7}/_{16}$ bi) k+2k+3k+4k+5k+6k=1 21k = 1 $k = {}^{1}/_{21}$ ii) $p(11) = {}^{5}/_{21} x {}^{6}/_{21} + {}^{6}/_{21} x {}^{5}/_{21}$ $= {}^{60}/_{441}$ $= {}^{20}/_{147}$	**B1** **B1** **B1** **B1** **B1** **B1** **M1** **A1** **M1** **A1** **10**	Dots listing talbe missing on the table or listed o on he table or listed * on the table or listed
21. Alcohol vol. in the mixture $= {}^{60}/_{100} \times 80$ = 48 litres New proportion of alcohol = $^{48}/_{80+x}$ $\therefore {}^{48}/_{80+x} = {}^{40}/_{100}$ x = 40 b) % of alcohol in the new solution is $^{48}/_{120+30} \times 100 = {}^{48}/_{150} \times 100$ =32 c) Alcohol volume in the mixture in litres $= 5 \times {}^{32}/_{100} + 2 \times {}^{60}/_{100}$ =1.6+1.2 =2.8 The ratio = (7-2.8) : 2.8 = 4.2:2.8 =3:2	**B1** **B1** **M1** **A1** **M1** **A1** **M1** **A1** **M1** **A1**	the volume of the water $^{40}/_{100} \times 80 = 32$ litres new proportion of water = $\frac{32+x}{80+x}$ $^{32+x}/_{80+x} = {}^{60}/_{100}$ x = 40 water volume in this mixture $= 5 \times {}^{68}/_{100} + 2 \times {}^{40}/_{100}$ 3.4 + 0.8 = 4.2 The ratio = 4.2 : (7-4.2) = 4.2:2.8 = 3:2

22.(a) $a \times ar \times ar^2 = 64$ — M1

$a^3 r^3 = 64$ — M1

$r = 3\sqrt{64/a^3}$ — A1

$= 4/a$ — M1

b) i) $a + a \times 4/a + 4/a\,(4/a)^2 = 14$ — A1

$a^2 - 10a + 16 = 0$ — B1

$a = 8$ or 2 — B1

$\therefore r = 1/2$ or 2 — B1

$8, 4, 2, 1$ — M1

$2, 4, 8, 16$ — A1

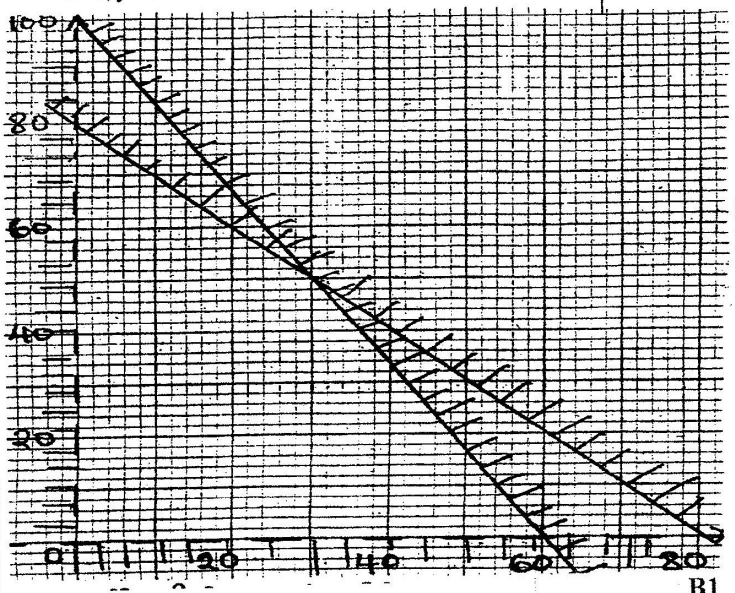
ii) The product $= 8\,(1/2)^{50-1} \times 2 \times 2^{50-1} = 16$ — 10

23. a) $300x + 180y \leq 18000$ — B1

$5x + 3y \leq 300$ — B1

$x + y \leq 80$ — B1

$x > 0, y > 0$



S1 B1 B1 B1 B1

$x = 30, y = 50$ — B1

Max profit $= 50 \times 4000 + 30 \times 6000$ — M1

380000 — A1

24. a) $3x = 4 - x^2$ — M1

$(x+4)(x-1) = 0$ — A1

$x = -4$ or $x = 1$ — B1

$\therefore$ The coordinator of P $(1,3)$ — B1

The coordinator of Q $(-4, -12)$ — M1

b) $\int_{-4}^{-2} (14 - x^2)\,dx = \left[4x - 1/3\,x^3\right]_{-4}^{-2}$ — A1

$= (4x2 - 1/3 x(-2)^3 - (4x-4 - 1/3(-4)^3$ — M1

$= 10\,2/3$ — A1

The shaded area $= 1/2 \times 4 \times 12 - 10\,2/3$ — M1

below x axis — A1

$= 13\,1/3$

Shaded area $= 13\,1/3 + [4x - 1/3\,x^3]_0^{10}$

$= 131/3 + 0 = [4x - 2 - 1/3(8)$

$= 13\,1/3 + 5\,1/3$

$= 18\,2/3$ — 10