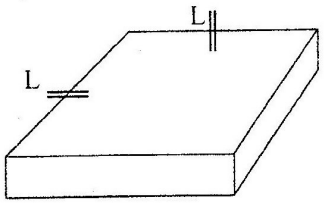
MATHEMATICS

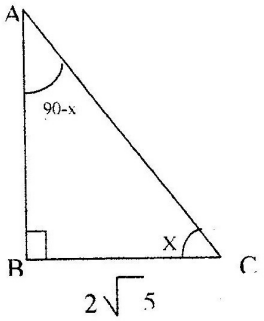
PAPER 1 OCT/NOV. 2007 2½Hours

1.	$\frac{0.0084 \times 1.23 \times 3.5}{2.87 \times 0.056} = \frac{84 \times 123 \times 35 \times 10^{-7}}{28 \times 56 \quad 10^{-7}}$ $= 0.225$	M_1 A_1
2.	$3x^0 + (x-20)^0 = 180^0$ $M_{½}$ $4x^0 - 20 = 180^0$ $4x^0 = 160^0$ $X = 40^0$ Let n = no of sides $\frac{360^0}{n} = 40^0$ $40^0 n = 360^0$ $n = 9$	$M_{½}$ M_1 A_1
3.	$(x^2 - y^2)(x^2 + y^2)(x^4 - y^4) = (x+y)(x-y)(x^2+y^2)(x^2-y^2)$ $x^4 + x^2y^2 - y^4 - x^2y^2 \Rightarrow (x^4 - y^4)(x^4 - y^4)$ $x^8 - x^4y^4 - x^4y^4 + y^8$ $x^8 - 2x^4y^4 + y^8$	M_1 A_1
4.	118 yens = Kshs.76 $\therefore$ 2,950,000 yens = $\frac{2,950,000 \times 76}{118}$ = Kshs.1,900,000 The duty paid = $^{20}/_{100}$ x 1,900,000 = Kshs.380,000	M_1 M_1 A_1
5.	$\frac{dy}{dx} = 3ax^2 + b = -5$ When x = 1 and y = 1 3a + b = -5 ..... (i) $Y = ax^3 + bx \Rightarrow a + b = 1$ ..... (ii) Solving (i) –(ii) ; a = -3 and b = 4	M_1 M_2 A_1
6.	$\frac{15a^2b - 10ab^2}{3a^2 - 5ab + 2b^2} = \frac{5ab(3a-2b)}{3a^2 - 3ab - 2ab + 2b^2} = \frac{5ab(3a-2b)}{(a-b)(3a-2b)} = \frac{5ab}{a-b}$	M_1 M_1 A_1
7.	Volume = $\frac{\text{Mass}}{\text{Density}}$ $= \frac{1050}{8.4}$ cm^3 = 125cm^3 $\therefore$ L x L x 0.2cm = 125cm^3 $L^2 = \frac{125}{0.2}$cm = 625 $L = \sqrt{625}$ = 25cm  	M_1 M_1 A_1

8. Cos x = $\frac{\text{Adjacent}}{\text{Hypo}}$

$= \frac{2\sqrt{5}}{5}$ Pythogoras':

$AB = \sqrt{5^2 - (2\sqrt{5})^2} = \sqrt{5}$



M_1

Tan $(90^0 - x) = \frac{\text{Opp}}{\text{Adjust}}$ $\frac{2\sqrt{5}}{\sqrt{5}} = 2$ A_1

9. x – Area = πDL = 3.142 x 10 x 12 = 377.04 cm^2 B_1

X – Area in Contract = 377.04 x $\frac{2.5}{10}$ = 94.26cm^2 M_1 A_1

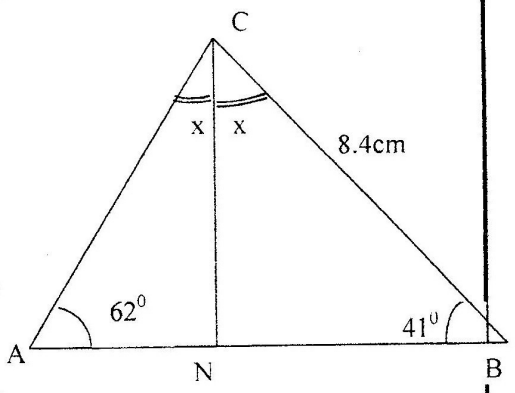
10. $\angle ACB = 180^0 - (62^0 + 4^0)$ M_1

$= 77^0$

$\therefore x = \frac{77^0}{2} = 38.5^0$

$\angle CNB = 180^0 - (41^0 + 38.5^0)$

$= 100.5^0$



A_1

$\frac{8.4}{\text{Sin } 100.5} = \frac{CN}{\sin 41^0}$ M_1

$\therefore CN = \frac{8.4 \sin 41^0}{\text{Sin}100\ 5^0} = 5.6cm$ A_1

11. Let Mother's years be x and son's be y now: M_1

x + 14 = 2(y+14) ..... (i)

x + 14 = 2y + 28

x - 2y = 14 ..... (ii) M_1

(x – 4) + (y - 4) = 30

X + y = 38 ..... (iii)

(iii) – (ii) M_1

x + y = 38

\+ -x+ 2y=-14

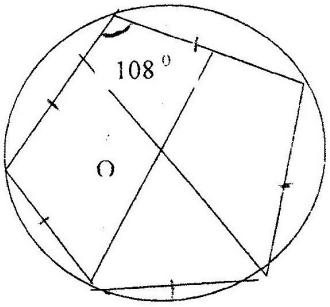
3y = 24

y = 8

x = 30 A_1

At son's birth: mother's age = 30-8 = 22years

12.



(i). Construct $\angle 108^0$, sides 4cm
(ii). Bisect two angles to produce centre O.
(iii). Draw a circle touching the vertices

Drawing M_1
Accuracy M_1
Explanation A_1

13. $x + y = 40$
$y = 40 - x$

$x^2 + (40-x)^2$
$x^2 - 80x + x^2 + 1600$
$2x^2 - 80x + 1600$

$\frac{dy}{dx} = 4x - 80$ M_1

M_1

for min. value $\frac{dy}{dx} = 0$

$\therefore 4x - 80 = 0$
$X = 20$ M_1
Subst. $y = 20$
$X^2 + y^2 = 400 + 400$
$= 800$ A_1

14. Area of Sector QPR $= \frac{60}{360} \times 6 \times 6 \times 3.142 = 18.852\ cm^2$ M_1

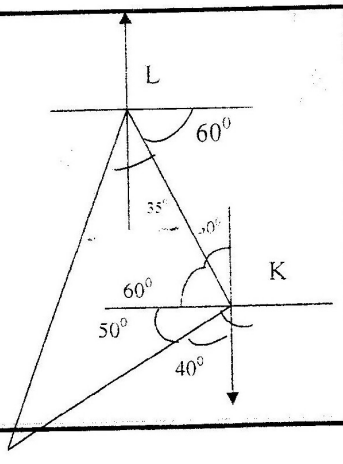
Area of triangle QPR $= \frac{6 \times 6 \sin 60^0}{2} = 15.559 cm^2$ M_1

Area of Segment $= 18.852 - 15.559 = 3.2935 cm^2$ M_1

Area of Shaded region $= 2 \times 3.2935 + 15.559 = 22.15 cm^2$ A_1

15. Δ LKM IS Isosceles
KL = KM (Given)

$\angle LKM = 50^0 + 60^0$
$= 110^0$ (Construction) M_1
$\angle KML = KLM$ (Base $\angle$s) B_1
$= 35^0$



Bearing of m from L $= 90^0 + 60^0 + 35^0$
$= \mathbf{185^0}$ A_1

16. 2h 40min $= 2\frac{2}{3}$
$= \frac{8}{3}h$ B_1

1 h = 120km
$\therefore \frac{8}{3}h = \frac{8}{3} \times 120 = 320km$ $\therefore$ 320Km would cost $= \frac{320 \times 59}{4}$ M_1
4Km cost = Kshs.59
$= \mathbf{Kshs.4,720}$ A_1

17a. Retained profit = 225,000 x $\frac{25}{100}$ = **Kshs.56,250** M_1

Remaining after retained = 225,000 – 56,250 = **Shs.168,750/=**

Taxes and insurance = 168.750 x $^{40}/_{100}$ = **Shs.67,500** M_1

Remaining = 168,750 – 67,500 = **Shs.101,250**

Cherop's share of profit = $\frac{105,000}{250,000}$ x 101,250 = **Kshs.42,525** A_1

Nangila's share of profit = $\frac{85,000}{250,000}$ x 101,250 = **Kshs.34,425**

Asha's Share of Profit = $\frac{60,000}{250,000}$ x 101,250 = **Kshs.24,300** M_1

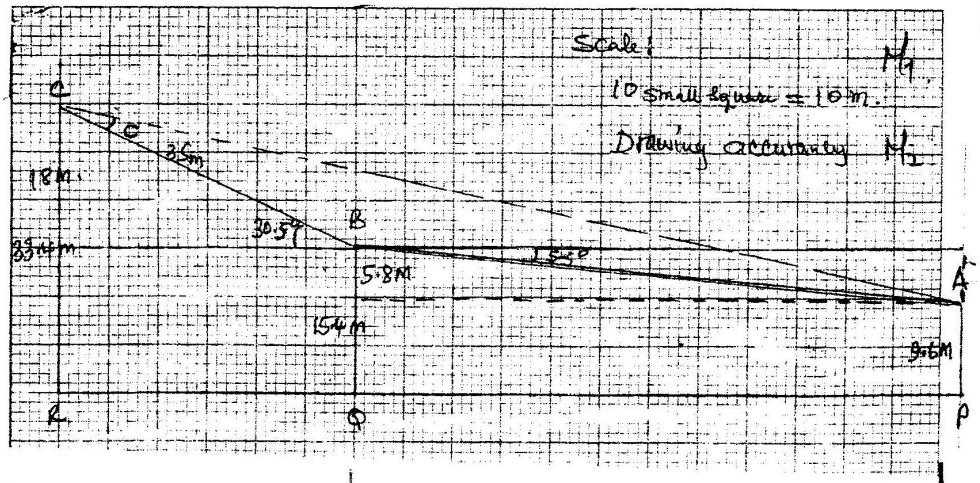
Cherop's – Asha's = 42,525 – 24,300 = **Kshs.18,225** A_1

(b). Profit 2nd Year = $^{10}/_{9}$ x 225,000 B_1

= **Kshs.250,000** M_1

Nangila's share of Profit = $\frac{110,000 \times 250,000}{275,000}$ M_2

= **Kshs.100,000** A_1



18. a

$\frac{5.8}{\sin 5.5^0} = \frac{x}{\sin 84.5^0}$

$x = \frac{5.8 \sin 84.5^0}{\sin 5.5^0} = 60.2m$ M_1 A_1

(b(i). 60mm = 33.4m

$\therefore$ 190mm = $\frac{190 \times 33.4}{60}$ = **105.77m** M_1

(iii). $\angle CBA = 180^0 - 30.5^0$

$= 149.5^0$

$\frac{105.8}{\sin 149.5^0} = \frac{60.2}{\sin C}$ M_1

$\sin C = \frac{60.2 \sin 149.5}{105.8}$

$= 0.2888$

$\therefore \angle BCA = 16.8^0$ D_1 A_1

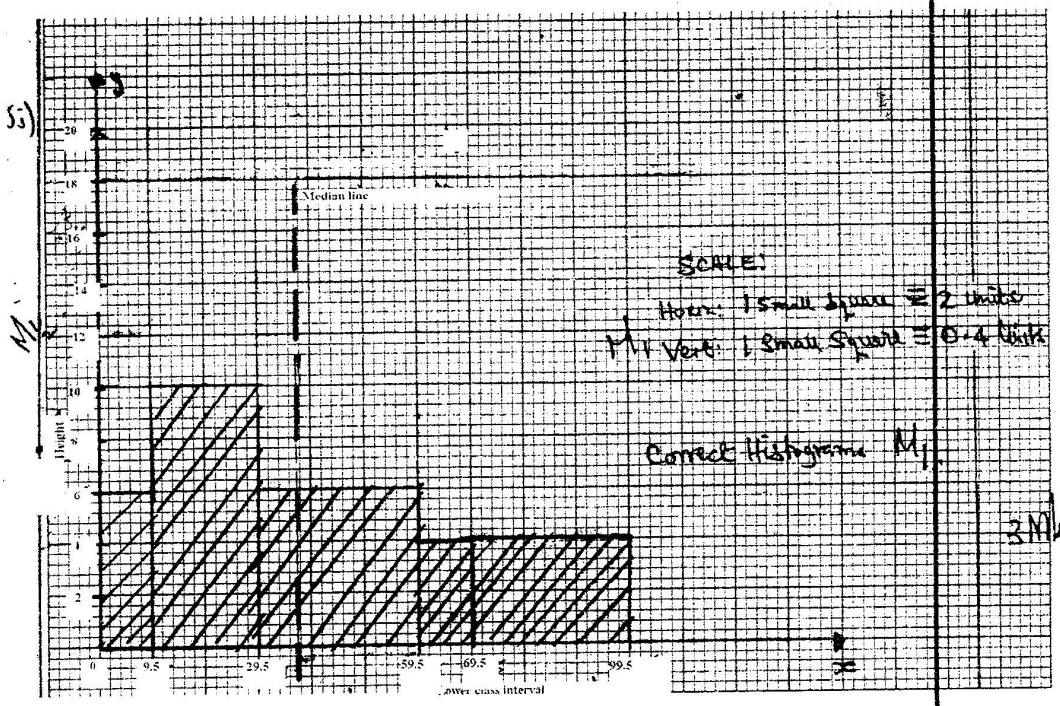
19.(i)

Marks	0-10	10-30	30-60	60-70	70-100
Frequency	12	40	36	8	24
Area of rectangle	60	200	130	40	120
Height of rectangle	6	10	6	4	4

(i) NB: Area (A) $= \frac{C.I}{2} \times F$ when C.I is double the frequency, (F) is halved

4mks

ii) Height (H) $= \frac{Area}{C.I}$



b) Median mark = 30 – 60
or = 29.5-59.6 M1

ii) $\left(\frac{35.5}{2}\right) + \frac{(39.5)}{2}$ $=17.5+19.75$ $=37.5$ M1

$= 37.5$ A1

3mks

20. Let the no. of computers be x

Price per unit = $\frac{1,800,000}{X}$ — M_1

After reduction: — M_1

Price per unit = $\frac{1,800,000}{X} - 4000$

New no. of units purchased = $(x + 5)$

$(x + 5)\left(\frac{1800,000 - 4000x}{x}\right) = 1,800,000x$ — B_1

$1,800,000x - 4000x^2 + 9000,000 - 20,000\,x = 1,800,000x$

$+ 4000x^2 + 20,000x - 900000 = 0$ — M_2

$x^2 + 5x - 2250 = 0$

$x^2 + 50x - 2250 = 0$

$x(x+50) - 45\,(x+50) = 0$

$(x+50)\,(x - 45) = 0$

$X = 45$ or $x = -50$ He bought $45 + 5 = 50 = 50$ computers — A_1

(b). Remaining computers = $50 - 2 = 48$ — M_1

Total Profit = $\frac{215}{100} \times 1,800,000$ — M_1

= Kshs.270,000 — A_1

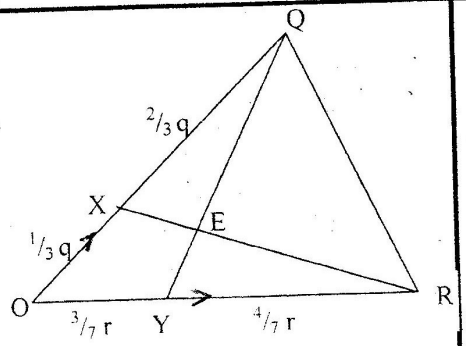
Profit per computer = $\frac{270,000}{48}$ = Kshs.5,625 — A_1

21. (a)i) $XR = \frac{OX + OR}{r - {}^1/_3 q}$ — M_1

(ii). $YQ = q - {}^3/_7 r$ — M_1

(bi). $XE = m\,(r - {}^1/_3 q)$ — M_1

(ii). $YE = n\,(q - {}^3/_7 r)$ — M_1



ci).OE = OX + XE — M_1

$= {}^1/_3 q + m\,(r - {}^1/_3 q)$

$= \frac{(1-m)}{3} q + mr$ — A_1

(cii). Also — M_1

OE = OY + YE

$= {}^3/_7 r - {}^3/_7 n\, r + nq$

$= \frac{1-m}{3} = n$ ..... (i) — A_1

$M = 1 - 3n$ ..... (ii) — M_1

Subst. and solving

$n = {}^2/_9$ and $m = {}^1/_3$ — A_1

22a. (A.S.F.)½ = (L.S.F.)

L.S.F. = $\left(\frac{45}{20}\right)$ ½ = 1.5 — M_1

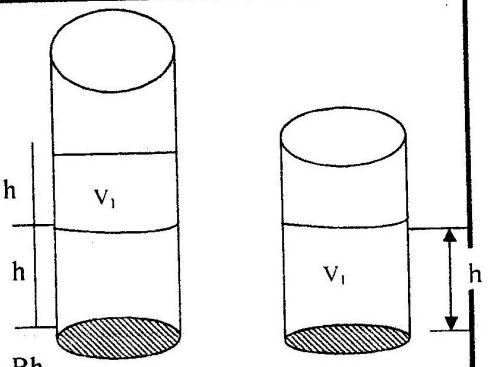
$(L.S.F.)^3 = (V.S.F.)$
$\therefore$ V.S.F. = $(1.5)^3 = 3.375$ — M_1

$\frac{0.945}{y} = 3.375$

$\therefore y = \frac{0.945}{3.375} = 0.28$ Litres — M_1 A_1

b. From A.S.F.
$A = {}^3/_2 B$
Both volumes are equal
$\therefore {}^3/_2 B (13-h) = Bh$ — B_1

$2 \times {}^3/_2 (13 - h) = h \times 2$
$39 - 3h = 2h$
$5h = 39$
$h = {}^{39}/_5 = 7.8$cm — M_1 A_1



(c). Volume in larger cylinder $= {}^3/_2 Bh$
$= {}^3/_2 \times 7.8B$
$= 11.7B$ cm^3 — M_1 A_1

(iii). ${}^1/_5$ of $11.7B = 2.34B$ cm^3
Total volume of juice in smaller container $= 2.34B + Bh$
$= 2.34B + 7.8B$
$= 10.14B$ — M_1 A_1

$10.14 B = h_1 B$ where h_1 = new height
$\therefore h_1 = 10.14$ cm

23a. $\begin{pmatrix} 9 & 8 \\ 7 & 6 \end{pmatrix}$ det. $= (9 \times 6) - (8 \times 7)$
$= 54 - 56$
$= -2$

$A^{-1} = \begin{pmatrix} 6 & -8 \\ -7 & 9 \end{pmatrix} -½ = \begin{pmatrix} -3 & 4 \\ 3.5 & -4.5 \end{pmatrix}$ — M_1 A_1

b. Let price of bicycle be x and radio be y

$A = \begin{pmatrix} 36 & 32 \\ 28 & 24 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 227{,}280 \\ 174{,}960 \end{pmatrix}$ — M_1

Bicycle Radio

Det = (36 x 24) - (32 x 28) $= 864 - 896 = -32$

$$A^{-1} = {}^{-1}/_{32}\begin{pmatrix} 24 & 32 \\ -28 & 36 \end{pmatrix} = \begin{pmatrix} -0.75 & +1 \\ +0.875 & -1.125 \end{pmatrix}$$ M_1

$$A^{-1}A\begin{pmatrix} x \\ y \end{pmatrix} = A^{-1}\begin{pmatrix} 227{,}280 \\ 174{,}960 \end{pmatrix}$$ M_1

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -0.75 & 1 \\ 0.875 & -1.125 \end{pmatrix}\begin{pmatrix} 227{,}280 \\ 174{,}960 \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4{,}500 \\ 2{,}040 \end{pmatrix}$$ A_1

c. New Costs:

Bicycle $\frac{90}{100} \times 4{,}500 = 4050$ /= M_1

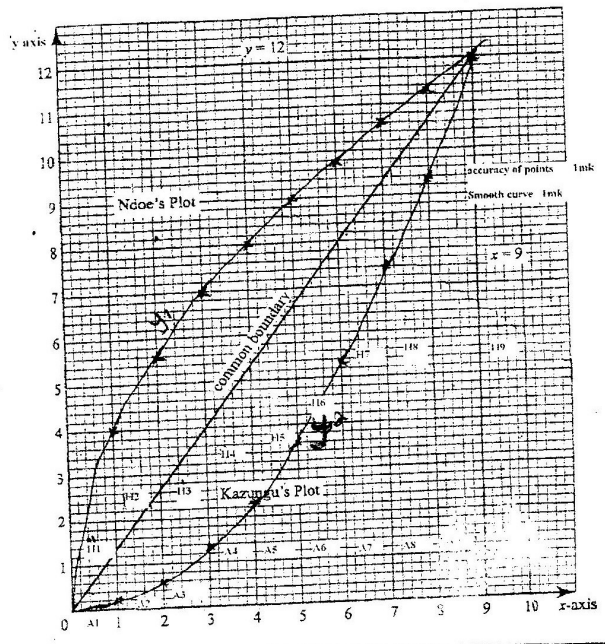
Radio $\frac{110}{100} \times 2040 = 2244$ /= A_1

$$\begin{pmatrix} 36 & 28 \\ 32 & 24 \end{pmatrix}\begin{pmatrix} 4050 & 2244 \\ 4050 & 2244 \end{pmatrix} = \begin{pmatrix} 145800 + 113400 & \\ 71.808 + 53.856) & \end{pmatrix}$$ W_1

Total for Bicycles 259,200

Total for Radios 125,664 A_1

24.



(bi). $A_1 = \frac{1}{2}(1 \times 0.2) + \frac{1}{2}(0.2 + 0.6)\,1 + \frac{1}{2}(0.6 + 1.3) + \frac{1}{2}(1.3 + 2.4) + \frac{1}{2}(2.4 + 3.7) + \frac{1}{2}(3.7 + 5.3) + \frac{1}{2}(5.3 + 7.3) + \frac{1}{2}(7.3 + 9.5) + \frac{1}{2}(9.5 + 12)$ $= \underline{36.30 \text{ sq Units}}$ $A_2 = \left(\frac{1}{2} \times 4 \times 1\right) + \frac{1}{2}(4 + 5.7) + \frac{1}{2}(5.7 + 6.9) + \frac{1}{2}(6.9 + 8) + \frac{1}{2}(8+9) + \frac{1}{2}(9+ 9.8) + \frac{1}{2}(9.8 + 1.06) + \frac{1}{2}(10.6+ 11.3) + \frac{1}{2}(11.3 + 2)$ $= \underline{59.65 \text{ sq units}}$ Disputed land $= 59.65 - 36.30$ $= \underline{23.35 \text{sq units}}$	M_1 A_1 M_1 M_1 A_1
(bii) $10.000m^2 = 1$ hactare 1 unit = 20m $\therefore 1 \times 1$ unit squared $= 20 \times 20m^2$ $= 400m^2$ Hence 23.35 unit squared $= 23.35 \times 400$ $= \underline{9.340m^2}$ But $10.000m^2 = 1$ hactare $\therefore 9.340m^2 = \frac{9.340 \times 1}{10,000}$ $= \underline{0.934 \text{ hactares}}$	M_1 M_1 A_1

121/2 MATHEMATICS 2007

No.	Workings	Marks	Other alternative
1.	No. | Log 0.32 | $\bar{2}.5051$ 14.26 | 1.1541 + $\bar{1}.6592$ 0.006 | $\bar{3}.7782$ – 1.8810 (4) | 1.8810 x 2/3 17.95 ← 1.2540 ← 17.95	3 marks M1 M1 A1 3	 3 logs Division 3 By 2
2.	$yx + 3yz = 2x - 2$ $yx - 2x = 03z - 2$ $x(y-2) = -3yz - z$ $x = \frac{-3yz - 2}{y-2}$	3 marks M1 M1 A1 3	 Or equivalent
3.	$3 \cos x = 2(1 - co^2x)$ $3 \cos x = 2 - 2 \cos^2 x$ $2 \cos^2 x + 3\cos x - 2 = 0$ $2y^2 + 3yz - 2 = 0$ $(2y-1)(y+2) = 0$ $y = ½$ or $y = -2$ $\cos x = 0.5$ $x = 60^0, 300^0$	4 marks M1 M1 A1 B1 4	Substitute Or Equivalent
4.a)	$(1 + ½ x)^5 = 1^5.1.1(1.2x)^0$ $+5.1^4(½ x)^1 + 10.1^3(½ x)^2 + 10.1^2(½ x)^3 + 5.1^1(½ x)^4$ $+ 1.1^0(½ x)^5$ $= 1 + {}^5/_2x + {}^5/_2x^2 + {}^5/_4x^3 + {}^5/_{16}x^4 + {}^1/_{32}x^5$	2marks M1 A1 2	
b).	$1^1/_{20} = 1 + {}^1/_{20} = {}^1/_2x = {}^1/_{20}$ x= $^1/_{10}$ $(1^1/_{20})^5 = 1 + {}^5/_2x^1/_{10} + {}^5/_2x\ {}^1/_{100}$ $= 1 + {}^5/_{20} + {}^5/_{200}$ $= 1\ {}^{11}/_{40}$	2 marks M1 A1 2	 Or 1 + 0.25 + 0.25 M1 = 1.275 AL
5.	$S = \sum (2 - t)\, dt$ $S = 2t - t^2/_2 + c$ When s = 5, t = 2 $5 = 2x2 - 2^2/_2 + c$ $= 3$ $S = 2t - {}^1/_2t^2 + 3$	3 marks M1 M1 A1 3	
6.	Interest = (13800-2280) x $^{20}/_{100}$ x 2 = 11520 x 0.2 x2 = 4608 Monthly instalments $= \frac{11520 + 4608}{24}$ = Kshs. 672	3 marks M1 M1 A1 3	

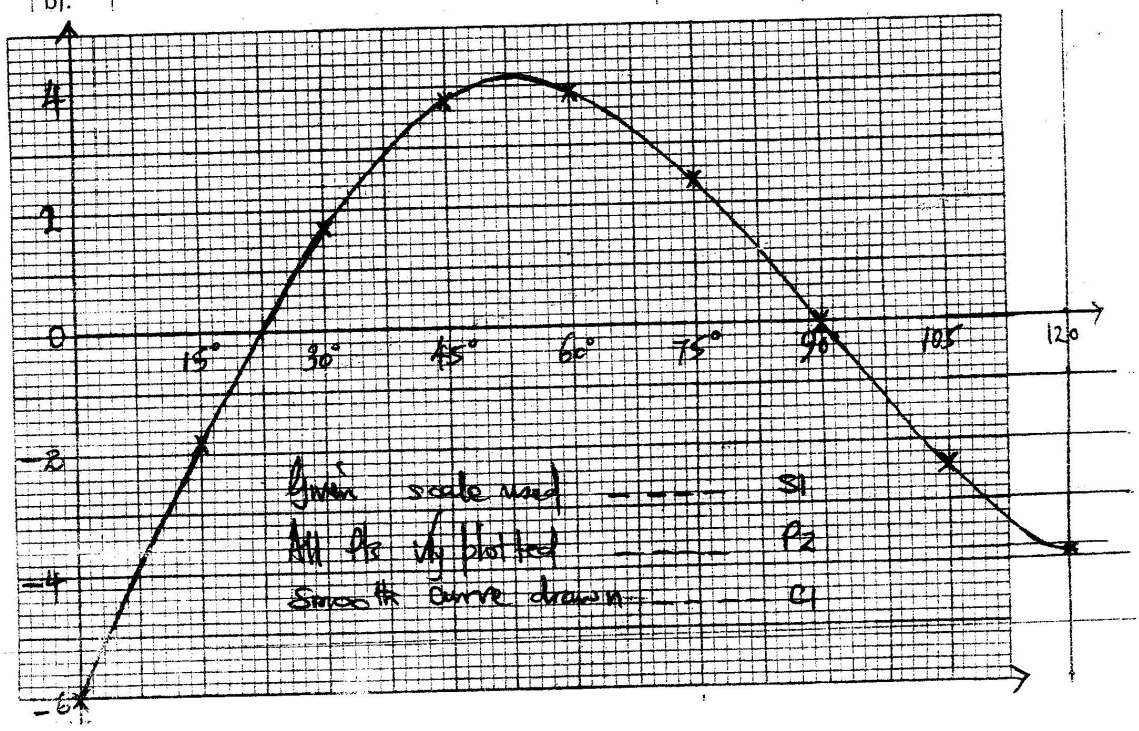
7.	$(\frac{6+2}{2}, \frac{1+3}{2}) = (4, 2)$ $M_1M_2 = \frac{1-3}{6-2} \times m_2 = -1$ $M_2 = 2$ $\frac{Y-2}{X-4} = 2$ $= 2x - y = 6$	4 marks B1 M1 M1 A1 4	Or equivalent
8.	Greatest possible error $= \frac{64(3.15 - 3.05)}{2}$ $= \frac{201.6 - 195.2}{2}$ $= 3.2cm^2$	2 marks M1 A1 2	
9.	2.5 litres = $2500cm^3$ $^4/_5 \times 2500 = 2000cm^2$(water) $^1/_5 \times 2500 = 500\ cm^3$ (milk) $200 \times 1 + 500 \times 1.2$ = 2600gm	3 marks M1 M1 A1 3	$\frac{4 \times 1 + 1 \times 1.2}{5}$ = 1.04 1.04 x 2500 = 2600g
10.	$\frac{67-32}{14}$ = 2.5 $T_7 = 67 - 6x\ 2.5$ = 52cm	M1 M1 A1 3	or equivalent
11. a). b).	NR $= \sqrt{42 + 7.52}$ = 8.5 AN QR (14 + 8.5) – 7.52 QR = 25 4 x AN = 14x (8.5 – 2.5) AN = $\frac{14 \times 6}{4}$ = 12cm	4 marks B1 M1 M1 A1 4	
12.	$\|\underline{P}\| = \sqrt{3^2 + (-1)^2 + (1\frac{1}{2})^2}$ = 3.5 $\Rightarrow \underline{Q} = 2\|\underline{P}\| = 6\underline{i} - 2\underline{j} + 3\underline{b}$	2 marks B1 B1 2	
13.	Longitude difference = 360 – (133 + 118) = 109 109 x 60 cos x = 5422 Cos x = 0.8291 x = 33.99^0 longitude of A or B = 34^0N	3 marks M1 M1 A1 3	
14.	The value of k, y = K (x + 1) (x -2)	2 marks M1	

	when x = 0 and y= 2 2 = k(1) (-2) 2 = - 2k ∴ K = -1	A1 2	
15.	$\frac{3}{\sqrt{5}+2} + \frac{1}{\sqrt{5}} = \frac{3(5+2)}{5-4} + \frac{1\sqrt{5}}{5}$ $= 3\sqrt{5} + 6 + \frac{1\sqrt{5}}{5}$ $= 6 + 3\frac{1}{5}\sqrt{5}$	3 marks M1 M1 A1 3	
16.	$X^2 + Y^2 - 3/2x + y = ¼$ $X^2 - {}^3/_2x + 9/16 + y^2 + y + ¼$ $= {}^{-1}/_4 + {}^9/_{16} + ¼$ $= {}^9/_{16}$ $(x - ¾)^2 + (y + {}^1/_2)^2 = {}^9/_{16}$ Centre $({}^3/_4, {}^{-1}/_2)$ Radius = ¾	4marks B1 B1 B1 B1 4	√ left hand side √ right hand side
17 a). i)	Fraction filled in 1hr $= {}^2/_9 + {}^1/_3 = {}^5/_9$ ∴ Time taken = $1{}^4/_5$hr	2 marks M1 A1 2	
ii)	Fraction filled in 1 hour $= {}^5/_9 - ½ = {}^1/_8$ ∴ Time taken = 18hr	2 marks M1 A1	
b).i)	$= {}^2/_9 \times 1 + {}^1/_3 \times ¼$ $= {}^2/_9 + {}^1/_{12}$ $= {}^{11}/_{36}$	M1 M1 A1	P for 45min: ${}^2/_9 \times {}^3/_4 = {}^1/_6$ P & Q for 15min ${}^5/_9 \times {}^1/_4$ $= {}^5/_{36}$ Fraction filled at 9.00am ${}^1/_6 + {}^5/_{36}$ M1 $= {}^{11}/_{36}$ A1
ii).	Time taken after 9.00am To fill up the tank $= {}^{25}/_{36} \times 18$ $= 12{}^1/_2$ Time when the tank filled up = 9.00 + $12{}^1/_2$ = 21:30hr (9.30pm)	3 marks M1 M1	

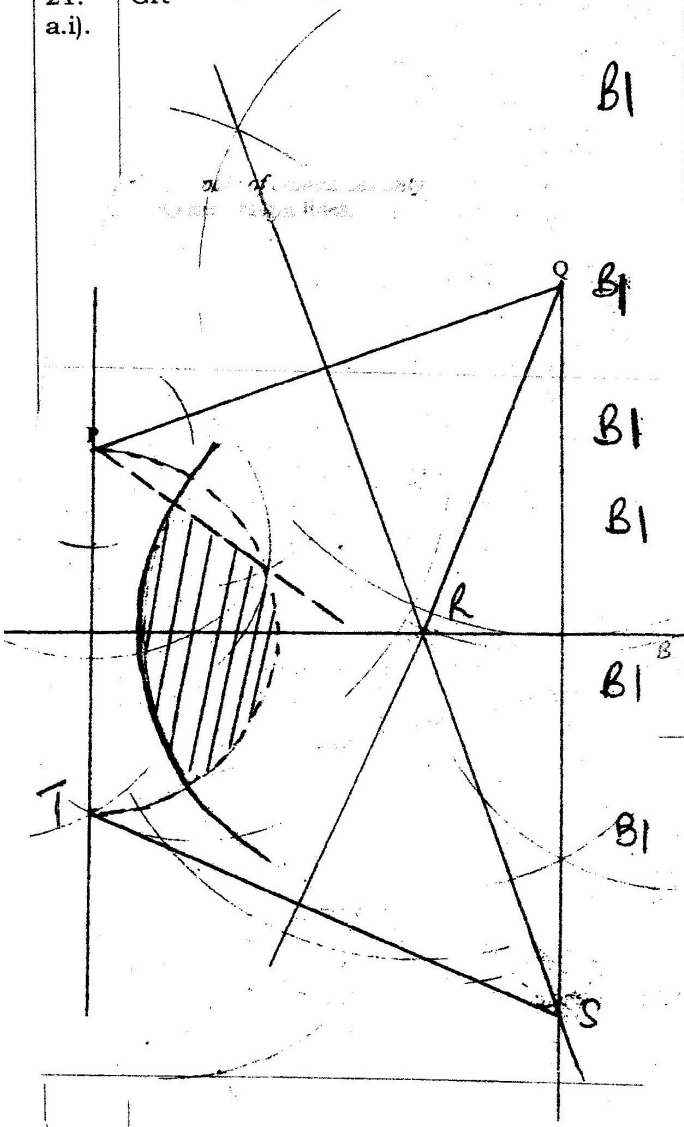
18. a).i)	$Y = \frac{k}{x^n}$	1 mark B1	
ii).	$K = yx^n$ $K = 12x2^n$ $K=3 \times 4^n$ $\Rightarrow 12 \times 2^n = 3x4^n$ $4x\ 2^n = 4^n$ $2^{n+2} = 2^{2n}$ $n+2 = 2n$ $n = 2$ $K=48$	7 marks B1 B1 M1 M1 M1 1A B1	All method $K = 12x(2^n)$ $K= 3x\ 4^n$ $k/12 = 2^n$ and $k/3 = (2^n)^2$ $k^2/144 = (2^n)^2$ $k/3 = k^2/144$ $48k=k^2$ $K^2-48k=0$ $K(k-48)=0$ $K=0$ or $k=48$
b).	$y = \frac{48}{(5^1/3)^2}$ $= \frac{48 \times 9}{16^2}$ $= 27/16$ $= 1\ 11/16$	2 marks M1 A1 Total 10	
19. a).		2 marks B1 B1	√ y for x = 30^0 √ y for x = 105^0

x	0°	15°	30°	45°	60°	75°	90°	105°	12°
Y=8sin 2x-6cos	-6	-1.8	1.7	3.8	3.9	2.4	0	-2.4	-3.9

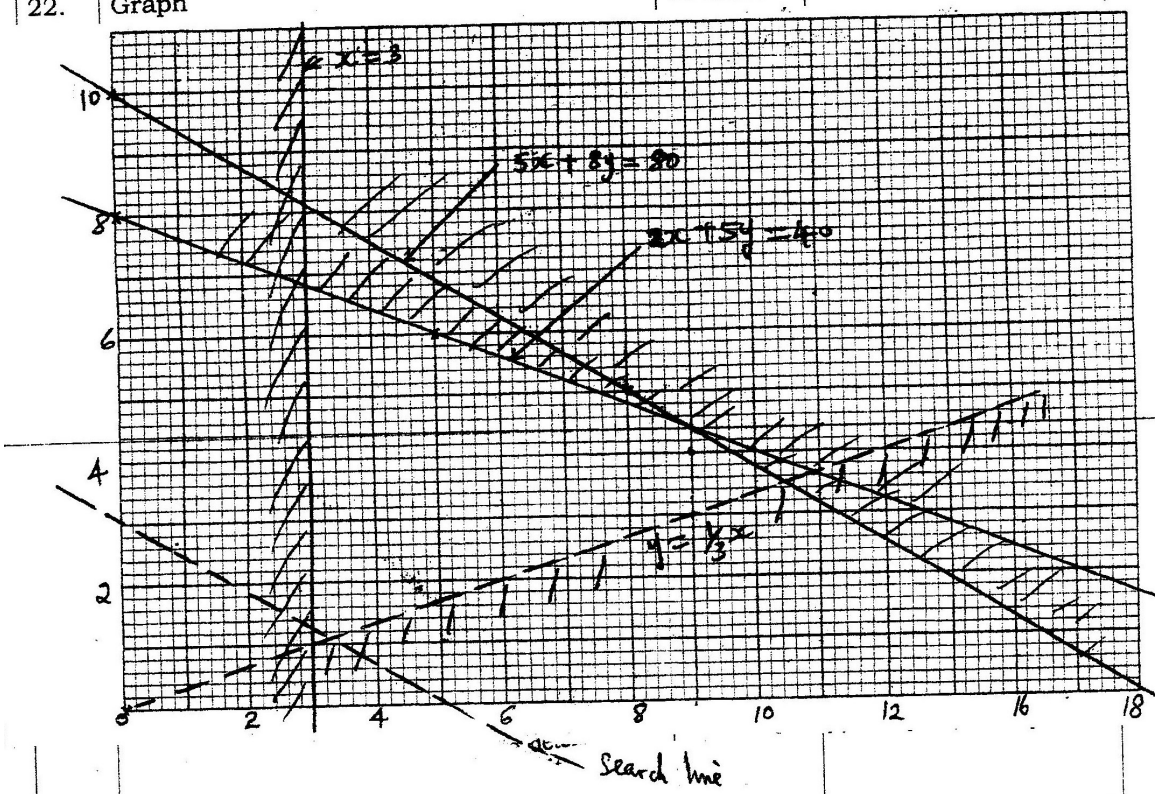
b). Graph



c).i)	$Y = 4.1 \pm 0.1$	1 mark B1	
ii).	$8\sin 2x - 6\cos x = 2$ $X = 31.5^0 \pm 0.75$ $X = 78^0 \pm 0.75$	B1 B1 B1 B1 10	
20. a). i).	$y = {}^2/_2x^2 + x + c$ at $x = -4$, $y = 6$ $6 = (-4)^2 - 4 + c$ $6 = 16 - 4 + c$ $C = -6$ $Y = x^2 + x - 6$	3 marks M1 M1 A1 3 marks	
ii).	$X^2 + x - 6 = 0$ $(x - 2)(x + 3) = 0$ $X = 2, x = -3$	M1 M1 A1	
b).	$\int_{-3}^{2}(x2 + x - 6)\,dx$ $= \left[x^3/_3 + x^2/_2 - 6x \right]_{-3}^{2}$ $= \left\{ 8/3 + 4/2 - 12 \right\} - \left\{ -27/_3 + 9/_2 + 18 \right\}$ $= -7^1/_3 - 13.5$ $= -20^5/_6$ Area = $20^5/_6$ square units	4 marks M1 M1 A1 B1 10	

21. a.i).	Gra  	B1 (i)	⊥bisector of PQ constructed and point R marked
		B1 (ii)	⊥ dropped from Q to AB or ∠PRB
		B1	transferred to ∠BRS
		B1	RS ⊥ form P to AB constructed
		1	PT=2 length of ⊥ and polygon completed
		B1	R from TS = 4.6 ±0.1
		4 marks	
		B1	Bisect of ∠QPT drawn dotted
		B1	Arc centre R with radius 4.5cm drawn
		B1	Semi circle with PT as diameter drawn dotted
		B1	correct region shaded

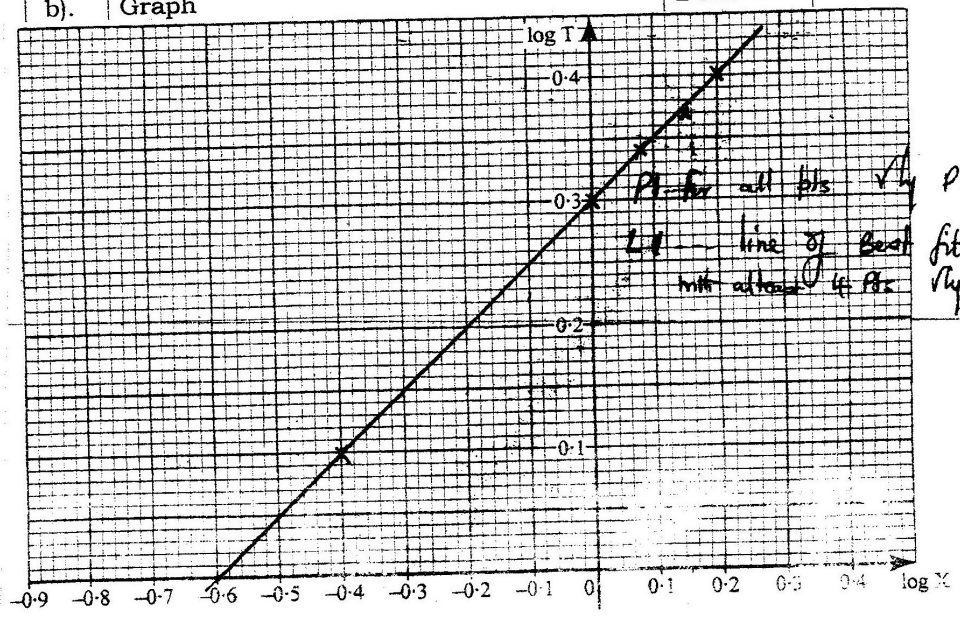
22. Graph — 10 marks



23.a) — 2 marks B2

Log x	-0.40	0.00	0.08	0.15	0.20
Log T	0.10	0.30	0.34	0.37	0.40

b). Graph — 2 marks



P1 — for all pts √ Plotted
L1 — line of best fit drawn with atleast 4 pts √ Plotted.

ii).	a = $\log^{-1}$ 0.3 = 2.00 b = graduent = $\frac{0.4 - 01}{0.1 - (-0.4)}$ or equivalent = 0.5	B1 M1 A1	
c).	Log T = blog x + log a O = 0.5log x + 0.3 Log x = $\frac{-0.3}{0.5}$ = 0.25	3 marks M1 M1 A1	
24.a)	P (RR) = $^4/_6$ X $^2/_5$ = $^8/_{30}$ P (YY) = $^2/_6$ X $^3/_5$ P (same colour) = $^8/_{30}$ + $^6/_{30}$ = $^7/_{15}$	4 marks M1 M1 M1 A1 4	
b).i)	P (R_AR_A) = $^4/_6$ X $^3/_5$ = $^2/_5$ P(R_BR_B) = $^2/_5$ X ¼ = $^1/_{10}$ P(R_AR_A) + P(R_BR_B) = $^2/_5$ + $^1/_{10}$ = ½	4 marks M1 M1 M1 A1	
ii).	P(all red) = $^2/_5$ x $^1/_{10}$ = $^1/_5$ x $^1/_5$ = $^1/_{25}$	M1 A1 10	