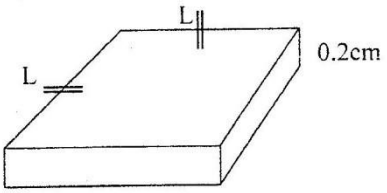
MATHEMATICS

PAPER 1 OCT/NOV. 2007 2½Hours

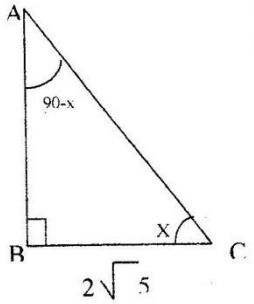
1.	$\frac{0.0084 \times 1.23 \times 3.5}{2.87 \times 0.056} = \frac{84 \times 123 \times 35 \times 10^{-7}}{28 \times 56 \quad 10^{-7}}$ $= 0.225$	M_1 A_1
2.	$3x^0 + (x-20)^0 = 180^0$ $M_{½}$ $4x^0 - 20 = 180^0$ $4x^0 = 160^0$ $X = 40^0$ Let n = no of sides $\frac{360^0}{n} = 40^0$ $40^0 n = 360^0$ $n = 9$	$M_{½}$ 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 $L = \sqrt{625} = 25$cm  	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

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

B_1 M_1 A_1

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

$= 77^0$

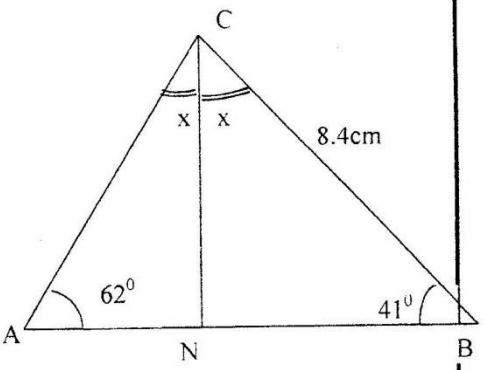
$\therefore x = \frac{77^0}{2} = 38.5^0$

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

$= 100.5^0$

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

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



M_1 A_1 M_1 A_1

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

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

x + 14 = 2y + 28

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

(x – 4) + (y - 4) = 30

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

(iii) – (ii) x + y = 38

\+ -x+ 2y=-14

3y = 24

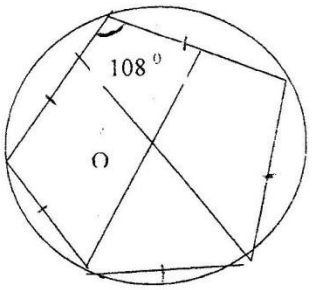
y = 8

x = 30

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

M_1 M_1 M_1 A_1

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

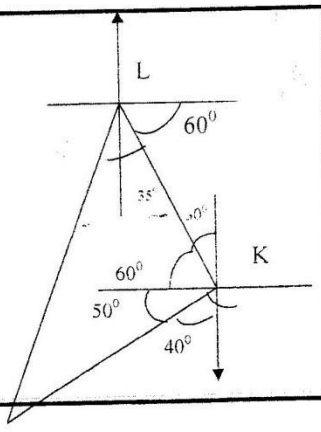
Area of Shaded region $= 2 \times 3.2935 + 15.559 = 22.15 cm^2$ A_1

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

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

M_1
B_1

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

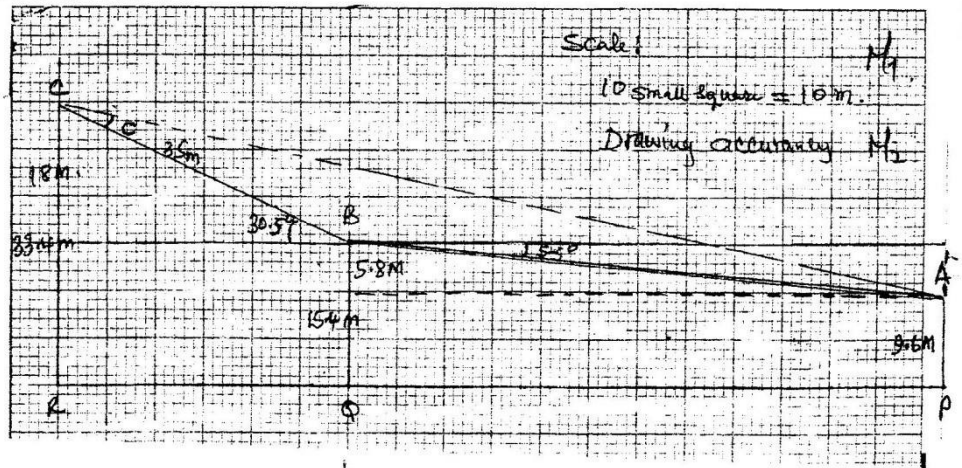


16. 2h 40min $= 2\frac{2}{3} = \frac{8}{3}h$ B_1

1 h = 120km
$\therefore \frac{8}{3}h = \frac{8}{3} \times 120 = 320km$ M_1

4Km cost = Kshs.59 $\therefore$ 320Km would cost $= \frac{320 \times 59}{4}$
$= \mathbf{Kshs.4,720}$ 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	= $\frac{110,000 \times 250,000}{275,000}$ = **Kshs.100,000**	M_2 A_1



18. a

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

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

(b(i). 60mm = 33.4m

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

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

$= 149.5^0$ M_1

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

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

$= 0.2988$ M_1

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

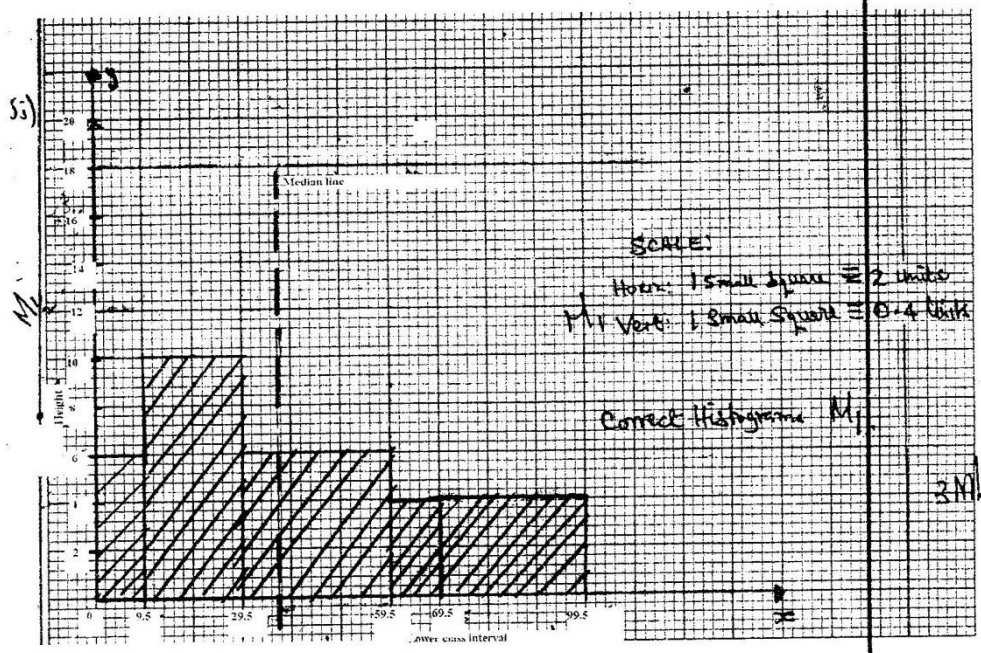
19.(i)

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

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

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

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

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

$X = 45$ 0r $x = -50$ He bought $45 + 5 = 50 = 50$ computers A_1

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

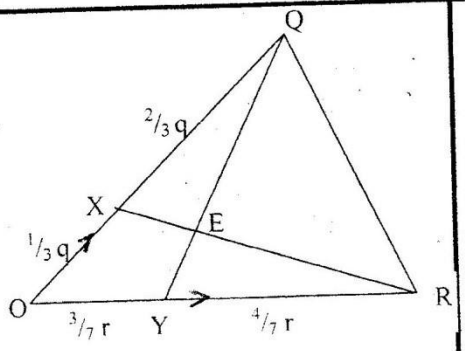
Total Profit = $\frac{215}{100} \times 1,800,000$ M_1

= Kshs.270,000 A_1

Profit per computer = $\frac{270,000}{48}$ = Kshs.5.625 A_1

21. (a)i) $XR = \underline{OX + OR}$ M_1

$r - {}^1/_3\,q$



(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).$OE = OX + XE$

$= {}^1/_3\,q + m\,(r - {}^1/_3 q)$ M_1

$= \frac{(1-m)}{3}\,q + mr$ 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

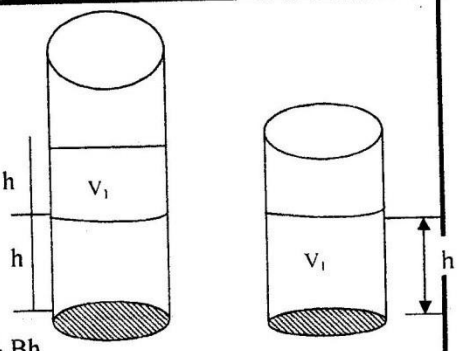
$(L.S.F.)^3 = (V.S.F.)$
$\therefore$ V.S.F. $= (1.5)^3 = 3.375$ — M_1

$\frac{0.945}{y} = 3.375$ — M_1

$\therefore y = \frac{0.945}{3.375} = 0.28$ Litres — 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 $= {}^3/_2 Bh$
$= {}^3/_2 \times 7.8B$ A
$= 11.7B$ 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

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:

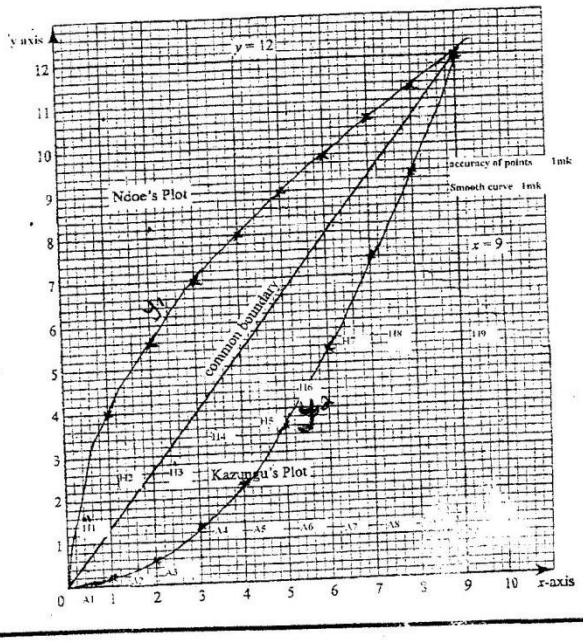
Bicycle $\frac{90}{100} \times 4,500 = 4050$ /= M_1

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

$$\begin{pmatrix} 36 & 28 \\ 32 & 24 \end{pmatrix}\begin{pmatrix} 4050 & 2244 \\ 4050 & 2244 \end{pmatrix} = \begin{pmatrix} 145800 + 1133.400 \\ 71.808 + 53.856) \end{pmatrix}$$ W_1

Total for Bicycles $\begin{pmatrix} 259,200 \\ 125,664 \end{pmatrix}$ A_1

24.



(bi). $A_1 = \frac{1}{2}(1 \times 0.2) + \frac{1}{2}(0.2 + 0.6)\,1 + \frac{1}{2}(0.6 + 1.3) + \frac{1}{2}(1.3 + 2.4) + \frac{1}{2}(2.4 + 3.7) + \frac{1}{2}(3.7 + 5.3) + \frac{1}{2}(5.3 + 7.3) + \frac{1}{2}(7.3 + 9.5) + \frac{1}{2}(9.5 + 12)$	M_1
$= \underline{36.3 \text{sq Units}}$	A_1
$A_2 = \left(\frac{1}{2} \times 4 \times 1\right) + \frac{1}{2}(4 + 5.7) + \frac{1}{2}(5.7 + 6.9) + \frac{1}{2}(6.9 + 8) + \frac{1}{2}(8+9) + \frac{1}{2}(9+ 9.8) + \frac{1}{2}(9.8 + 1.06) + \frac{1}{2}(10.6+ 11.3) + \frac{1}{2}(11.3 + 2)$	M_1
$= \underline{59.65 \text{ sq units}}$	M_1
Disputed land $= 59.65 - 36.3$	A_1
$= \underline{23.35 \text{sq units}}$	
(bii) $10.000\text{m}^2 = 1\text{hactare}$ 1 unit = 20m $\therefore 1 \times 1$ unit squared $= 20 \times 20\text{m}^2$	M_1
$= 400\text{m}^2$ Hence 23.35 unit squared $= 23.35 \times 400$	
$= \underline{9.340\text{m}^2}$	M_1
But $10.000\text{m}^2 = 1$ hactare	
$\therefore 9.340\text{m}^2 = \frac{9.340 \times 1}{10,000}$	
$= \underline{0.934 \text{ hactares}}$	A_1