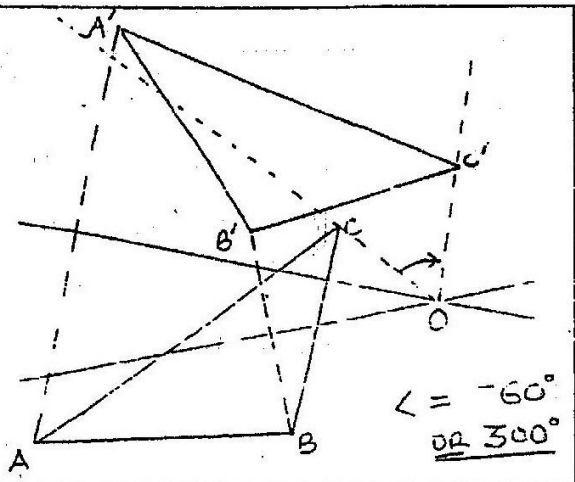
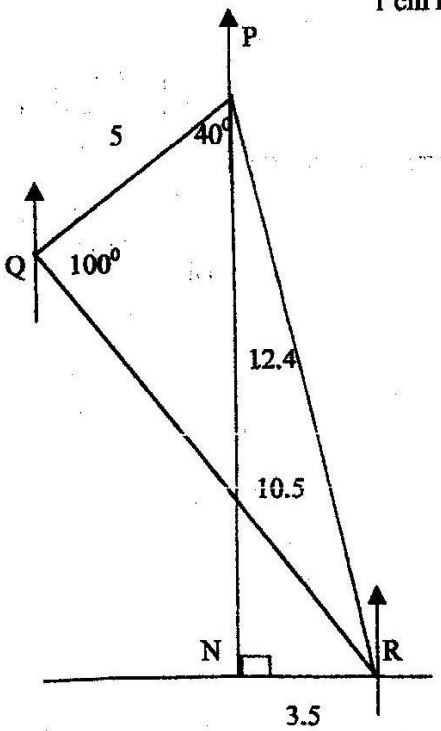
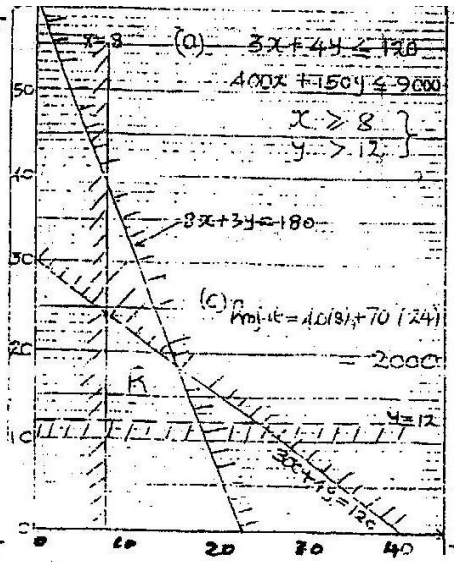
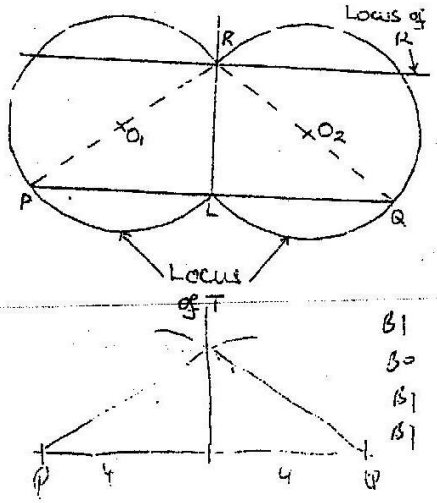
121/2 MATHEMATICS PAPER II KCSE 2003

1.	23.47 ⟶ 3.3705 0.4666 ⟶ $\bar{1}$ 6689 = 3.0394 $\sqrt[3]{0.0924}$ ⟶ $\frac{\bar{2}.9657}{3} = \frac{\bar{1}6552}{3.3842}$ 2.422×10^{3} ⟵ 2.422×10^{3} 0.423×10^{3} 2422^{3}	M_1 M_1 M_1 A_1 4 marks	All 3 logs $3\sqrt{tables}$ Attempt to add logs M_0 M_1 Attempt to divide by 3 & sin Accept standard form.
2	Selling price $= \frac{87}{100}\times800$ $=696$ Cost price $= \frac{100}{120}\times696$ $=580$	M_1 M_1 A_1 3	
3	a) Mode = 1 b) Mean $= \frac{0\times5+1\times6+2\times4+3\times3+4\times1+5\times1}{20}$ $=1.6$	B_1 M_1 A_1 3 marks	accept 32 20 or $1\frac{3}{5}$
4	Grade. AB $\frac{-4-8}{3-(-3)}$ $=-2$ through (3,40 $\frac{y-4}{x-3}=-2$ $y=-2x+10$	M_1 M_1 A_1 3 marks	$Y = -2x+C$ $4= -2(3)+C$ substitute $C=10$
5	Log (6x-2)-log 10= log (x-3) $\text{Log}\left(\frac{6x-2}{10}\right)=\log(x-3)$ $\frac{6x-2}{10}x-3$ 6x-2=10x-30 x=7	M_1 M_1 A_1 3 marks	for single logs on both s for dropping logs correctly
6	a) 72 km/h $= \frac{72\times1000\,m}{60\times605}$ $=20$m/s b) let l be length of train $\frac{l+80}{20}=15$ l=300-80 =220m	B_1 M_1 A_1 3 marks	let length of train & bridge be x $x \div 20=15$ $=300$ l=300-80

7		B_1 B_1 B_1 3 marks	for 1 mediator for 2nd mediator and centre labelled or equivalent
8	$\frac{dy}{dx} = 2 - 8x = 0$ $x = \frac{1}{4}$ $y = 6 + 2\left(\frac{1}{4}\right) - 4\left(\frac{1}{4}\right)^2$ $= 6\frac{1}{4}$ turning point $\left(\frac{1}{4}, 6\frac{1}{4}\right)$	M_1 M_1 A_1 3 marks	derivative equated to zero at least 1 term correctly differential
9	S.A. $= \frac{1}{2}(4\pi^2) + \pi r^2 75\pi$ $r^2 = \frac{75\pi}{3\pi} = 25$ $r = 5$ $V = \frac{1}{2}\left(\frac{4}{3}\pi \times 5^3\right)$ $= 88\frac{1}{3}\pi$	M_1 A_1 M_1 A_1 4 marks	S.A. of sphere MRE –5 R = 4.33 1 V = 108.3 Accept $\frac{250}{3}\pi 83.33\pi$
10	$A = \frac{1}{\sqrt{3}} \Rightarrow \sqrt{3}\, a = 1$ $\sqrt{3} - 6\sqrt{39} = 2\sqrt{3} - 6\sqrt{3}\sqrt{13}$ $= 2\left(\frac{1}{a}\right) - 6\left(\frac{1}{a}\right)b$ 2 $= \frac{2}{a} - \frac{6b}{a}$ $= \frac{2-6b}{a}$ or $\frac{2}{a}(1-3b)$	B_1 M_1 A_1 3 marks	$A = \frac{1}{\sqrt{3}} \Rightarrow a\sqrt{\frac{3}{3}}$ $\Rightarrow \sqrt{3} = 3a$ 2(3a) – 6 (3a)b =6a-18ab =6a(1-3b)
11	(a) $(8-x)^2 = 2^6 - 6.2^5 x + 15.2^4 x^2 -$ $20.2^3 x^3 + 15.2^2 x^4 - 6.2x^5 + x^6$ $= 64 - 192x + 240x^2 - 160x^3$ $+ 60x^4 - 12x^5 + x^6$ (b) $1.993 = (2 - \quad 1)^6$ $\approx$ [illegible] $92(0.01) + 240(0.0$ $\approx$ [illegible] $.92 + 0.24$ [illegible]	M_1 A_1 M_1 A_1 4 mar	coefficient and correct powers of x

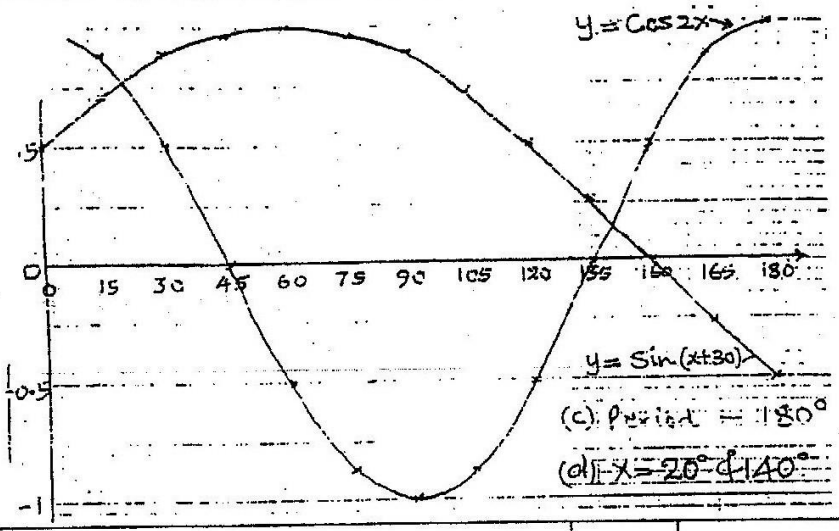
12	$x+y \leq 440$ $y \geq 120$ $x > 150$	B_1 B_1 B_1 3 marks	
13	Work done by $A = 3\frac{1}{2} \times \frac{1}{6}$ $= \frac{7}{2} \times \frac{1}{6} = \frac{7}{12}$ Remaining work $= 1 - \frac{1}{6} - \frac{7}{12}$ Time taken by B $= \frac{5}{12} \div \frac{1}{9}$ $= \frac{5}{12} \times \frac{9}{1} = \frac{45}{12}$ $3\frac{3}{4} hr$	M_1 M_1 A_1 3 marks	
14	A:W : M = 10:8:5 Amount shared $= \frac{23}{5} \times 10000$ $= 46000$ Atieno's extra $= \frac{2}{23} \times 46000$ $= 4000$	M_1 M_1 A_1 3 marks	or equivalent or equivalent
15	A=250, r=2, n=$\frac{16}{2}$+1=9 $T_9 = 250 \times 2^8$ $= 250 \times 256$ $= 64000$	B_1 M_1 A_1 3 marks	for a, r and n correct allow for T_8 M_1 M_0
	Days: 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 Insects: 250 | 500 | 1000 | 2000 | 4000 | 8000 | 16000 | 32000 | 4000	B_1 M_1 A_1	For 250 seen, evidence of doubling and nine terms. For consistent doubling for 64000
16	$S \alpha t + \sqrt{t} \Rightarrow S = kt + p\sqrt{t}$ $14 = 4k + p\sqrt{4}$ $27 = 9k + p\sqrt{9}$ $42 = 12k + 6p$ $54 = 18k + 6p$ $-12 = -6k$ $k = 2$ & $p = 3$ $S = 2t + 3\sqrt{t}$	M_1 M_1 A_1 B_1 4 marks	for 1 equation attempt to solve simultaneous equations
17	$\left.\begin{matrix} x+y=19 \\ -x+3y=9 \end{matrix}\right\} \Leftrightarrow \begin{pmatrix} 5 & 1 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 19 \\ 9 \end{pmatrix}$	B_1	
(a)	$inverse = \frac{1}{16}\begin{pmatrix} 3 & -1 \\ 1 & 5 \end{pmatrix}$ $\frac{1}{16}\begin{pmatrix} 3 & -3 \\ 1 & 5 \end{pmatrix}\begin{pmatrix} 5 & 1 \\ -1 & 3 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{16}\begin{pmatrix} 3 & -1 \\ 1 & 5 \end{pmatrix}\begin{pmatrix} 19 \\ 9 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{16}\begin{pmatrix} 48 \\ 64 \end{pmatrix}$ $x = 3$ *and* $y = 4$	B_1 M_1 M_1 A_1	
(b)	$\sqrt{(11-3)^2 + (-2-4)^2}$ $= \sqrt{64+36}$ $= 10cm$	M_1 M_1 A_1 8 marks	

18 a)	Cost of 1st brand per kg $= \frac{5\times140+3\times160}{8}$ $= 147.50$ $\%\ \text{profit} = \frac{180-147.50}{147.50}\times100\%$ $= 22.03\%$	M_1 M_1 A_1
b) (i)	$X:Y=5:3 \Rightarrow x=\frac{5}{3}y$ $Y:Z=2:5 \Rightarrow Z=\frac{5}{2}y$ $X:Y:Z=\frac{5}{3}Y:Y:\frac{5}{2}Y$ $= 10:6:15$	M_1 A_1
(ii)	Cost/kg $= \frac{10\times140+6\times160+15\times256}{31}$ $=$sh. 200 New price $= \frac{130}{100}\times200$ $=$sh. 260	M_1 M_1 A_1
19	1 cm rep 40km  $\text{Time} = \frac{496}{1.853\times40}$ $=$ 6.1 hr	B_1 B_1 B_1 B_1 M_1 A_1 8 m

20		B_1 B_1 B_1 L_1 L_1 L_1 M_1 A_1 8 marks	$8x+3y \leq 180$ accept if $x = 8$ given $3x + 4y \leq 120$ drawn & shade $8x + 3y \leq 180$ drawn & shade $x \geq 8$ and $y >$ drawn & shade accept if $x = 8$ drawn
21	$\frac{dy}{dx} = 3x^2 - 3 = 0$ $3(x^2 - 1) = 0$ $(x-1)(x+1) = 0$ $x = 1, y = 0$ & $x = -1, y = 4$ *Coordinates are* $(1,0)$ & $(-1\ 4)$ *for* $(1,0)$ $x < 1, \frac{dy}{dx}$ *is* $-$ $x > 1, \frac{dy}{dx}$ *is* $+$ $\Rightarrow (1, 0)$ *is a* min *imum* *for* $(-1\ 4)$ $x < -1, \frac{dy}{dx}$ *is* $+$ $x > -1, \frac{dy}{dx}$ *is* $-$ $\Rightarrow (-1, 4)$ *is a* max *imum*			
22			a perpendicular to PQ drawn a parallel line 3cm above PQ drawn perpendicular to PQ drawn at L R identified Locating centre 0_1 Major arc RPL drawn Locating centre 0_2 Major arc RQL drawn apply 0W-1 once if complete circles drawn.

23

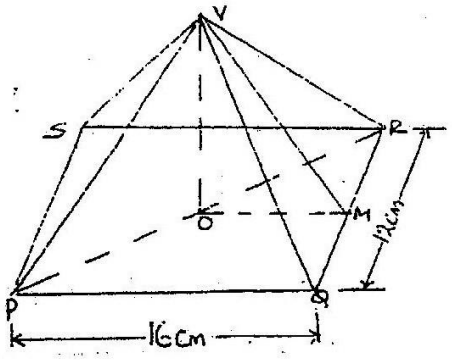
x	30	75	105	135	165
Cos x^0		0.87	0.97	0.97	
Sin $(x+30)^0$		0.97		0.26	-26



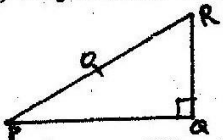
B_2 S_1 P_1 P_1 C_1 B_1 B_1

8 marks

24



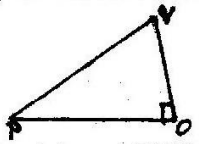
(a) Projection of VP on plane PQRS=PO



$$OP = \frac{1}{2}\sqrt{16^2+12^2}$$

$$\frac{1}{2}\sqrt{400} = 10\text{cm}$$ M_1

(b) < between VP and PQRS = <VPO

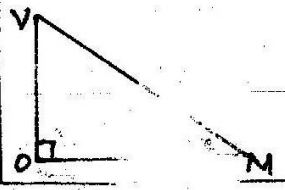


$$\text{Cos } Q = \frac{10}{13}$$

$$= 0.5556 \quad Q = 56^0\,15'$$

$$(56.25^0)$$

(c) < between VQR and PWRS = <VMO=α



$$VM = \sqrt{18^2-6^2}$$

$$= \sqrt{288} = 16.977$$

$$\cos x = \frac{1}{\quad} = 0.97$$

$$\alpha = 61^0\,52'$$

$$= (61.87^0)$$