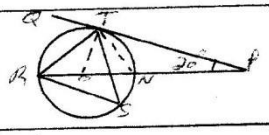
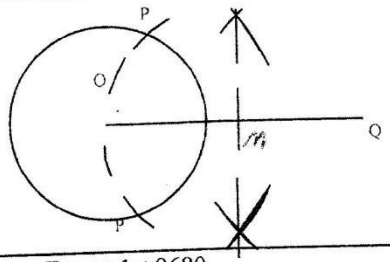
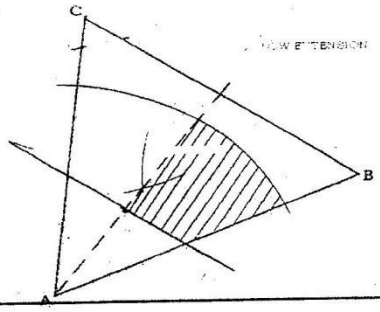
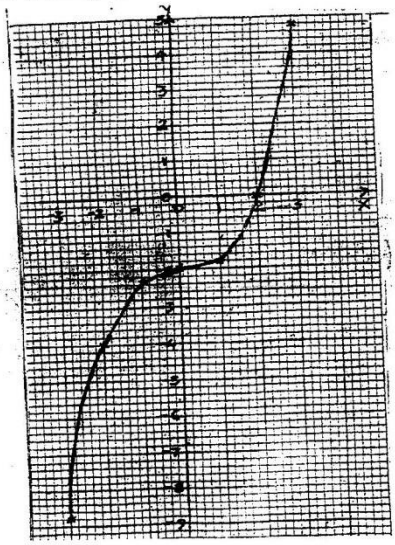
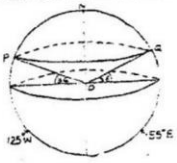
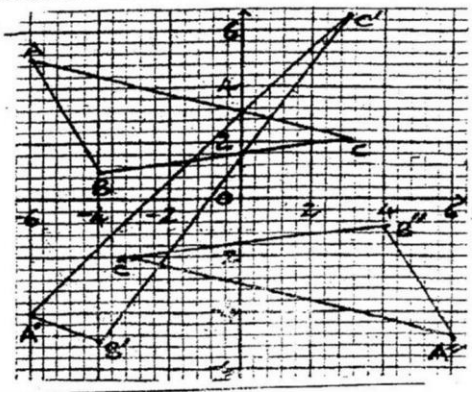
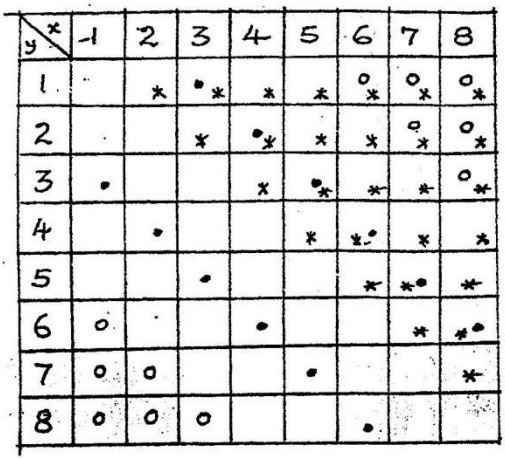
MATHS P2

1. No. → Log 36.72 → 1.5649 0.46^2 → 2($\bar{1}$.6628) = $\bar{1}$.3256 0.8905 185.4 → $\bar{2}$.2682 (4) 2.6223 $\frac{\bar{2}.6223}{3} = \frac{\bar{3}+1.6223}{3}$ 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. $P = r^2(1 - as^2)$ $s^2 = \frac{1}{a}(1 - \frac{p}{r^2})$ $s = \pm\sqrt{\frac{1}{a}(1 - \frac{p}{r^2})}$	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. $\bar{x} = \frac{9 + 11 + 12 + 13 + 11 + 10}{6}$ $(X-\bar{X})^2 = 4,0,1,4,0,1 \quad = 11$ $S^2 = \frac{4 + 0 + 1 + 4 + 0 + 1}{6}$ $1.6 = X = 10 \div 6 = 1\frac{2}{3}$	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. $t = k\sqrt{x}/\sqrt{y}$ $t_1 = k\sqrt{0.96x}/\sqrt{1.44y}$ $= 0.8t$ 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 = 30m/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(1,1½) matrix = $\begin{pmatrix} 1 & 0 \\ 1\frac{1}{2} & 1 \end{pmatrix}$ b)i) $\begin{pmatrix} -1 & 0 \\ 1\frac{1}{2} & -1 \end{pmatrix}$ $\begin{matrix} A1 & B1 & C1 \end{matrix}$ $\begin{pmatrix} -6 & -4 & 3 \\ -4 & -1 & -2 \end{pmatrix}$ $\begin{matrix} A11 & B11 & C11 \end{matrix}$ $= \begin{pmatrix} 6 & 4 & -3 \\ -5 & -1 & -2 \end{pmatrix}$ 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 = $^{60}/_{100} x 80$ = 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 $^{48}/_{120+30} x 100 = ^{48}/_{150} x 100$ =32 c) Alcohol volume in the mixture in litres = $5 x ^{32}/_{100} + 2 x ^{60}/_{100}$ =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 $^{40}/_{100} x 80 = 32$ litres new proportion of water = $\frac{32+x}{80+x}$ $^{32+x}/_{80+x} = ^{60}/_{100}$ x = 40 water volume in this mixture = $5 x ^{68}/_{100} + 2 x ^{40}/_{100}$ 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

2, 4, 8, 16

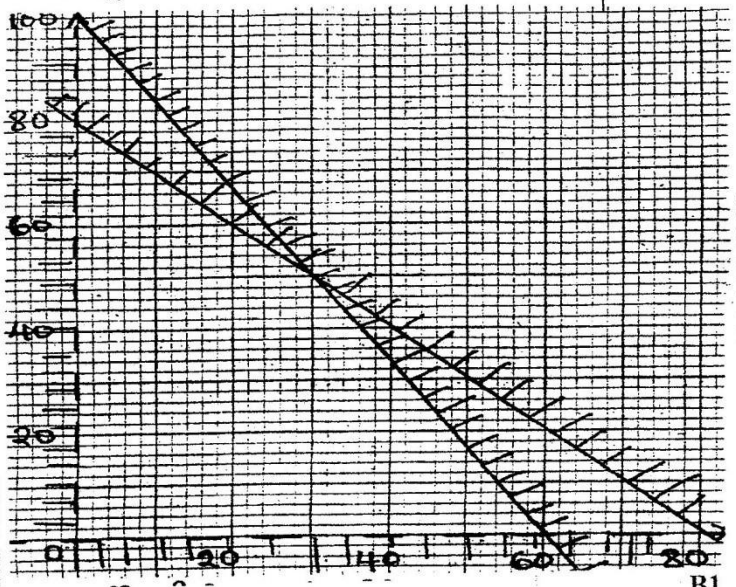
ii) The product $= 8 (1/2)^{50-1} \times 2 \times 2^{50-1} = 16$ — M1, A1 — 10

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 — 10

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

$= (4 \times 2 - 1/3 \times (-2)^3 - (4x - 4 - 1/3 (-4)^3$ — 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 $= 13^1/3 + [4x - 1/3 x^3]^0$

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

$= 13^1/3 + 5^1/3$

$= 18^2/3$ — 10