MATH MUSJET PP2 MARKING SCHEME.

1 $A = P(1-\frac{r}{100})^n$

$= 80000(1-\frac{15}{100})^2$ — M_1

$= \$51800$ — A_1

2a) $1(x)^8(y)^0 + 8(x)^7(y)^1 + 28(x)^6(y)^2 + 56(x)^5(y)^3 + 70(x)^4(y)^4 \ldots$ — M_1 for Substitution

$= x^8 + 8x^7y + 28x^6y^2 + 56x^5y^3 + 70x^4y^4$ — A_1

b) $(x+y)^8 = (1+0.2)^8$

$x = 1 \; ; \; y = 0.2$

$= 1^8 + 8(0.2) + 28(0.2)^2 + 56(0.2)^3 + 70(0.2)^4$ — M_1 For correct x and y.

$= 1 + 1.6 + 1.12 + 0.448 + 0.112$

$= 4.28$ — A_1

3. $\log\left(\frac{3x+4}{3-x}\right) = \log(10)$ — M_1 Logs on both sides

$= \frac{3x+4}{3-x} = \frac{10}{1}$ — M_1

$= 3x + 4 = 30 - 10x$

$13x = 26$

$x = 2$. — A_1

4 $\frac{dy}{dx} = 12x^2 + 2$ — M_1 Correct gradient function

at $x = 1$

gradient $= 14$

gradient of normal $= -\frac{1}{14}$

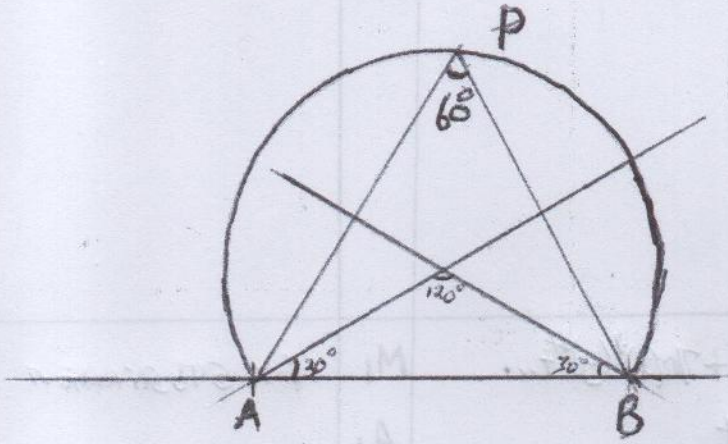
$\frac{y-4}{x-1} = -\frac{1}{14}$ — M_1 Equation to $-\frac{1}{14}$

$14y - 56 = -x + 1$

$\frac{14}{14}y = -\frac{x}{14} + \frac{57}{14}$

$y = -\frac{1}{14}x + 4\frac{1}{14}$ — A1

5



B1 for AB = 5cm.

B1 for centre.

B1 for Locus P.

6

$= \frac{2}{1-\frac{1}{\sqrt{2}}} \times \frac{(1+\frac{1}{\sqrt{2}})}{(1+\frac{1}{\sqrt{2}})}$ — M1

$= \frac{2+\frac{2}{\sqrt{2}}}{\frac{1}{2}}$ — M1

$= 4 + \frac{4}{\sqrt{2}}$

$= 4(1+\frac{1}{\sqrt{2}})$ — A1 C.A.O.

7

$\frac{0.05}{6} \times \frac{0.05}{3.5}$ — M1

$= 0.02261904 \times 100$ — M1

$= 2.261904\%$ — A1

8

$\frac{1-\cos^2\theta}{\cos^2\theta} = 1$ — M1 for attempt to remove square root.

$1 - \cos^2\theta = \cos^2\theta$

$2\cos^2\theta = 1$ — M1

$\cos^2\theta = 0.5$

$\cos\theta = 0.7071$ — A1

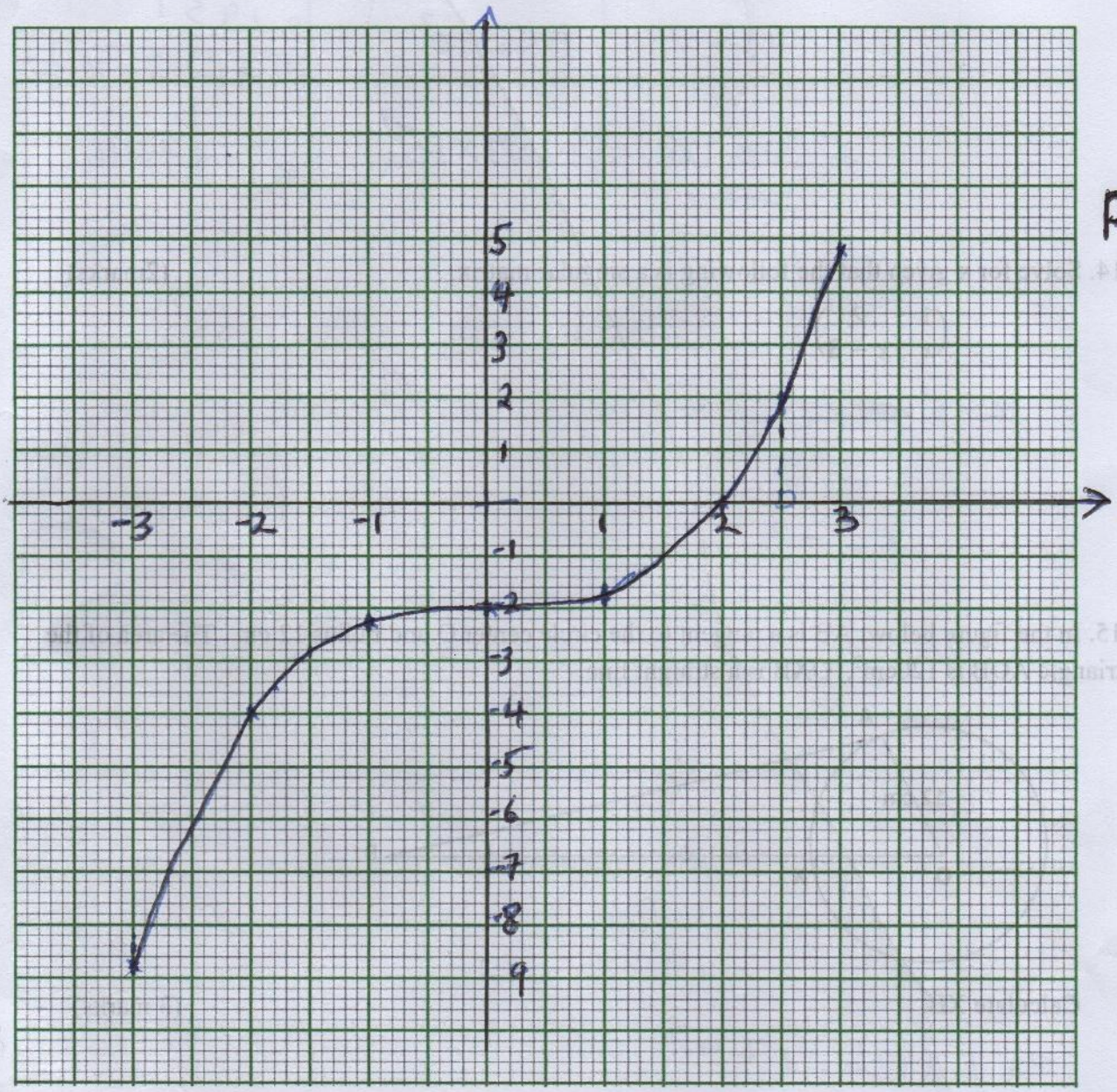
$\theta = 45°$

9	$Q^2 = \frac{T^2+1}{T^2}$	M_1	Attempt of removing root sing
	$= Q^2T^2 = T^2+1$	M_1	collecting like terms.
	$= Q^2T^2 - T^2 = 1$		
	$= T^2(Q^2-1) = 1$		
	$= T^2 = \frac{1}{(Q^2-1)}$		
	$= T = \pm\frac{1}{\sqrt{Q^2-1}}$	A_1	C.A.O.
10	$4x^2+4y^2 = 144$		
	$x^2+y^2 = 36$	M_1	Simplifying equation.
	$(x+0)^2+(y+0) = 36$	M_1	
	Centre $(0,0)$		
	$r^2 = 36$ units	A_1	correct Centre and radius.
	$r = 6$ units		
11 a)	$\frac{(3\times120)+(4\times90)+(5\times60)}{12}$	M_1	
	$= sh\ 85$	A_1	
b)	$B.P = 5\times85$		attempting to get
	$= sh\ 425$	M_1	for B.P
	$S.P = \frac{108}{100}\times 425$		
	$= sh\ 459$	A_1	for S.P

12. The table shows corresponding values of x and y for the curve $Y = \frac{1}{4}x^3 - 2$

X	-3	-2	-1	0	1	2	3
Y	-8.8	-4	-2.3	-2	-1.8	0	4.8

On the grid provided below, draw the graph of $Y = \frac{1}{4}x^3 - 2$ for $-3 \leq x \leq 3$. Use the graph to estimate the value of x when y =2 (3 marks)



P1
C1

x = 2.5 B1

13

No.	Sf	log
83·6	8.36×10^{1}	1·9222
0·00541	5.41×10^{-3}	$\bar{3}\cdot7332$ +
		$\bar{1}\cdot6554$
156	1.56×10^{2}	2·1931 −
		$\bar{3}\cdot4623\times\frac{1}{5}$
0·31078	3.1078×10^{-1}	$=\bar{1}\cdot49246$

M_1 For reading all logs correctly

M_1 correct Sum of logs

M_1 Correct Quotient

A_1 C.A.O

14

$x - 3 - 2x = 0$

$-x = 3$

$x = -3$

M_1 Equating det to zero

M_1 for simplification

A_1

15

$\frac{1}{2}\times12h = 120$

$AB = h = 20\,cm$

$\sqrt{H^2} = \sqrt{20^2+12^2}$

$OB = H = 23.32\,cm$

$XB = 23.32 - 12$

$= 11.3\,cm$

M_1 for $h\cdot(AB)$

M_1 for OB

A_1

16

$3x + 4y \leq 120$ — (i)

$400x + 150y \leq 900$

$8x + 3y \leq 18$ — (ii)

$x \geq 8$ — (iii)

$y > 12$ — (iv)

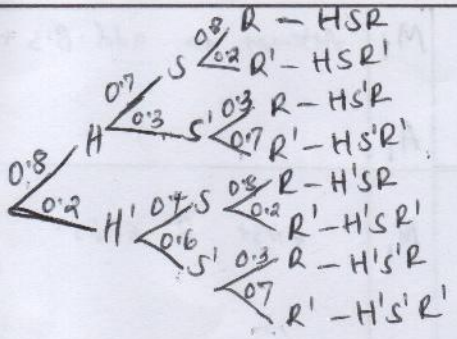
B_1

B_1

B_1

B_1

17a)



B_1 for tree diagram

B_1 for outcomes.

b) (i) $P(HS'R')$ or $P(H'S'R')$

~~$=(0.8\times0.3\times0.7)\ (0.8\times0.3\times0.3)\ (0.2\times0.4\times0.2)$~~

$=(0.8\times0.3\times0.7)+(0.2\times0.6\times0.7)$ M_1

$=0.252$ A_1

(ii) $(0.8\times0.7\times0.2)+(0.8\times0.3\times0.3)+(0.2\times0.4\times0.2)$ M_1

$=0.2$. A_1

(iii) $P(HS'R')$ M_1

$=0.8\times0.3\times0.7$

$=0.168$ A_1

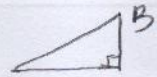
iv) $P(HSR)$ or $P(HSR')$ or $P(HS'R)$

$(0.8\times0.7\times0.8)+(0.8\times0.7\times0.2)+(0.8\times0.3\times0.3)$ M_1

$=0.632$ A_1

18 a	(i) 19200 + 12000 + 13000 + 2300 = sh 46500 = £ 2325	M_1 A_1	Attempt to add B.S + A.
	(ii) $\frac{8420}{20} \times 2 = 840$ $480 \times 3 = 1440$ $600 \times 4 = 2400$ $300 \times 5 = 1500$ $525 \times 6 = 3150$ Gross tax = sh 9300 Net tax = Sh. 8090	M_1 M_1 M_1 M_1 A_1	first 2 slabs Next 2 slabs Last slab Gross tax Net tax.
	b) Total deductions = 8090 + 230 + 100 + 4000 + 1200 = sh 13620 Net salary = 46500 − 13620 Net salary = 32880	M_1 M_1 A_1	Adding deductions Subtracting T.I and T.deduc. C.A.D
19	$P \propto \frac{V}{\sqrt{R}}$		
(a)	$P = \frac{kV}{\sqrt{R}}$ $180 = \frac{9k}{5}$ $k = 100$ $P = \frac{100V}{\sqrt{R}}$ $P = \frac{100 \times 6}{\sqrt{26}}$ $= 117.6697$ $P = 118$	 M_1 M_1 A_1	 for formular with value K C.A.D

b)	$360 = \frac{100 \times V}{\sqrt{0.64}}$ $360 = \frac{100V}{0.8}$ $V = 2.88$	M_1 M_1 A_1	Substitution Attempting to solve C.A.O
c	Before $100 \rightarrow \frac{10000}{10}$ $100 \rightarrow 1000$ After $\frac{100 \times 116}{\sqrt{75}}$ $= 1339.45$ $100\% \Rightarrow 1000$ $? \Leftarrow 1339.45$ $\frac{1339.45 \times 100}{1000}$ $= 133.95$ Percentage change $= 33.95\%$	M_1 M_1 M_1 A_1	New percentage Change in percentage (atleast 2 d.p)

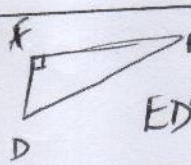
20 a) 

$\sin 25 = \frac{BE}{12}$ M1

$BE = 5.07\,cm$ A1

b) $\tan 25 = \frac{5.07}{CE}$ M1

$CE = 10.88\,cm$ A1

c 

$ED^2 = 16^2 + 10.88^2$ M1

$ED = 19.35\,cm$

$DB^2 = 19.35^2 + 5.07^2$ M1

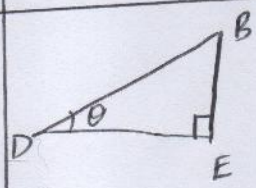
$DB = 20.03\,cm$

$FB^2 = 16^2 + 5.07^2$ M1

$FB = 16.78$

$\tan\theta = \frac{10.88}{16.78}$ A1

$\theta = 32.95^\circ$

d) 

$\tan\theta = \frac{5.07}{19.35}$ M1

$\theta = 14.68$ A1

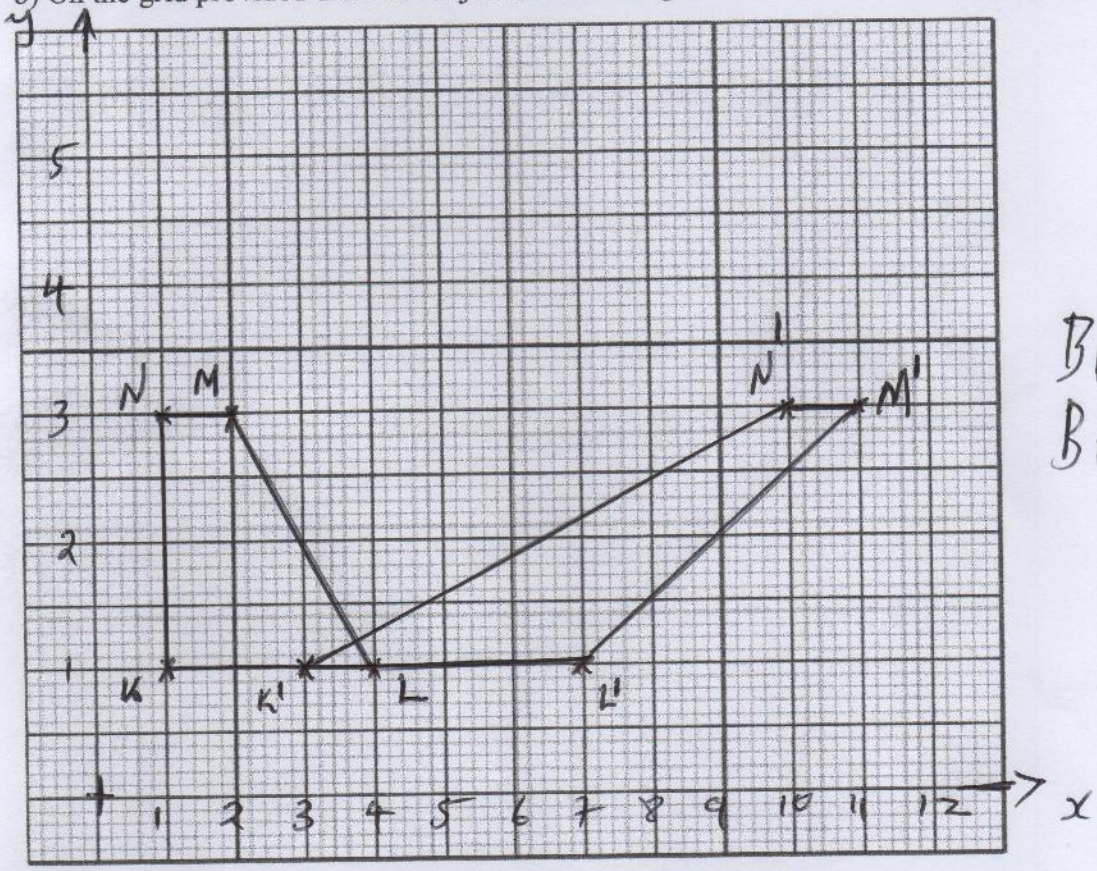
21. A quadrilateral with vertices at K (1,1), L(4,1), M(2, 3) and N (1, 3) is transformed by a matrix T = $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ to a quadrilateral K'L'M'N'

a) Determine the coordinates of the image (3marks)

$\begin{pmatrix} 1 & 3 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} K & L & M & N \\ 1 & 4 & 2 & 1 \\ 1 & 1 & 3 & 3 \end{pmatrix} = \begin{pmatrix} K' & L' & M' & N' \\ 3 & 7 & 11 & 10 \\ 1 & 1 & 3 & 3 \end{pmatrix}$ M_1

$K'(3,1)$ $L'(7,1)$, $M'(11,3)$, $N'(10,3)$ A_1

b) On the grid provided draw the object and the image (2marks)



B_1 - object
B_1 - image

i) Describe fully the transformation which maps KLMN onto K'L'M'N (2marks)

Its a shear, x-axis invariant B_1
K(1,1) mapped onto K'(3,1) B_1

ii) Determine the area scale factor of the image and its object. (1mark)

1 B_1

iii) Find a matrix which maps K'L'M'N' onto KLMN (2marks)

$-\frac{1}{3}\begin{pmatrix} 1 & -3 \\ 0 & 1 \end{pmatrix} = M_1$

$= \begin{pmatrix} -\frac{1}{3} & 1 \\ 0 & -\frac{1}{3} \end{pmatrix}$ A_1

22. a) $140^\circ + 39^\circ = 179^\circ$ — M_1

$60 \times 179 \cos 61^\circ$ — M_1

$= 52 \cdot 06 \cdot 86$ nm — A_1

b) $180 - (61 \times 2) = 58^\circ$ — M_1

$\frac{58}{360} \times \frac{22}{7} \times 2 \times 6370$ — M_1

$= 6450 \cdot 89$ km — A_1

c. $\frac{\alpha}{360} \times 2 \times \frac{22}{7} \times 6370 \cos 61^\circ = 430$ — M_1

$\frac{53.92^\circ \alpha}{53.92} = \frac{430}{53.92}$

$\alpha = 7.97^\circ$ — M_1

Position D $= 39 + 7.97$ — M_1

$= 46.97^\circ W$ — A_1

23

Class	M.P (x)	$d = x - A$	f	fd	d^2	fd^2
45-49	47	-15	3	-45	225	675
50-54	52	-10	9	-90	100	900
55-59	57	-5	13	-65	25	325
60-64	62	0	15	0	0	0
65-69	67	5	5	25	25	125
70-74	72	10	4	40	100	400
75-79	77	15	1	15	225	225
			$\Sigma f = 50$	$\Sigma fd = -120$		$\Sigma fd^2 = 2650$

a)

B_1 for x column

B_1 for d column

B_1 for fd column

$$\bar{x} = \frac{\Sigma fd}{\Sigma f} + A$$

M_1

$$= \frac{-120}{50} + 62$$

A_1

$$= 59.6 \text{ marks}$$

$$Var = \frac{\Sigma fd^2}{\Sigma f} - \left(\frac{\Sigma fd}{\Sigma f}\right)^2$$

$$= \frac{2650}{50} - \left(\frac{-120}{50}\right)^2$$

M_1

M_1

$$= 53 - 5.76$$

$$= 47.24 \text{ marks}$$

A_1

c

$$Sd = \sqrt{Var}$$

$$= \sqrt{47.24}$$

M_1

$$= 6.873 \text{ marks}$$

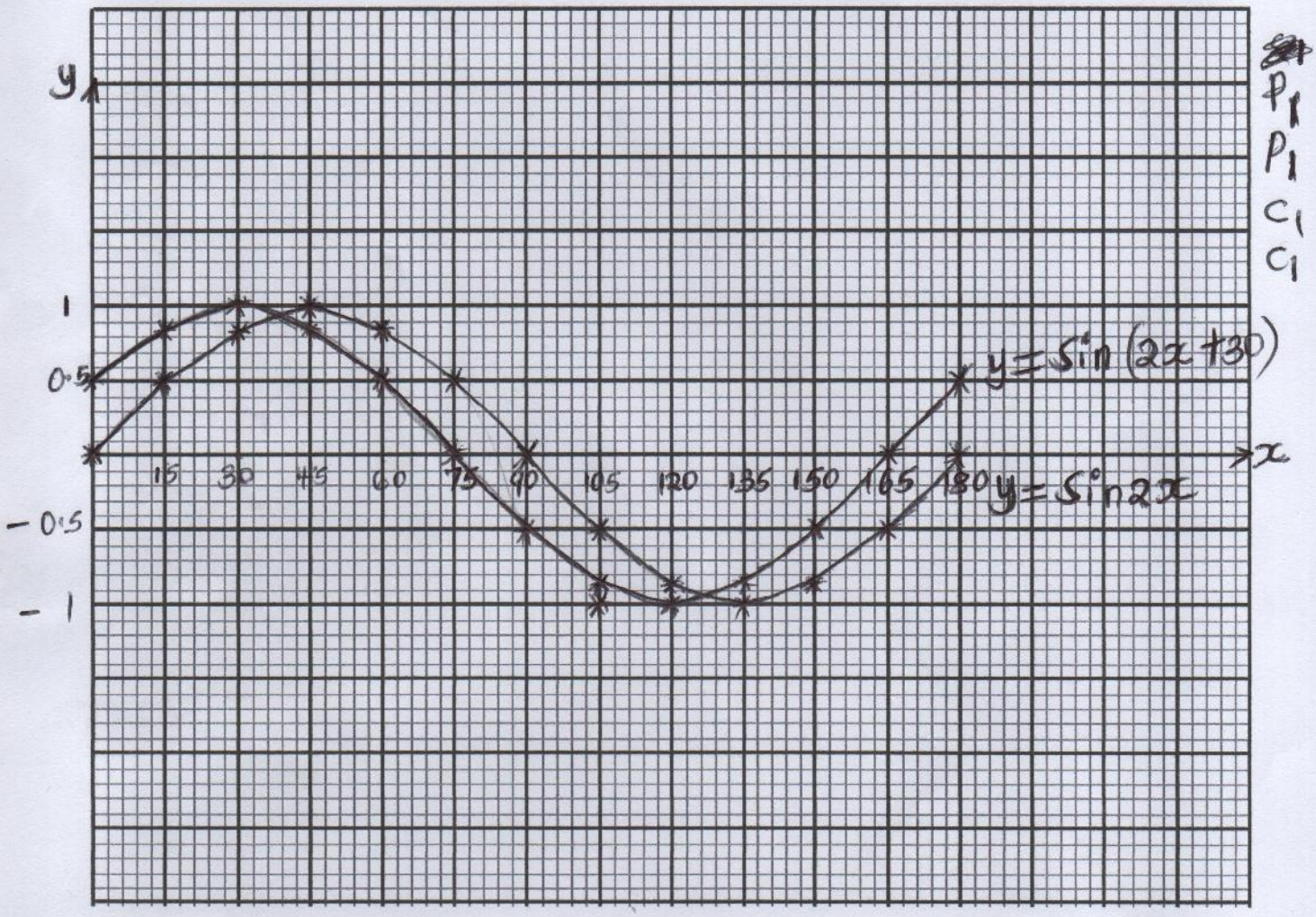
A_1

24. a) Complete the table below for y=sin 2x and y=sin (2x + 30) giving values to 2d.p (2 marks)

X	0	15	30	45	60	75	90	105	120	135	150	165	180
Sin 2x	0	0·5	0·87	1	0.87	0·5	0	-0·5	-0.87	-1	-0·87	-0·5	0
Sin (2x + 30)	0.5	0·87	1	0·87	0.5	0	-0·5	-0·87	-1	-0·87	-0·5	0	0.5

B1 B1

b).On the same axes,draw the curves (4marks)



P1 P1 C1 C1

c) Use the graph to solve $\sin(2x + 30) - \sin 2x = 0$ (2 mark)

$\sin(2x + 30) = \sin 2x$

$x = 36^\circ, 126^\circ$

M1 A1

d) State the period and amplitude of $y = \sin(2x + 30)$ (2 marks)

Period 180°

Amplitude = 1 unit

B1 B1