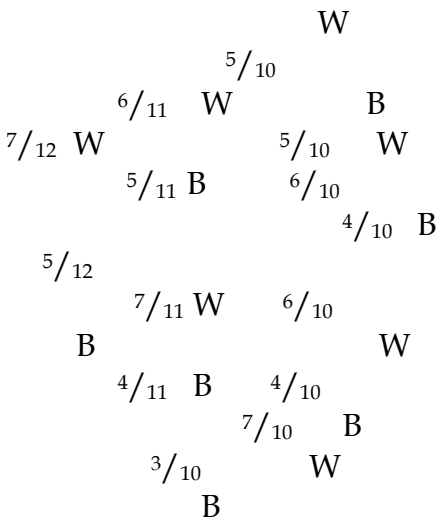
MATHEMATICS P2 MARKING SCHEME 2021

1.	$\frac{(\sqrt{2}+\sqrt{3})(\sqrt{6}+\sqrt{3})}{(\sqrt{6}-\sqrt{3})(\sqrt{6}+\sqrt{3})}$ $\frac{\sqrt{12}+\sqrt{6}+\sqrt{18}+3}{6-3}$ $\frac{2\sqrt{3}+\sqrt{6}+3\sqrt{2}+3}{3}$	M_1 M_1 A_1
2.	$3(2x-1) = 8x-1$ $6x-3 = 8x-1$ $-2x = 2$ $x = -1$	M_1 A_1
3.	$A = P\left(1+\frac{r}{100}\right)^n$ $= 200{,}000\left(1+\frac{7}{100}\right)^4$ $= 200{,}000\ (1.3107960)$ $=$ Sh. 262159.20 I = 262159.20 – 200000 = Sh.62,159	 M_1 A_1 B_1
4.	12^{th} term $= ar^{11}$ 10^{th} term $= ar^9$ $\frac{ar^{11}}{ar^9} = \frac{9}{1}$ $r^{11-9} = 9$ $r^2 = 9$ $r = \pm 3$ r = 3 or -3	 M_1 A_1
5. ii.	$(2 - \frac{1}{4}x)^5 = 2^5 + (2^4)(5)(-\frac{1}{4}x)^2 +$ $10(2^2)(-\frac{1}{4}x)^3 + 5(2)(-\frac{1}{4}x)4 + (-\frac{1}{4}x)^5$ $=32 - 20x + 5x^2 - \frac{5}{8}x^3 + \frac{5}{128}x^4 - \frac{1}{1024}x^5$ $1.96^5 = 32 - 20(0.16) + 5(0.16)^2 - \frac{5}{8}(0.16)^3 + \frac{5}{128}(0.16)^4 - \frac{1}{1024}(0.16)^5$ $=28.925$	 B_1 M_1 A_1
6.	a) QW x QX = QY x QZ 11 x 6 = 4(a+4)	 M_1

	$4a + 16 = 66$ $4a = 50$ $a = 25$ b) $QS^2 = QY \times QZ$ $= 4(4+12.5)$ $QS = \sqrt{66}$ $= 8.124$	 A_1 M_1 A_1
7.	$x(x-1) - 3x(x+1) = 0$ $x^2 - x - 3x^2 - 3x = 0$ $-2x^2 - 4x = 0$ $-2x(x + 2) = 0$ $x = 0$ or $x = -2$	 M_1 M_1 A_1
8.	x f cf 45 – 50 2 2 51 – 56 10 12 57 – 62 11 23 63 – 68 20 33 69 – 74 6 39 75 – 80 1 40 ¼ x 50 =12.5th = $56.5 + \frac{12.5 - 12}{11} 6$ = 56.77kg ¾ x 50 = 37th ; $62.5 + \frac{37.5 - 23}{20} 6$ = 66.85kg Quartile deviation = ½ (66.85 – 56.77) = 5.04	B_1 B1 A1
9.	$P = \frac{KQ^3}{\sqrt{R}}$ $P_1 = \frac{K(1.2Q)^3}{\sqrt{0.64R}}$ $= \frac{1.728KQ^3}{0.8\sqrt{R}}$ $= 2.16\frac{KQ^3}{\sqrt{3}}$ $\frac{2.16 - 1}{1} \times 100$	 M_1 M_1

	= 116%	A_1
10.	Let cos x be y $8y^2 - 2y - 1 = 0$ 4y + 1) (2y – 1) = 0 y = - ¼ or ½ cos x = ¼ => x = 75.52 angle in 2nd and 3rd quadrant . : . x = 104.48, 255.52 Cosx = ½ => x = 60^0 Angle in 1st and 4th quadrant. x = 60^0, 300^0 .:. x = 104.48, 255.52^0, 60^0 300^0	 M_1 A_1 B_1
11.	$A^2 = \frac{3+2\chi}{5-4\chi}$ $A^2 (5 - 4\chi) = 3 + 2\chi$ $5A^2 - 4A^2\chi = 3 + 2\chi$ $5A^2 - 3 = 2\chi + 4A^2\chi$ $5A^2 - 3 = \chi(2 + 4A^2)$ $\chi = \frac{5A^2 - 3}{4A^2 + 2}$	
12.	$AB = \begin{pmatrix} -2 \\ -1 \\ 2 \end{pmatrix} - \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ 2 \\ -2 \end{pmatrix}$ $/AB/ = \sqrt{16+4+4}$ $= \sqrt{24}$ $/AB/ = 4.90$	M1 M1 A1
13.	$x^2-6x+9+y^2-10y+25 = -30+9+25$ $(x-3)^2+(y-5)^2=4$ R=2 C (3,5)	**B1** **B1** **B1**

14.	$\begin{pmatrix}3 & 1\\ 2 & 4\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}3x+y\\ 2x+4y\end{pmatrix}+\begin{pmatrix}-4\\ 3\end{pmatrix}=\begin{pmatrix}13\\ 13\end{pmatrix}$ 3x+y=17 2x+4y=10 X=5.8 Y=-0.4 (-0.4,5.8)	
15.		M1 M1 A1
16.		B1 M1 A1
17.	a) Taxable income = 21,000 + 9000 p.a = sh. 30,000 $\frac{30000 \times 12}{12}$ = K£ 18,000 p.a 2 x 3900 = 7,800 3 x 3900 = 11,700 4 x 3900 = 15,600 5 x 3900 = 19,500 7 x 2400 = 16,800 71,400 $^{15}/_{100}$ x 2000 = 300 Total relief p.a = (300 + 1056) 12 = sh. 16,272 Tax paid 71400 – 16272 = sh. 55, 128 P.A.Y.E $\frac{55128}{12}$ = sh 4594 b) Total deductions = 4594 +2000 + 2000 + 2500 = sh. 11,094 per month Net salary = 30,000 – 11,094 = sh. 18,906	 B_1 B_1 B_1 B_1 B_1 B_1 B_1 M_1 M_1 A_1

18.	i) $^{7}/_{200}$ x 50 + $^{19}/_{400}$ x 30	M1
	1.75 + 1.425	M1
	= 3.175	A1
	ii) $\frac{3.175}{80}$ x 100	M1
	= 3.96875%	A1
	iii) let the masses be x	
	$\frac{^{19}/_{400}\ x + ^{7}/_{200}\ (50 - x)}{50}$ 100 = 4	M1
	$\frac{1.25\ x + 1.75}{50}$ 100 = 4	M1
	1.25 x + 175 = 200 1.25x = 25	M1
	x = $\frac{25}{1.25}$	
	x = 20	A1
	x > 20	B1
19.		
	b) i) ($^{7}/_{12}$ x $^{6}/_{11}$ x $^{5}/_{10}$) + ($^{7}/_{12}$ x $^{5}/_{11}$ x $^{6}/_{10}$) + ($^{5}/_{12}$ x $^{7}/_{11}$ x $^{6}/_{10}$)	M_1
	= $^{21}/_{44}$	A_1

ii) $(^7/_{12} \times ^5/_{11} \times ^4/_{10}) + (^5/_{12} \times ^7/_{11} \times ^4/_{10}) + (^5/_{12} \times ^4/_{11} \times ^7/_{10})$ M_1

$= ^7/_{22}$ A_1

iii) $(^5/_{12} \times ^4/_{11} \times ^7/_{10}) + (^5/_{12} \times ^7/_{11} \times ^4/_{10}) + (^7/_{12} \times ^5/_{11} \times ^4/_{10}) + (^5/_{12} \times ^7/_{11} \times ^6/_{10}) + (^7/_{12} \times ^5/_{10} \times ^6/_{10}) + (^7/_{12} \times ^6/_{11} \times ^5/_{10}) + (^7/_{12} \times ^6/_{11} \times ^5/_{10})$ M_1

$= ^{427}/_{440}$ A_1

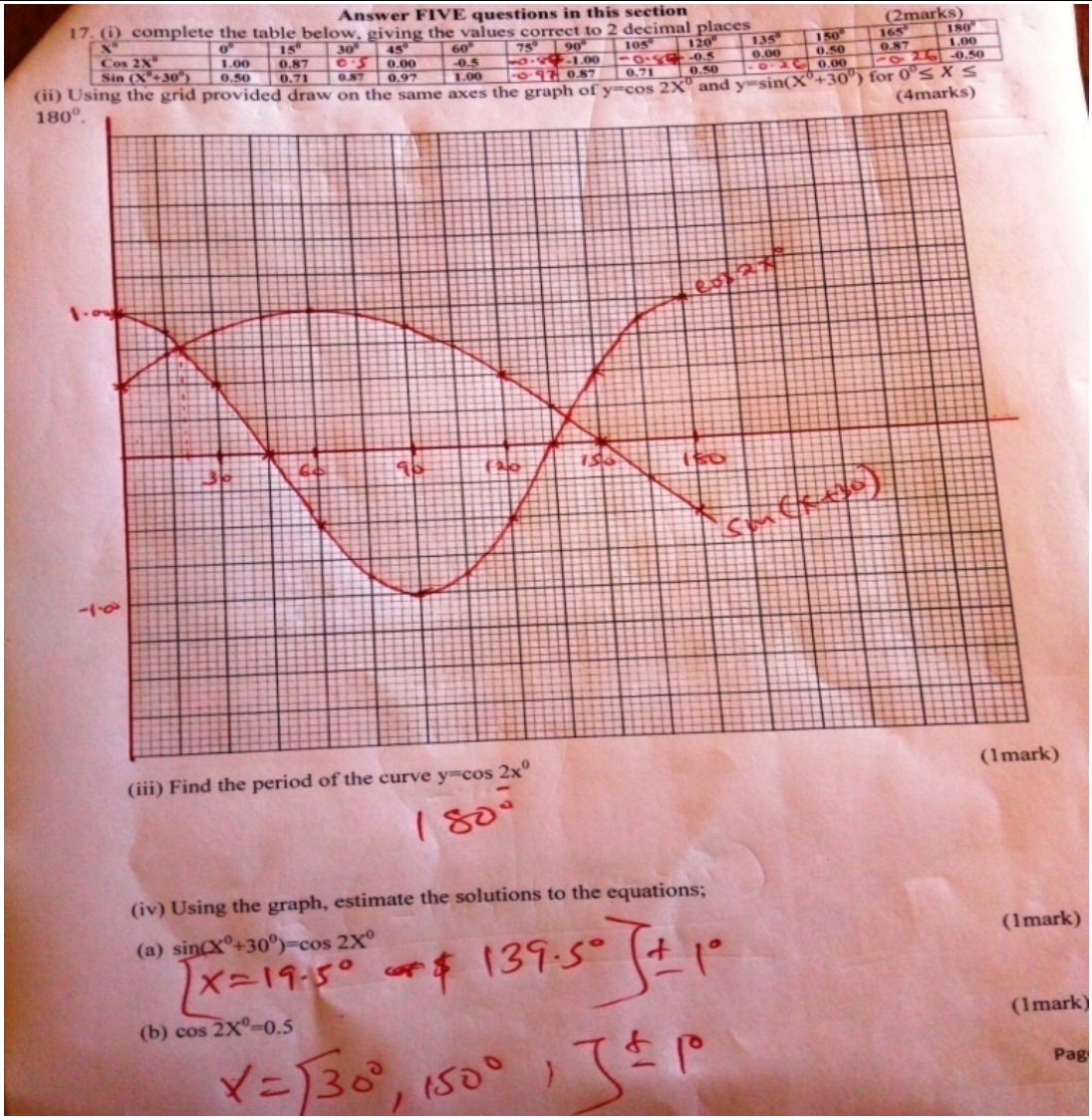
20.

Answer FIVE questions in this section

17. (i) complete the table below, giving the values correct to 2 decimal places (2marks)

X^0	0^0	15^0	30^0	45^0	60^0	75^0	90^0	105^0	120^0	135^0	150^0	165^0	180^0
Cos $2X^0$	1.00	0.87	0.5	0.00	-0.5	-0.98	-1.00	-0.98	-0.5	0.00	0.50	0.87	1.00
Sin (X^0+30^0)	0.50	0.71	0.87	0.97	1.00	0.97	0.87	0.71	0.50	0.26	0.00	-0.26	-0.50

(ii) Using the grid provided draw on the same axes the graph of $y=\cos 2X^0$ and $y=\sin(X^0+30^0)$ for $0^0 \leq X \leq 180^0$. (4marks)



(iii) Find the period of the curve $y=\cos 2x^0$ (1mark)

180^0

(iv) Using the graph, estimate the solutions to the equations;

(a) $\sin(X^0+30^0)=\cos 2X^0$ (1mark)

$X = 19.5^0$ or 139.5^0 $\pm 1^0$

(b) $\cos 2X^0=0.5$ (1mark)

$X = 30^0, 150^0$ $\pm 1^0$

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T2 P1 C1 P1 C1 B1 **B1** **B1** **B1**

21.

Class	Mid point X	f	t =	ft	t^2	ft^2
15-19	17	6	-5	-30	25	150
20-24	22	10	-4	-40	16	160
25-29	27	9	-3	-27	9	81
30-34	32	5	-2	-10	4	20
35-39	37	7	-1	-7	1	7
40-44	42	11	0	0	0	0

45-49	47	15	1	15	1	15
50-54	52	13	2	26	4	52
55-59	57	8	3	24	9	72
60-64	62	7	4	28	16	112
65-69	67	5	5	25	25	125
70-74	74	4	6	24	36	144
			f = 100	ft = 28		$ft^2 = 873$

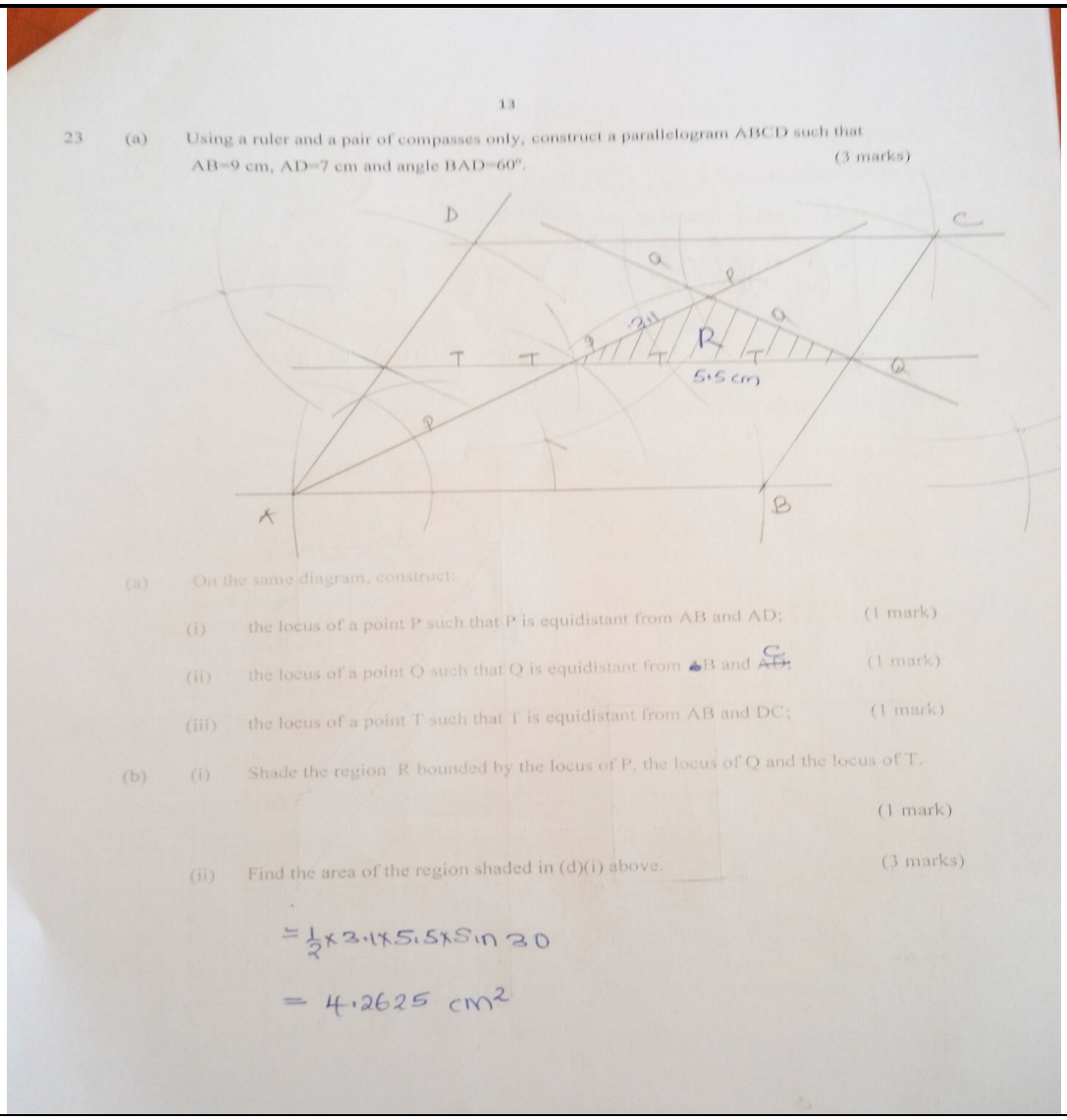
a) (i) x = 42 + = 43.4

(ii) - = 0.7856

(b) x

= 12.31

22.



23. + =

A+4b = 7 …….(i) x 4

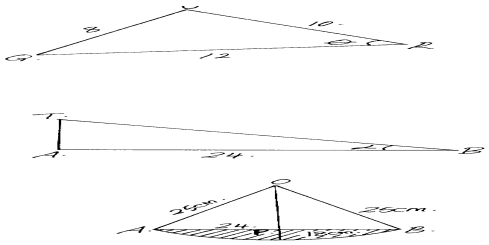
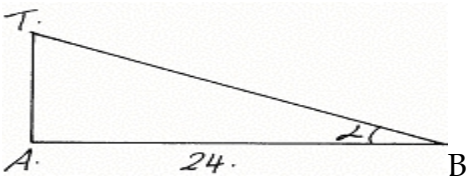
4a + 16b ……..10 (ii)

4a + 16b = 28

b = 1

M1

M1

	a = 9-4 = 3 c+4d =4 ……. (iii) x 4 4c – 2d = 16 ……..(iv) 4c + 16d = 16 d =0 c =4 = ii. = = **B¹ (-6 ,-8)** b) **A¹ B¹ C¹ A¹¹ B¹¹ C¹¹** **=** **A¹¹ (10,7) B¹¹ (-4,-6) C¹¹ (4,10)** **=**	M1 A1 M1 A1 M1 A1 M1A1
		10
24.	a)  Required angle is θ $82=102+12^2-2x10x12\cos\theta$ $64=244-240\cos\theta$ $-180=-240\cos\theta$ $\cos\theta = \frac{180}{240}$ $\theta = \cos^{-1}\frac{180}{240} = 41.41°$ b) Space =volume $= ½ \times 6 \times 10\sin 41.41° \times 24$ $= 60\sin 41.41° \times 24$ $=952.5m^3$ C)  B TA= 10 sinθ= 10xsin41.41° Tan∝=10xsin41.41	M1 M1 A1 M1 M1 A1

	$\frac{24}{}$ $\tan\propto=0.2756$ $= 15.41°$	M1 M1 M1 A1