

SULIT

3472/2

3472/2

Matematik

Tambahan

Kertas 2

Ogos

2025

2 $\frac{1}{2}$ jam



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR

SIJIL PENDIDIKAN MRSM 2025

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

UNTUK KEGUNAAN PEMERIKSA SAHAJA

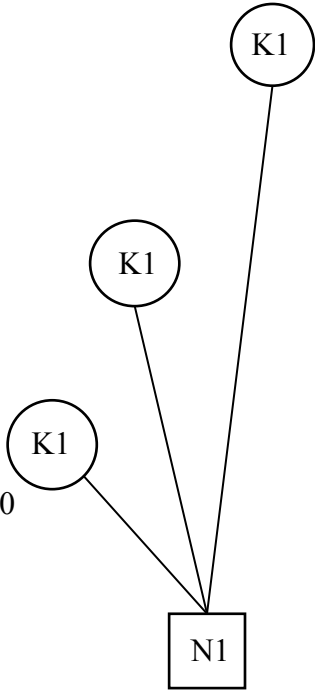
AMARAN

Peraturan pemarkahan ini **SULIT** dan Hak Cipta Bahagian Pendidikan Menengah MARA. Kegunaannya khusus untuk pemeriksa yang berkenaan sahaja. Sebarang maklumat dalam peraturan pemarkahan ini tidak boleh dimaklumkan kepada sesiapa.

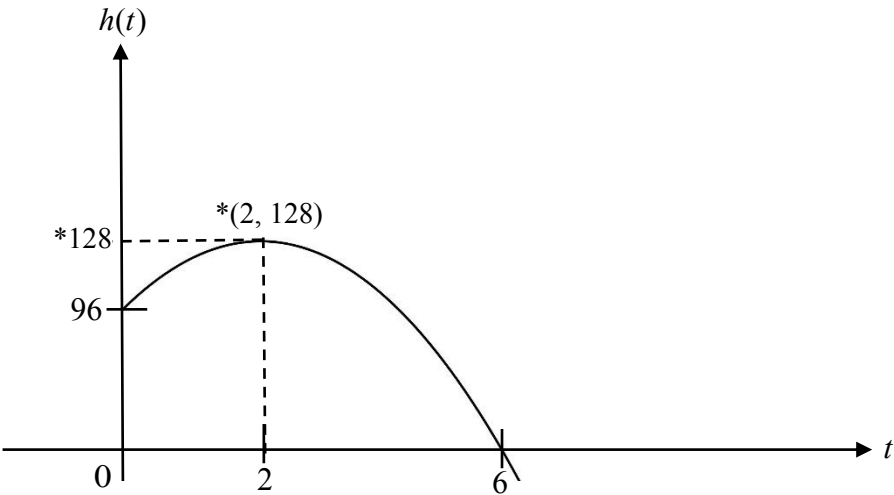
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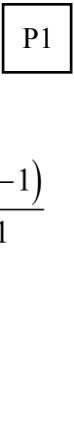
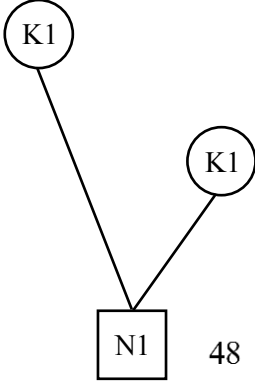
No	Skema Pemarkahan	Sub Markah	Markah
1	$x = 7 + y @ y = x - 7 @ x = \frac{120}{y} @ y = \frac{120}{x}$ Hapus satu anu <u>Selesaikan *persamaan kuadratik</u> • Pemfaktoran • Rumus Kuadratik • Penyempurnaan Kuasa Dua $x = 15 \text{ DAN } x = -8 @ y = 8 \text{ DAN } y = -15$ $y = 8 \text{ DAN } y = -15 @ x = 15 \text{ DAN } x = -8$	5	5
2(a)(i)	$\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$ P1		
(ii)	$\overrightarrow{AC} = \overrightarrow{AD} - \overrightarrow{AF}$ N1	2	
(b)	$\overrightarrow{PQ} = -2\overrightarrow{RS} @ \overrightarrow{RS} = -\frac{1}{2}\overrightarrow{PQ}$ K1 $\overrightarrow{PQ}$ dan $\overrightarrow{RS}$ N1	2	4

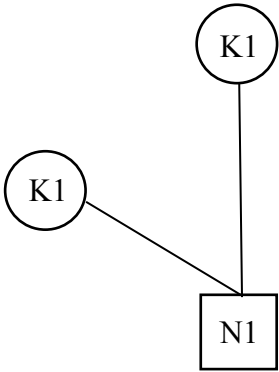
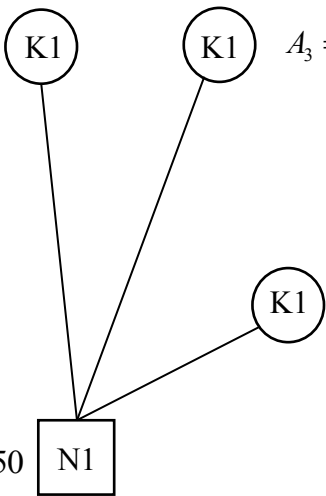
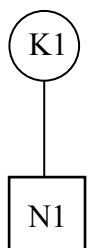
No	Skema Pemarkahan	Sub Markah	Markah
3(a)	$y = \frac{120 - x - \frac{1}{2}\pi x}{12}$ P1 Ganti x ke dalam A $6x \left(\frac{120 - x - \frac{1}{2}\pi x}{12} \right) - \frac{1}{2}\pi \left(\frac{x^2}{4} \right)$ $A = 60x - \frac{(4 + 3\pi)x^2}{8}$ K1 N1	3	
(b)	Bezakan A & samakan dengan 0 $\frac{dA}{dx} = 0$ Ganti x ke dalam A $60(*17.88) - \frac{(4 + 3(3.142))(*17.88)^2}{8}$ $*536.27 \times 10$ $5362.7 > 5000$ & Ya. K1 K1 K1 N1	4	7

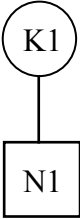
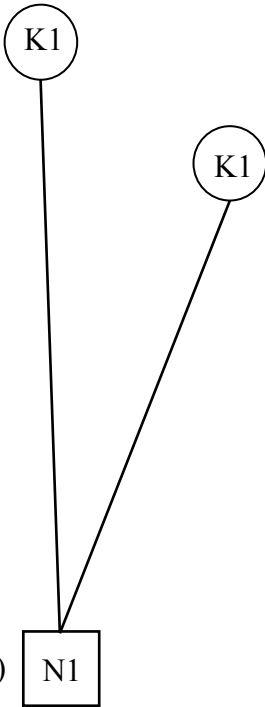
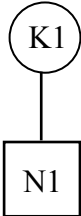
ALTERNATIF			
Cari isipadu, $V = A \times 10$ $\left(60x - \frac{(4 + 3\pi)x^2}{8} \right) \times 10$ Bezakan V & samakan dengan 0 $\frac{dV}{dx} = 0$ Ganti x ke dalam V $\left(60(*17.88) - \frac{(4 + 3(3.142))(*17.88)^2}{8} \right) \times 10$ $5362.7 > 5000$ & Ya. JOIN TELEGRAM @exercise_students for more tips ramalan spm 2025!!			4

No	Skema Pemarkahan	Sub Markah	Markah
4(a)(i)	Guna $\sin^2 \theta + \cos^2 \theta = 1$ @ $\sin 2\theta = 2 \sin \theta \cos \theta$ K1 N1 Kiri = Kanan	2	
(ii)	$\sin 2\theta = \frac{3}{4}$ P1 N1 N1 Sudut rujukan = $48.59^\circ // 48.35'$ $24.30^\circ, 65.71^\circ, 204.30^\circ, 245.71^\circ$ $24^\circ 18', 65^\circ 43', 204^\circ 18', 245^\circ 43'$	3	
(b)(i)	(a) $-4 \leq y \leq 6$ P1 (b) $\sin x$ P1 Dilihat $y = 5 \sin \frac{3}{2}x + 1$ N1	3	
(ii)	0, 1, 2, 4 P1	1	9
JOIN TELEGRAM @exercise_students for more tips ramalan spm 2025!!			

No	Skema Pemarkahan	Sub Markah	Markah
5(a)	$-8 \left[t^2 - 4t + \left(-\frac{4}{2} \right)^2 - \left(-\frac{4}{2} \right)^2 - 12 \right] @$ K1 N1 $-8 \left[t^2 - 4t + \left(-\frac{4}{2} \right)^2 - \left(-\frac{4}{2} \right)^2 \right] + 96$ $h(t) = -8(t-2)^2 + 128$  Bentuk $\cap$ & paksi-paksi guna alat tepi lurus P1 Titik maksimum *(2, 128) & pintasan-x & pintasan-y & label paksi-paksi dan asalan P1	4	
(b)	$(*128 - 96) + *128$ K1 N1 160	2	
(c)	Tiada perubahan N1	1	7

No	Skema Pemarkahan	Sub Markah	Markah
6(a)	$1(3^n - 1)$  $T_n = \frac{3^n}{3}$	2	
(b)	$a = 3 \text{ \& } r = 3$  Boleh tersirat $\frac{{}^*3({}^*3^8 - 1)}{{}^*3 - 1}$ 9840	3	
(c)	Cari nisbah sepunya $r = \frac{3}{4}$  $\frac{12}{1 - \left(\frac{3}{4}\right)}$ Nota: $0 < {}^*r < 1$ 48	3	8

No	Skema Pemarkahan	Sub Markah	Markah
7(a)(i)	Guna Nisbah Trigonometri @ Petua Kosinus untuk mencari $\angle POT$ & S_{PRT} $S_{PRT} = 13(*2.352)$ $\frac{*S_{APD} + *PQ + *TS + 24}{13(*2.352) + *8 + *8 + 24}$ 70.58 	3	
(a)(ii)	76.66° @ 26.68° @ 1.338 @ 0.4657 Guna $\frac{1}{2}j^2\theta$ $A_1 = \frac{1}{2}(6)^2(*1.338) @$ $A_2 = \frac{1}{2}(13)^2(*0.4657)$ $A_3 = \frac{1}{2}(6)(12.65)$ $@ \frac{1}{2}(13)^2(\sin *26.68^\circ)$ $@ \frac{1}{2}(6)(13)(\sin *76.66^\circ)$ $*A_1 + (*A_2 - *A_3)$ 25.47 $\leftrightarrow$ 25.50 	5	
(b)	$\frac{L}{\theta} = \frac{\pi j^2}{2\pi}$ $L = \frac{1}{2}j^2\theta$ ditunjukkan 	2	10

No	Skema Pemarkahan	Sub Markah	Markah
8(a)	$\frac{x-a}{c-x} = \frac{m}{n}$ $\frac{mc+na}{n+m}$ 	2	
(b)(i)	Guna $(x,y) = \left(\frac{nx_1+mx_2}{m+n}, \frac{ny_1+my_2}{m+n} \right)$ Selesaikan persamaan serentak $\frac{2a+(-6d)}{1+2} = 6 \quad \& \quad \frac{2(a+1)+d}{1+2} = 2 \text{ @}$ $\frac{2a+c}{1+2} = 6 \quad \& \quad \frac{2(a+1)+\left(-\frac{c}{6}\right)}{1+2} = 2 \text{ @}$ $\frac{2(b-1)+(-6d)}{1+2} = 6 \quad \& \quad \frac{2b+d}{1+2} = 2 \text{ @}$ $\frac{2(b-1)+c}{1+2} = 6 \quad \& \quad \frac{2b+\left(-\frac{c}{6}\right)}{1+2} = 2$ $R(3,4) \quad \& \quad T(12,-2)$ 	Nota: Selesaikan persamaan serentak sehingga satu anu dihapuskan dan anu pada sebelah dan pemalar pada sebelah berbeza.	
(b)(ii)	Guna $\frac{1}{2} \left \begin{pmatrix} & \end{pmatrix} - \begin{pmatrix} & \end{pmatrix} \right$ $\frac{1}{2} \left \begin{pmatrix} (*3)(*-2) + (*12)(0) + (-2)(*4) \\ -((*4)(*12) + (-2)(* -2) + (*3)(0)) \end{pmatrix} \right $ 33 	5	

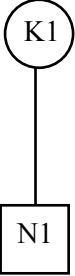
(c)	Guna $m_{RQ}m_{QS} = -1$ @ $(QR)^2 + (QS)^2 = (RS)^2$ @ $D = \sqrt{(y_1 - y_2)^2 + (x_1 - x_2)^2}$ $\left(\frac{y-4}{x-3}\right)\left(\frac{y-0}{x-(-2)}\right) = -1 \text{ @}$ $\left(\sqrt{(x-3)^2 + (y-4)^2}\right)^2 + \left(\sqrt{(x-(-2))^2 + (y-0)^2}\right)^2$ $= \left(\sqrt{(3-(-2))^2 + (4-0)^2}\right)^2$ $\text{@ } \sqrt{\left(x-\frac{1}{2}\right)^2 + (y-2)^2} = \sqrt{\left(3-\frac{1}{2}\right)^2 + (4-2)^2}$ $\text{@ } \sqrt{\left(x-\frac{1}{2}\right)^2 + (y-2)^2} = \sqrt{\left(-2-\frac{1}{2}\right)^2 + (0-2)^2}$ $x^2 + y^2 - x - 4y - 6 = 0$ $0 = 0$ & Ya	K1 N1 N1	3 10
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No	Skema Pemarkahan	Sub Markah	Markah
9(a)(i)	Guna ${}^nC_r p^r q^{n-r}$ ${}^9C_r (0.4)^r (0.6)^{9-r} @ {}^9C_r (0.6)^r (0.4)^{9-r}$ Nota: $0 \leq r \leq 9$		
(ii)	Cari $P(X \geq 2)$ $1 - P(X = 0) - P(X = 1) @$ $P(X = 2) + P(X = 3) + \dots + P(X = 9) @$ $1 - P(X = 9) - P(X = 8) @$ $P(X = 0) + P(X = 1) + \dots + P(X = 7)$		
(b) (i)	35 P1 Dilihat Tulis $P\left(z \geq \frac{35-40}{8}\right)$		
(ii)	Tulis $1 - P\left(z > \frac{50-40}{8}\right) \& 1 - ^* 0.1056$ @ label dan lorek pada lakaran graf normal & $1 - ^* 0.1056$ Nota: 1. Paksi dilukis dan dilabel 2. Guna alat tepi lurus $*(1 - 0.1056) \times 300 = 268$		

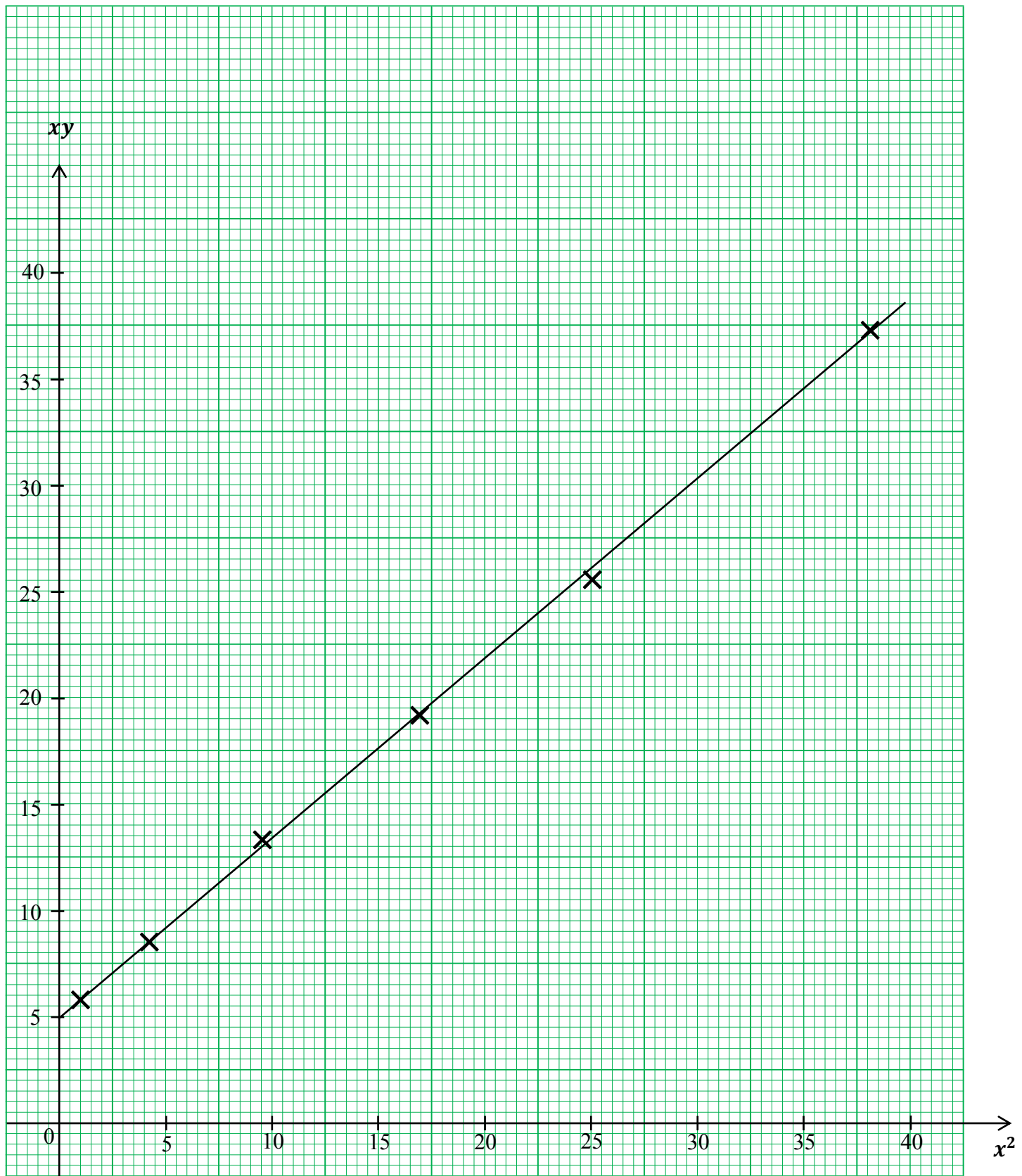
No	Skema Pemarkahan	Sub Markah	Markah
10(a)(i)	<u>Kamirkan persamaan lengkung</u> $9y - \frac{y^3}{3} \quad \text{K1}$ <u>Guna had $\int_0^3$</u> $\text{K1} \quad \left[A_1 = \left[9(3) - \frac{(3)^3}{3} \right] - \left[9(0) - \frac{(0)^3}{3} \right] \right]$ <u>Cari luas segiempat</u> $\text{K1} \quad \left[A_2 = \right] 5 \times 2$ <u>$*A_1 - *A_2$</u> $18 - 10$ Nota: $A_1 > A_2$ 8 N1	5	

	ALTERNATIF <u>Kamirkan persamaan lengkung</u> $9y - \frac{y^3}{3} @ \frac{2(9-x)^{\frac{3}{2}}}{3(-1)}$ Guna had $\int_2^3$ untuk mencari A_1 $\left[9(3) - \frac{3^3}{3} \right] - \left[9(2) - \frac{2^3}{3} \right]$ <u>$*A_1 + *A_2$</u> $*\left(\frac{8}{3}\right) + *\left(\frac{16}{3}\right)$ Guna had $\int_5^9$ untuk mencari A_2 $\left[\frac{-2(9-9)^{\frac{3}{2}}}{3} \right] - \left[\frac{-2(9-5)^{\frac{3}{2}}}{3} \right]$ $\frac{8}{N1}$ $\frac{136\pi}{15}$		
(ii)	Kamirkan $\frac{\pi}{6} \int (9-y^2)^2 dy$ Guna had $\int_1^3$ dalam $* \left[81y - \frac{18y^3}{3} + \frac{y^5}{5} \right]$ $\frac{136\pi}{15}$	5	3

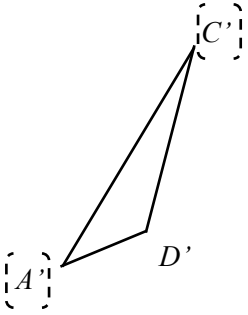
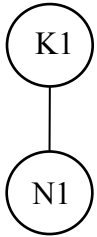
(b)	$2b(b) \quad @ \quad 2 \times \pi$  $2b^2 - 2\pi$	2	10
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No	Skema Pemarkahan	Sub Markah	Markah								
11(a)(i)	<table><tr><td>xy</td><td>$5.9(0)$</td><td>$8.4(0)$</td><td>$12.9(0)$</td><td>$18.4(0)$</td><td>$25.5(0)$</td><td>$35.4(0)$</td><td>N1</td></tr></table>	xy	$5.9(0)$	$8.4(0)$	$12.9(0)$	$18.4(0)$	$25.5(0)$	$35.4(0)$	N1	1	
xy	$5.9(0)$	$8.4(0)$	$12.9(0)$	$18.4(0)$	$25.5(0)$	$35.4(0)$	N1				
(ii)	Graf garis lurus xy melawan x^2 dilukis -Paksi-paksi betul dan skala seragam dari titik pertama sehingga titik terakhir -Sekurang-kurangnya satu *titik diplot betul 6 *titik diplot dengan betul Garis lurus penyuaian terbaik [Sekurang-kurangnya 5 *titik diplot]	3									
(b)	$xy = px^2 + \frac{r}{p}$ P1 Guna * $m = p$ or * $c = \frac{r}{p}$ (2 titik pada *garis) $p = 0.8429$ K1 N1 N1 N1 N1 $r = 4.214$ Syarat: $c = 4.5 // 4.75 // 5 // 5.5$	4									
(c)	$\frac{y}{x} = p + \frac{r}{p} \left(\frac{1}{x^2} \right) @ \frac{y}{x} = \frac{5}{x^2} + 0.8429$ Kecerunan = 5 Pintasan-y = 0.8429	2	10								

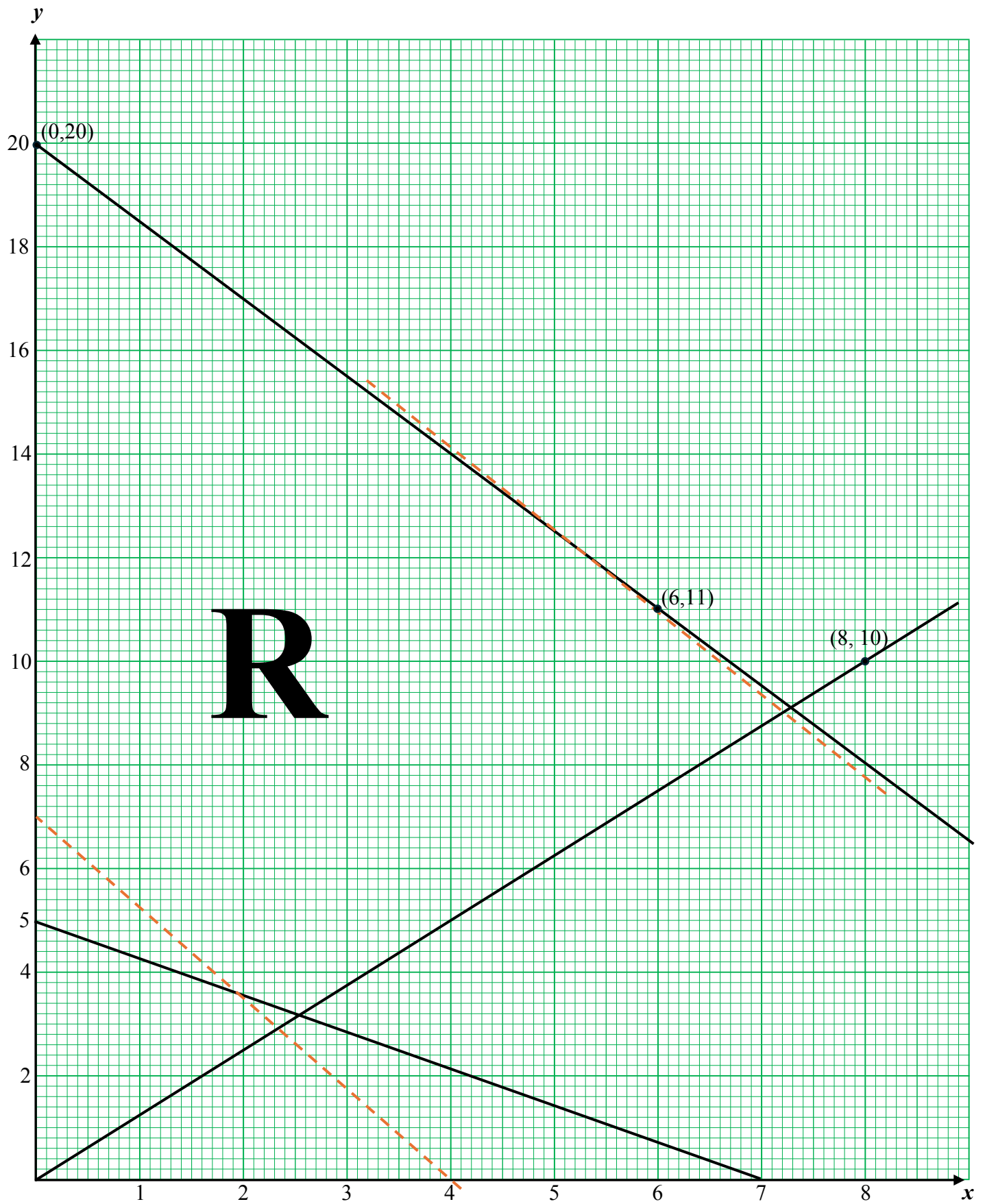
11 (a) (ii)

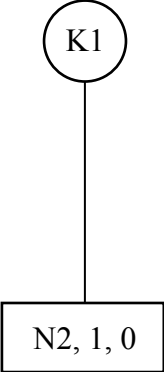
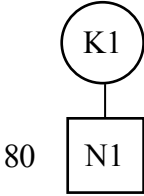
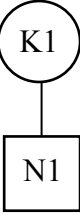
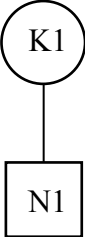


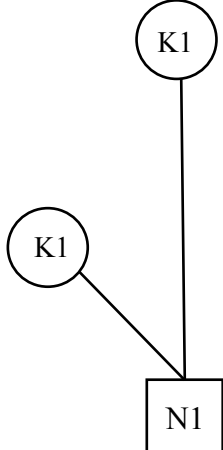
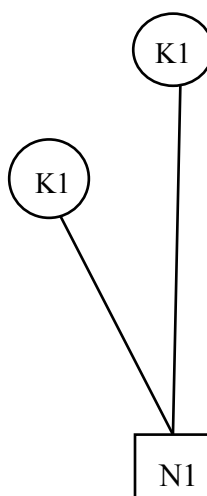
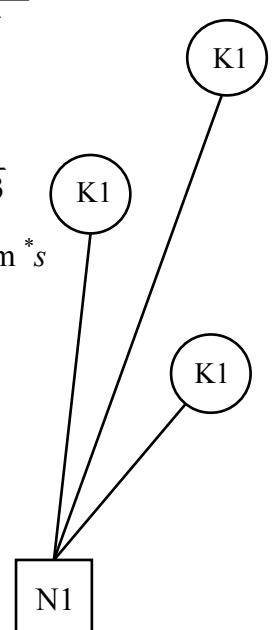
No	Skema Pemarkahan	Sub Markah	Markah
12(a)(i)	Guna petua kosinus @ luas segi tiga $17.46^2 = 20^2 + 15^2 - 2(20)(15)\cos \angle ABD$ @ $\frac{20+15+17.46}{2} \quad \&$ $\frac{1}{2}(20)(15)\sin \angle ABD = \sqrt{*26.63(*26.63-20)(*26.63-17.46)(*26.63-15)}$ 57.75°	K1 N1 2	
(a)(ii)	64.50° Guna petua sinus $\frac{BC}{\sin 64.50} = \frac{15}{\sin * 57.75}$ 16.01 ALTERNATIF $\cos * 57.75 = \frac{x}{15} \quad @ \quad \sin * 57.75 = \frac{t}{15}$ $2 \times 15 \times \cos * 57.75 \quad @ \quad 2\sqrt{15^2 - (15 \sin * 57.75)^2}$	P1 Dilihat K1 N1 3 K1 16.01 N1 K1 N1	
(a)(iii)	Kira semi perimeter & guna Rumus Heron $\frac{*16.01+15+15}{2} \quad \&$ $\sqrt{*23.005(*23.005-16.01)(*23.005-15)(*23.005-15)}$ 101.55 ↔ 101.66	K1 N1 2	

(b)(i)	 Nota: 1. $\angle A'D'C'$ adalah sudut cakah 2. Sisi-sisi dilakar dengan alat tepi lurus	1	
(ii)	Guna Petua Kosinus @ Petua Sinus @ Nisbah Trigonometri untuk mencari $\angle CDA$  133.40° Nota: $180 - ^*\angle CDA$	2	10

No	Skema Pemarkahan	Sub Markah	Markah
13(a)	Bentuk persamaan & cari nilai A 10 K1 N1	2	
(b)	$50x + 70y \geq 350$ atau setara $\frac{x}{y} \leq \frac{4}{5}$ atau setara N1 NMA N1 NMA	2	
(c)	Lukis dengan betul sekurang-kurangnya satu garis lurus dari *ketaksamaan yang melibatkan x dan y Rantau R dilabel dengan betul K1 N1	2	
(d)	$350x + 200y = k$ N1 Boleh tersirat. NMA Melukis * $350x + 200y = k$ & Ganti mana-mana titik integer dalam *rantau ke * $(350x + 200y)$ K1 K1 N1 $64500 > 40000$ & Ya Ganti titik (6, 11) dalam $[350x + 200y] \times 15$	4	10



No	Skema Pemarkahan	Sub Markah	Markah
14(a)	Guna $I = \frac{Q_1}{Q_0} \times 100$ $\frac{84}{x} \times 100 = 105 @$ $\frac{y}{90} \times 100 = 90 @$ $\frac{178}{160} \times 100 = z$  $x = 80, y = 81, z = 111.25$	3	
(b)	$\frac{88 \times 100}{110} @ \frac{242}{Q_{23}} \times 100 = 88 \& \frac{220}{275} \times 100$  80	2	
(c)(i)	40 @ 20 dilihat   106 $\frac{110(*40) + 105(25) + 90(15) + 111.25(*20)}{*40 + 25 + 15 + *20}$	3	
(c)(ii)	$\frac{106 \times 115}{100}$  21.9	2	10

No	Skema Pemarkahan	Sub Markah	Markah
15(a)	Kamir a terhadap t & Ganti $t = 0, v = 0, c = 0$ $v = 4ht - \frac{ht^3}{3}$ Ganti $t = 3, v = 12,$ ke dalam v dan selesaikan untuk h  Nota: 1. Kuasa bagi t bertambah 1 & 2 sebutan dikamir, K1¹ <i>Terima</i> 2. Jika K1¹ <i>Terima</i>, maka N0³ $v = 16t - \frac{4}{3}t^3$	3	
(b)	$s = 8t^2 - \frac{t^4}{3}$ $a = 0$ & ganti t dalam s $16 - 4t^2 = 0$ Ganti $t = 2$ ke dalam $s = 8t^2 - \frac{t^4}{3}$  $26\frac{2}{3} @ \frac{80}{3} @ 26.67$	3	
(c)	Selesaikan $v = 0$ $t = 3.464 // 2\sqrt{3}$ Ganti $t = 3 @$ $t = 3.464 // 2\sqrt{3}$ @ $t = 4$ ke dalam s  $2[S(3.464) - S(3)] + S(3) - S(4)$ @ $\int_2^{2\sqrt{3}} v dt + \left \int_{2\sqrt{3}}^4 v dt \right$ 8.33	4	10

PERATURAN PEMARKAHAN TAMAT