

PERATURAN PEMARKAHAN SPMC 2022 MATEMATIK TAMBAHAN



Bagi jawapan mengikut Negeri



+ **PERATURAN PEMARKAHAN** **MODUL KOLEKSI SPMC 2022:** **MATEMATIK TAMBAHAN**

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SCAN ME

PERATURAN PEMARKAHAN



TERIMA KASIH KEPADA SEMUA PENYUMBANG SOALAN.

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#kamiwiwaaddmath

SULIT
3472/1
Matematik
Tambahan
Kertas 1
November
2022
2 jam



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR

SIJIL PENDIDIKAN MRSMA 2022

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

Kertas 1

Dua jam

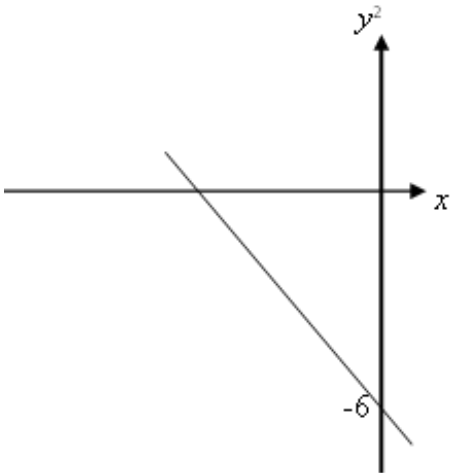
UNTUK KEGUNAAN PEMERIKSA SAHAJA

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.

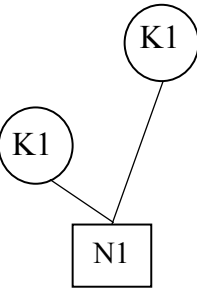
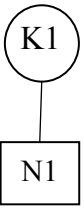
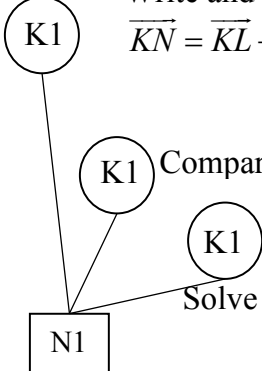
Dokumen ini mengandungi 11 halaman bercetak

ANSWER SCHEME

No	Solution	Scheme	Sub marks	Marks
1				
(a)	$2^2 = \frac{p}{2}(-5) + q$ or $4^2 = \frac{p}{2}(-11) + q$	K1 Substitute $y = 2, x = -5$ or $y = 4, x = -11$	5	
		K1 Solve simultaneous equations	3	
	$p = -4, q = -6$ (both)	N1 $p = -4, q = -6$ (both)		
(b)		N1 Note: Straight line with y-intercept = -6	1	
				4
2				
(a)	$2\alpha + 2\beta = -m$	K1		
	$\{m = \}$ 4	N1	2	
(b)	$2\alpha(2\beta) = -3$ OR $\alpha = -2.3229, \beta = 0.3229$ (both)	K1		
	$x^2 + 2x - \frac{3}{4} = 0$	N1	2	
				4

3	(a) $y = f(x)$, Vertical line test cut only one point // one to one relation // each object has only one image // any valid reason (both) (b) (i) $0 \leq x \leq 5$ (ii) $-4 \leq f(x) \leq 6$ (iii) $f : x \rightarrow 2x - 4$ or $f(x) = 2x - 4$	N1 No Multiple Answer (NMA) N1 NMA N1 NMA N1 NMA	1	3	4
4	(a) $\frac{5+2f(x)}{3} = \frac{2}{x} - 1$ OR $g^{-1}gf(x) = \frac{3\left(\frac{2}{x} - 1\right) - 5}{2}$ $^*\left(\frac{3-4(3)}{3}\right)$ -3 (b) (i) $h(x) = \frac{x+7}{4}$ (ii) $k+5 = \frac{p+7}{4}$ $p = 4k + 13$	K1 Use valid method to find $f(x)$ K1 Substitute $x = 3$ into $^*f(x)$. N1 -3 N1 $h(x) = \frac{x+7}{4}$ K1 $k+5 = \frac{p+7}{4}$ N1 $p = 4k + 13$	3	3	6
5	(a) $0 < a < 1$ (b) $7^{2x} \times 7^{2y}$ or $\frac{7^x}{7^y}$ $7^{2x} \times 7^{2y} + \frac{7^x}{7^y}$ or equivalent $a^2b^2 + \frac{a}{b}$ or equivalent	P1 NMA K1 Use any one rule correctly $a^m \times a^n = a^{m+n}$ $a^m \div a^n = a^{m-n}$ $(a^m)^n = a^{mn}$ K1 Use any two rules N1	1	3	4

6				
(a)	1477.81	N1	1	
(b)	$200e^n + 20e^{n+1} > 800000$ $200e^n + 20[e^n(e^1)] > 800000$ $e^n(200 + 20e) > 800000$ $e^n > 3145.08$ $n > \ln(3145.08)$ $n > 8.05$ $n = 9$	 Use $a^m \times a^n = a^{m+n}$ Use $e^a = b \Leftrightarrow a = \ln b$ 9	3	4
7				
(a)	Discrete, countable (both)	N1 NMA	1	
(b)	(i) ${}^{10}C_4 \left(\frac{2}{7}\right)^4 \left(\frac{5}{7}\right)^6$ 0.1859 (ii) ${}^{10}C_0 \left(\frac{5}{7}\right)^0 \left(\frac{2}{7}\right)^{10}$ or ${}^{10}C_1 \left(\frac{5}{7}\right)^1 \left(\frac{2}{7}\right)^9$ or ${}^{10}C_2 \left(\frac{5}{7}\right)^2 \left(\frac{2}{7}\right)^8$ ${}^{10}C_8 \left(\frac{2}{7}\right)^8 \left(\frac{5}{7}\right)^2$ or ${}^{10}C_9 \left(\frac{2}{7}\right)^9 \left(\frac{5}{7}\right)^1$ or ${}^{10}C_{10} \left(\frac{2}{7}\right)^{10} \left(\frac{5}{7}\right)^0$ ${}^{10}C_0 \left(\frac{5}{7}\right)^0 \left(\frac{2}{7}\right)^{10} + {}^{10}C_1 \left(\frac{5}{7}\right)^1 \left(\frac{2}{7}\right)^9 + {}^{10}C_2 \left(\frac{5}{7}\right)^2 \left(\frac{2}{7}\right)^8$ or ${}^{10}C_8 \left(\frac{2}{7}\right)^8 \left(\frac{5}{7}\right)^2 + {}^{10}C_9 \left(\frac{2}{7}\right)^9 \left(\frac{5}{7}\right)^1 + {}^{10}C_{10} \left(\frac{2}{7}\right)^{10} \left(\frac{5}{7}\right)^0$ 0.001114	 0.001114	5	6

8				
(a)	$\left({}^{10}C_8 \times {}^8C_7\right)$ or $\left({}^{10}C_9 \times {}^8C_6\right)$ or $\left({}^{10}C_{10} \times {}^8C_5\right)$ $\left({}^{10}C_8 \times {}^8C_7\right) + \left({}^{10}C_9 \times {}^8C_6\right) + \left({}^{10}C_{10} \times {}^8C_5\right)$ 696		3	
(b)	$\frac{(7-1)!}{2}$ or 6P_4 $\frac{(7-1)!}{2}$ and 6P_4 , Yes (both)		2	5
9				
(a)	(i) $\sqrt{k^2 + 2^2} = \sqrt{29}$ $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$ $*5\mathbf{i} + 2\mathbf{j} = (3\mathbf{i} - 8\mathbf{j}) + (n\mathbf{i} + 10\mathbf{j})$ or $\begin{pmatrix} *5 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ -8 \end{pmatrix} + \begin{pmatrix} n \\ 10 \end{pmatrix}$ $n = 2$ (ii) $\begin{pmatrix} *2 \\ 10 \end{pmatrix}$	 Use magnitude Write and use triangle law $\overrightarrow{PQ} = \overrightarrow{PO} + \overrightarrow{OQ}$	4	
(b)	$\overrightarrow{KN} = k\overrightarrow{LM}$ $\overrightarrow{KL} + \overrightarrow{LM} + \overrightarrow{MN} = k\overrightarrow{LM}$ $3\mathbf{a} + (\mathbf{a} + \mathbf{b}) - (5\lambda\mathbf{a} + \lambda\mathbf{b}) = k(\mathbf{a} + \mathbf{b})$ $(4 - 5\lambda)\mathbf{a} + (1 - \lambda)\mathbf{b} = k\mathbf{a} + k\mathbf{b}$ $4 - 5\lambda = k$ or $1 - \lambda = k$ $k = \frac{1}{4}$ $\overrightarrow{KN} = \frac{1}{4}\overrightarrow{LM}$ @ $\overrightarrow{LM} = k\overrightarrow{KN}$ $\overrightarrow{LM} = k(\overrightarrow{KL} + \overrightarrow{LM} + \overrightarrow{MN})$ $\mathbf{a} + \mathbf{b} = k[3\mathbf{a} + (\mathbf{a} + \mathbf{b}) - (5\lambda\mathbf{a} + \lambda\mathbf{b})]$ $\mathbf{a} + \mathbf{b} = (4 - 5\lambda)k\mathbf{a} + (1 - \lambda)k\mathbf{b}$ $(4 - 5\lambda)k = 1$ or $(1 - \lambda)k = 1$ $k = 4$ $\overrightarrow{LM} = 4\overrightarrow{KN}$	 Write and use polygon law $\overrightarrow{KN} = \overrightarrow{KL} + \overrightarrow{LM} + \overrightarrow{MN}$ Compare for $*\mathbf{a}$ and $*\mathbf{b}$ Solve simultaneous	4	8

10				
(a)	$-\frac{4}{5}$ or $-\frac{1}{\sqrt{5}}$ or $-\frac{2}{\sqrt{5}}$ $\left(-\frac{4}{5}\right)\left(-\frac{1}{\sqrt{5}}\right) + \left(-\frac{3}{5}\right)\left(-\frac{2}{\sqrt{5}}\right)$ 2	P1 Seen anywhere K1 Use $\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$ N1	3	
(b)	$\tan 60^\circ = \sqrt{3}$ $\frac{k - \sqrt{3}}{1 + k\sqrt{3}} = -1$ $k - \sqrt{3} = -1 - k\sqrt{3}$ $k(1 + \sqrt{3}) = \sqrt{3} - 1$ $k = \frac{\sqrt{3} - 1}{1 + \sqrt{3}}$ $k = \frac{\sqrt{3} - 1}{1 + \sqrt{3}} \times \frac{1 - \sqrt{3}}{1 - \sqrt{3}}$ $k = 2 - \sqrt{3}$	P1 $\tan 60^\circ = \sqrt{3}$ K1 Use $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$ K1 Multiply conjugate N1 $2 - \sqrt{3}$	4	
				7

11	$2ax - \frac{b}{x^2}$ $m_t(-1) = -1$ or $m_n(2a - b) = -1$ $^*\left(2a(1) - \frac{b}{(1)^2}\right) = 1 \quad \text{and} \quad 5 = a(1)^2 + \frac{b}{(1)}$ $a = 2, b = 3$ Note: $\frac{d}{dx}(ax^n)$ the power of x reduced by 1, must correct for both terms.	K1 Differentiate $y = ax^2 + \frac{b}{x}$ wrt x K1 Use $m_1 m_2 = -1$ and find m_2 K1 Solve simultaneous equations N1 Both correct $a = 2, b = 3$	4	4
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12				
(a)	$f = \frac{15g}{g-15} // g = \frac{15f}{f-15}$ $\frac{df}{dg} = \frac{(g-15)(15) - 15g(1)}{(g-15)^2} \text{ or equivalent}$ $\frac{-225}{(20-15)^2} \times 1.2$ -10.8	P1 K1 Use quotient rule K1 Use chain rule N1	4	
(b)	(i) $\left[\frac{dy}{dx} \right] = -2x$ (ii) $\delta x = k$ $\frac{\delta y}{k} \approx -2(p)$ $\delta y = -2pk$ $q = (1 - p^2) + (-2pk)$ $q = 1 - p^2 - 2pk$	N1 NMA P1 $\delta x = k$ K1 Use $\frac{\delta y}{\delta x} \approx \frac{dy}{dx}$ N1 $q = 1 - p^2 - 2pk$	4	
				8

13				
(a)	$760 - 710 = 710 - 660$ or equivalent Arithmetic	K1 Use $T_n - T_{n-1}$ N1	2	
(b)	$660 + (n - 1)(50) > 1350$ $n = 15$ Jan 2049	K1 Use $T_n = a + (n - 1)d > 1350$ to find n. N1 15 N1 Jan 2049	3	
(c)	$s_{14} = \frac{14}{2} [2(20640) + (14 - 1)(1200)]$ or $s_{18} = \frac{18}{2} [2(660) + (18 - 1)(50)]$ or $s_4 = \frac{4}{2} [2(660) + (4 - 1)(50)]$ or $s_3 = \frac{3}{2} [2(660) + (3 - 1)(50)]$ $12(s_4 - s_3) + 24(s_{18} - s_4)$ or $12(810) + s_{14}$ 407880	K1 Use $S_n = \frac{n}{2} [2a + (n - 1)d]$ with correct a and d N1 407880 K1 Any valid method to find the total rental.	3	8

14	(i) (a) $y^2 = y^3$ (1,1) (ii) $\int_0^1 y^3 dy$ or $\int_0^1 y^2 dy$ AND substitute the limit OR $\int_0^1 x^{\frac{1}{3}} dx$ or $\int_0^1 x^{\frac{1}{2}} dx$ AND substitute the limit $\left[\frac{y^3}{3} \right]_0^1 - \left[\frac{y^4}{4} \right]_0^1$ OR $\left[\frac{x^{\frac{4}{3}}}{\left(\frac{4}{3}\right)} \right]_0^1 - \left[\frac{x^{\frac{3}{2}}}{\left(\frac{3}{2}\right)} \right]_0^1$ $\frac{1}{12}$	K1 Equate and solve $y^2(1-y) = 0$ or $y^2(y-1) = 0$ N1 K1 K1 N1 $\frac{1}{12}$	5	
	(b) $V_1 = \frac{1}{3}\pi(1)^2(1)$ or $\pi \int_0^1 (2-y)^2 dy$ or $V_2 = \int_0^1 (y^2)^2 dy$ $\frac{1}{3}\pi + \frac{1}{5}\pi$ $\frac{8}{15}\pi$	K1 Find volume V_1 or V_2 K1 $V_1 + V_2$ N1 $\frac{8}{15}\pi$	3	8

15				
(a)	$(-3, 0.5)$	P1	1	
(b)	$(-4, -2) \text{ or } (0, -2)$ $\frac{0.5 - (-2)}{-3 - (-4)}, \frac{0.5 - (-2)}{-3 - 0} \text{ (both)}$ $1 = 2.5x + 8 \text{ AND } 1 = -\frac{5}{6}x - 2$ OR $\frac{1 - 0.5}{x - (-3)} = 2.5 \text{ or equivalent AND}$ $\frac{1 - 0.5}{x - (-3)} = -\frac{5}{6} \text{ or equivalent}$ $VU = 0.4, UT = 0.8 \text{ (both)}$ $1:2$	P1 K1 Find gradient for both straight line K1 Substitute value of y to find x N1 N1	5	
(c)	$m_{QU} \times \frac{0 - (-2)}{-1 - (-4)} = -1$ $m_{QU} = -\frac{5}{6} \neq -\frac{3}{2} \text{ or } -\frac{5}{6} \times -\frac{3}{2} \neq -1$ therefore not perpendicular	K1 Find gradient and use $m_1 \times m_2 = -1$ N1	2	8

SULIT**3472/2****Matematik****Tambahan****Kertas 2****November****2022**

2 jam 30 min

**MAKTAB RENDAH SAINS MARA****PEPERIKSAAN AKHIR****SIJIL PENDIDIKAN MRSM 2022****PERATURAN PEMARKAHAN****MATEMATIK TAMBAHAN**

Kertas 2

Dua jam tiga puluh minit

UNTUK KEGUNAAN PEMERIKSA SAHAJA**AMARAN**

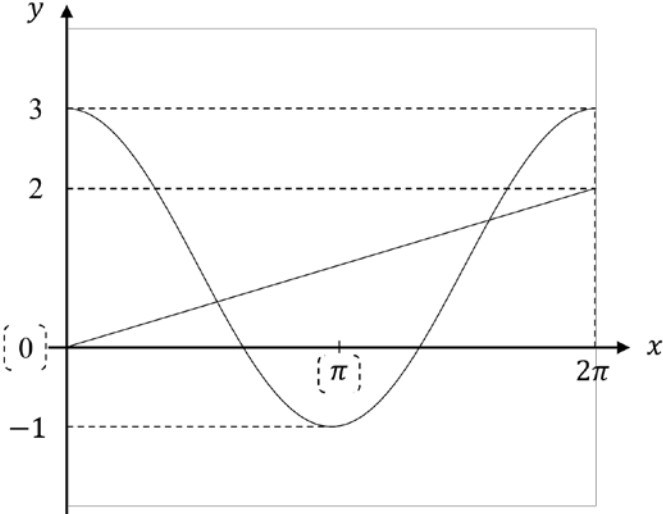
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Dokumen ini mengandungi 22 halaman bercetak

Additional Mathematics Paper 2
SPMRSM 2022
ANSWER SCHEME

No	Solution	Scheme	Sub Marks	Marks
1	Method: Substitution $y = -x - 5$ or $x = -y - 5$ $2(-x - 5)^2 + x = 5$ or $2y^2 + (-y - 5) = 5$ $x = -\frac{15}{2}, x = -3$ @ $y = \frac{5}{2}, y = -2$ $y = \frac{5}{2}, y = -2$ and $x = -\frac{15}{2}, x = -3$	P1 Seen or implied K1 Substitute *y or *x into the non-linear equation. K1 Solve the quadratic equation $ax^2 + bx + c = 0$, by using factorization OR quadratic formula OR completing the square. Factorization $(2x + 15)(x + 3) = 0$ or $(2y - 5)(y + 2) = 0$ OR Completing the square $2 \left[x^2 + \frac{21}{2}x + \left(\frac{21}{2}\right)^2 - \left(\frac{21}{2}\right)^2 + \frac{45}{2} \right] = 0$ or $2 \left[y^2 + \frac{y}{2} + \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right)^2 - 5 \right] = 0$ OR Quadratic Formula $x = \frac{-21 \pm \sqrt{(21)^2 - 4(2)(45)}}{2(2)}$ or $y = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-10)}}{2(2)}$ a, b, c must be correct		

	<u>Method: Elimination</u> $4y^2 + 2x = 10 \quad \text{or} \quad y + x = -5$ $2y + 2x = -10 \quad \text{or} \quad y + x = -5$ $(-) \quad \frac{4y^2 + 2x = 10}{2y - 4y^2 = -20} \quad (-) \quad \frac{2y^2 + x = 5}{y - 2y^2 = -10}$ $x = -\frac{15}{2}, x = -3 \quad \text{or} \quad y = \frac{5}{2}, y = -2$ $y = \frac{5}{2}, y = -2 \quad \text{and} \quad x = -\frac{15}{2}, x = -3$	P1 K1 Eliminate one variable. K1 Solve the quadratic equation $ax^2 + bx + c = 0$, by using factorization <u>OR</u> quadratic formula <u>OR</u> completing the square. Factorization $(2y - 5)(y + 2) = 0 \quad \text{or} \quad 2(2y - 5)(y + 2) = 0$ <u>OR</u> Completing the square $\text{or } 2 \left[y^2 + \frac{y}{2} + \left(\frac{\frac{1}{2}}{2} \right)^2 - \left(\frac{\frac{1}{2}}{2} \right)^2 - 5 \right] = 0$ <u>OR</u> Quadratic Formula $y = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-10)}}{2(2)}$ a, b, c must be correct		
			5	5

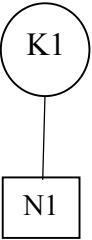
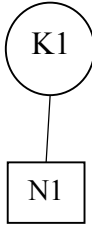
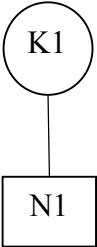
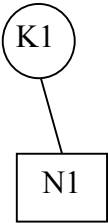
2 (a)	$\operatorname{cosec}^2 x = 1 + \cot^2 x \quad \text{or} \quad \sin^2 x + \cos^2 x = 1$ $\cos^2 x$ (b) (i)  (ii) $y = \frac{x}{\pi}$ Refer question 2 (b) (i) 2	K1 Use or implied N1 LHS = RHS 2 P1 Shape of cosine graph P1 Complete 1 cycle and 2π must be seen. P1 Amplitude 4 and shift upward 1 unit Note: Maximum value = 3 Minimum value = -1 3 N1 K1 Sketch straight line $y = \frac{x}{\pi}$ with correct gradient and y-intercept N1 3	2 3 3	8
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3 (a)	$\left[3x^2 - x\right]_0^1$ $\left(3(1)^2 - (1)\right) - \left(3(0)^2 - (0)\right)$ 2	P1 K1 Use the limit of $\int_0^1$ into $3x^2 - x$ Note: Must show completely N1	3	
(b)	$3(5) - h = \frac{7.5 - 0}{5 - 3.75}$ $7.5 = \frac{3}{2}(5)^2 - 9(5) + c$ $y = \frac{3}{2}x^2 - 9x + 15$	K1 $3(5) - h = \frac{7.5 - 0}{5 - 3.75}$ K1 Integrate $3x - 9$ and substitute to find c. N1	3	6

4 (a)	$\frac{5}{2} + 3(2^{1-1} - 1) \text{ or } \frac{5}{2} + 3(2^{2-1} - 1)$ $\frac{5}{2} // 2.5$ $\frac{\left(\frac{11}{2}\right) - \left(\frac{5}{2}\right)}{\left(\frac{5}{2}\right)}$ $\frac{6}{5} // 1.2$ (b) $\frac{9}{10}$ $\frac{1}{1 - \left(\frac{9}{10}\right)}$ 10	K1 N1 K1 N1 Use S_n Note: Can reward K1 in (a)(ii) if not seen in (a)(i) Use $r = \frac{T_{n+1}}{T_n}$ P1 Seen K1 N1 Use $S_\infty = \frac{a}{1-r}$	4 3	7
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5 (a)	(6,5) $\sqrt{(*6-2)^2 + (*5-7)^2} @ \sqrt{(-2-2)^2 + (9-7)^2}$ $@$ $\sqrt{(x-*6)^2 + (y-*5)^2}$ $\sqrt{(-2-2)^2 + (9-7)^2} = \sqrt{(x-*6)^2 + (y-*5)^2}$ $@$ $\sqrt{(*6-2)^2 + (*5-7)^2} = \sqrt{(x-*6)^2 + (y-*5)^2}$ $@$ $\sqrt{20} = \sqrt{(x-*6)^2 + (y-*5)^2}$ $x^2 + y^2 - 12x - 10y + 41 = 0$	P1 Implied K1 Find distance K1 Equate BS=SQ N1 Note: MUST in lowest term with '= 0'. K1 N1 (18, -1) K1 N1 67	4 4	8
(b)	$\frac{2(3) + x(1)}{1+3} = *6 @ \frac{7(3) + y(1)}{1+3} = *5$ $(18, -1)$ $A = \frac{1}{2} [0(3) + 0(7) + 2(*-1) + *18(0)] - [0(0) + 2(3) + *18(7) + 0(*-1)]$ 67	K1 N1 (18, -1) K1 N1 67	4	8

7 (a)	$x + y = 2 \quad @ \quad y = -x + 2 \quad @ \quad x = -y + 2$ $-3 * (2 - y) + \sqrt{2}y = 1 \quad @ \quad -3x + \sqrt{2} * (2 - x) = 1$ $y = \frac{7}{3 + \sqrt{2}} * \left(\frac{3 - \sqrt{2}}{3 - \sqrt{2}} \right) @ x = \frac{2\sqrt{2} - 1}{3 + \sqrt{2}} * \left(\frac{3 - \sqrt{2}}{3 - \sqrt{2}} \right)$ $y = \frac{21 - 7\sqrt{2}}{9 - 2} \quad @ \quad x = \frac{-3 + \sqrt{2} + 6\sqrt{2} - 2(2)}{9 - 2}$ $(-1 + \sqrt{2}, 3 - \sqrt{2})$	P1 Seen or implied K1 Solve simultaneous equation for x or y K1 K1 Note: For x, all 6 terms must be seen. For y, all 4 terms must be seen. N1 $(-1 + \sqrt{2}, 3 - \sqrt{2})$	5	8
(b)	$\sqrt{\left((-1 + \sqrt{2}) - (-1 + m\sqrt{2}) \right)^2 + \left((3 - \sqrt{2}) - (-\sqrt{2}) \right)^2} = \sqrt{17}$ $\sqrt{2} \times \sqrt{2} = 2$ $2m^2 - 4m - 6 = 0$ $m = 3, m = -1$	K1 Use distance formula and equate to $\sqrt{17}$ K1 Use surd law correctly until quadratic equation is formed N1 Both	3	8

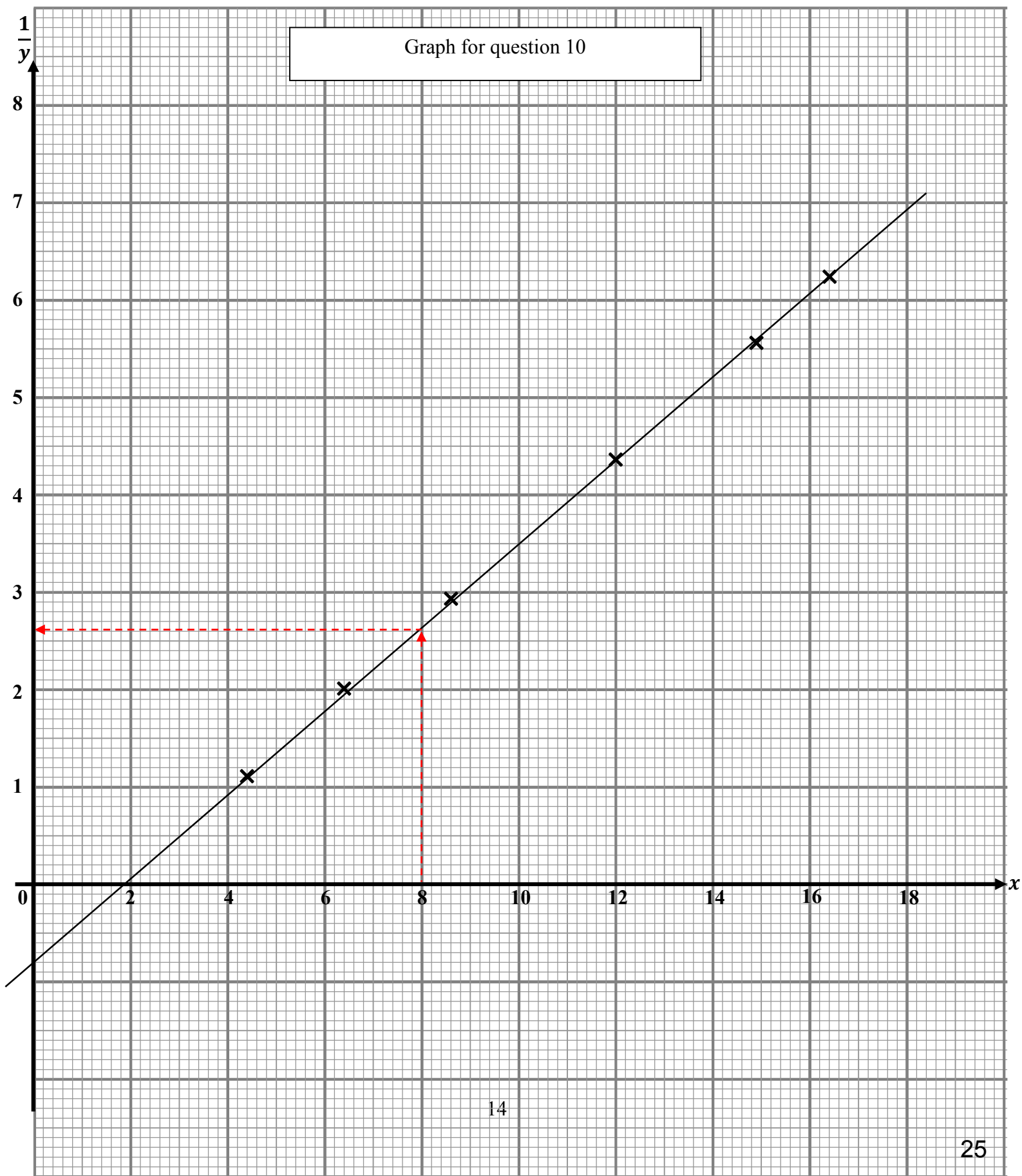
8 (a)	(i)			
	$np = 20, npq = 16$ (both) or $20q = 16$			
	$0.2 // \frac{1}{5}$			
	(ii)		4	
	${}^{10}C_3 \left({}^*0.2 \right)^3 \left({}^*0.8 \right)^7 // {}^{10}C_3 \left({}^*\frac{1}{5} \right)^3 \left({}^*\frac{4}{5} \right)^7$			
	0.2013	0.2013		
(b)	(i)			
	$\left\{ - \right\} 0.16$			
	$\frac{72 - \mu}{50} = -0.16$	Use of $Z = \frac{x - \mu}{\sigma}$		
	80		6	
	(ii)			
	0.0999			
	(iii)			
	$349 \times \text{RM}150$ or $350 \times \text{RM}150$			
	52350 // 52500			10

9 (a)	(i) $5y$ $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$ $4x + 5y$ (ii) $\frac{12}{5}x$ $\left(3y + \frac{12}{5}x\right) = k(4x + 5y)$ $3 = 5k \quad \text{or} \quad \frac{12}{5} = 4k$ $\frac{3}{5}$	P1 K1 N1 Write triangle law K1 K1 K1 $\left(3y + \frac{12}{5}x\right) = k(4x + 5y)$ N1 Compare the coefficient of x or y	7	
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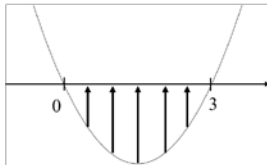
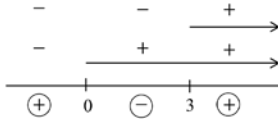
(b)	1800 $RS = \sqrt{1800^2 + 900^2}$ 1006.23 <u>Alternative method</u> $PR = \sqrt{900^2 + 1200^2}$ $RS = 3000^2 + \left(\sqrt{900^2 + 1200^2}\right)^2 - 2(3000) \left(\sqrt{900^2 + 1200^2}\right) \cos 36.87^\circ$ 1006.23	P1 K1 Find RS N1 K1 Use magnitude formula K1 Use cosine rule N1 1006.23	3	10
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10 (a)	<table><tr><td>$\frac{1}{y}$</td><td>1.11</td><td>2.00</td><td>2.94</td><td>4.35</td><td>5.56</td><td>6.25</td></tr></table> Draw straight line graph $\frac{1}{y}$ against x - Correct axes and uniform scale - At least ONE correct * point plotted Draw line of best fit at least - 5 *points plotted - Table in 2 d.p	$\frac{1}{y}$	1.11	2.00	2.94	4.35	5.56	6.25	N1 At least 2 d.p	K1 Use data given ONLY.		
$\frac{1}{y}$	1.11	2.00	2.94	4.35	5.56	6.25						
			N1 6 *points plotted correctly									
			N1	4								
(b)	i) $0.36 \leftrightarrow 0.39$	N1										
	ii) $\frac{1}{y} = \frac{2}{d}x - \frac{f}{d}$	P1										
	$\frac{2}{d} = {}^*m$											
	$4.65 \leftrightarrow 4.88$		K1									
	$-\frac{f}{{}^*d} = {}^*c$		N1 $4.65 \leftrightarrow 4.88$	6								
	<u>Note:</u> 1. If the table of values is not shown, then check values from the graph. 2. If the axes are interchanged, N1 for table of values only	K1										
	$3.33 \leftrightarrow 3.54$		N1 $3.33 \leftrightarrow 3.54$		10							

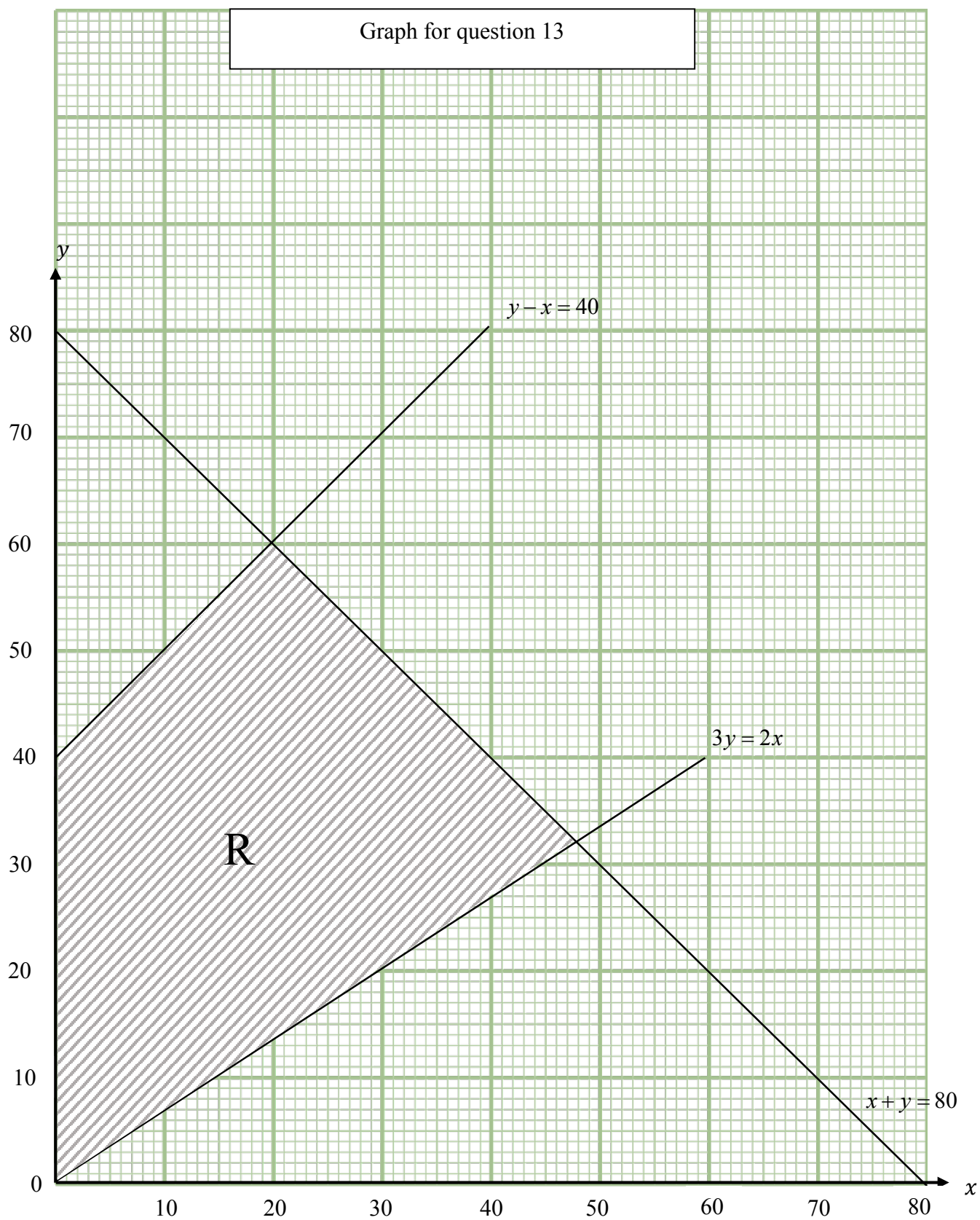
Graph for question 10

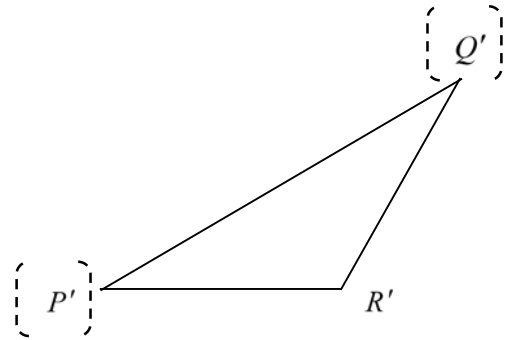
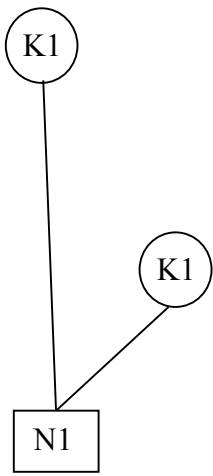


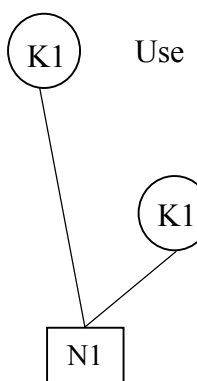
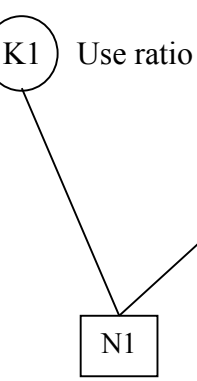
11.				
(a)	$x \times 2x \times h = 375$ OR $P = 4(x) + 4(2x) + 4h$ $P = 4(x) + 4(2x) + 4\left(\frac{375}{2x^2}\right)$ $P = 12x + \frac{750}{x^2}$	P1 Seen		
		K1 Substitute height in P N1	3	
(b)	$12 - \frac{1500}{x^3}$			
(i)	$12 - \frac{1500}{x^3} = 0$ $x = 5$	K1 Differentiate P w.r.t. x N1 K1 Equate $\frac{dP}{dx} = 0$	5	
(ii)	$12(5) + \frac{750}{(5)^2}$ 90	K1 Substitute value of x in P N1		
(c)	$\frac{*90}{100} \times 30 \times 1.80$ RM48.60	K1 N1	2	
				10

12	(a) $a = 2ht + k$ $0 = h(3)^2 + k(3)$ or $-3 = 2h(1) + k$ $9 = 3h$ or $3k = -27$ $h = 3, k = -9$ (both)	K1 Differentiate v w.r.t. t to find a. K1 Substitute $t = 3, v = 0$ or $t = 1, a = -3$ in the correct function K1 Solve simultaneous linear equation N1																		
(b)	$*3t^2 - *9t < 0$ $3t(t - 3) < 0$  OR  OR <table><tr><td></td><td>$t < 0$</td><td>$0 < t < 3$</td><td>$t > 3$</td></tr><tr><td>$3t$</td><td>-</td><td>+</td><td>+</td></tr><tr><td>$t - 3$</td><td>-</td><td>-</td><td>+</td></tr><tr><td>$3t(t - 3)$</td><td>+</td><td>-</td><td>+</td></tr></table> $0 < t < 3$		$t < 0$	$0 < t < 3$	$t > 3$	$3t$	-	+	+	$t - 3$	-	-	+	$3t(t - 3)$	+	-	+	K1 Use $v < 0$ K1 N1	4	3
	$t < 0$	$0 < t < 3$	$t > 3$																	
$3t$	-	+	+																	
$t - 3$	-	-	+																	
$3t(t - 3)$	+	-	+																	
(c)	$\int *3t^2 - *9t \, dt = t^3 - \frac{9}{2}t^2 + c$ $(2)^3 - \frac{9}{2}(2)^2$ or $(*3)^3 - \frac{9}{2}(*3)^2$ or $(5)^3 - \frac{9}{2}(5)^2$ Use $s_3 - s_2 + s_3 + s_5$ OR Use $\left \int_2^3 *3t^2 - *9t \, dt \right + \int_3^5 *3t^2 - *9t \, dt$ $29.5 // \frac{59}{2}$	K1 Integrate and substitute t correctly K1 Find total distance N1	3	10																

13				
(a)	$3y \geq 2x$ or equivalent $x + y \leq 80$ or equivalent $y - x \leq 40$ or equivalent	N1 N1 N1	3	
(b)	Graph Draw correctly at least one straight line from *inequalities x and/or y. Draw correctly all the *straight line from *inequalities x and/or y. Region shaded correctly (refer graph)	K1 N1 N1 Note: Accept if region labeled R	3	
(c)	(i) 10 (ii) (30, 50) $20(*30) + 30(*50)$ 2100 Note: SS-1 once if (i) In (a) more than 3 inequalities given @ x and y not use at all (ii) In (b) does not use given scale @ axis interchange	N1 No multiple answer N1 K1 Substitute any point in the *shaded region into $50x + 30y$ N1 Note: point in integer only	4	
				10



14 (a)	$\sin \angle QRP = \frac{5.36}{6.99}$ OR $\sqrt{6.99^2 - 5.36^2}$ OR $\frac{1}{2} \times 12.01 \times 6.99 \times \sin \angle QRP = \frac{1}{2} \times 12.01 \times 5.36$ $PQ^2 = (6.99)^2 + (12.01)^2 - 2(6.99)(12.01)\cos^* 50.07^\circ$ OR $\sqrt{7.5233^2 + 5.36^2}$ 9.22 $\leftrightarrow$ 9.24 (b) (i)  (ii) 129.93 (iii) $\frac{\sin \angle QPR}{6.99} = \frac{\sin \angle^* PRQ}{^* PQ}$ OR $6.99^2 = (^* PQ)^2 + (12.01)^2 - 2(^* PQ)(12.01)\cos \angle QPR$ OR $\angle QPR = \sin^{-1}\left(\frac{5.36}{9.2374}\right)$ 35.46 $\leftrightarrow$ 35.55	 P1 Note: (i) $\angle P'R'Q'$ must be obtuse angle and sketch by using ruler. (ii) No multiple answer N1 Note: No multiple answer 	3	4
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(c)	$\frac{1}{2}(12.01)\left(\frac{6.99}{2}\right)\sin^* 50.07^\circ$ $Area \Delta ABR = \frac{2}{5}\left(\frac{1}{2}(12.01)\left(\frac{6.99}{2}\right)\sin^* 50.07^\circ\right)$ 6.42 ↔ 6.44 <u>Alternative method</u> $PB = \sqrt{(12.01^2) + \left(\frac{6.99^2}{2}\right) - 2(12.01)\left(\frac{6.99}{2}\right)\cos^* 50.07^\circ}$ $PB = 10.1277$ $AB = \frac{2}{5}(10.1277)$ $Area \Delta ABR = \frac{1}{2} \left(\frac{2}{5}(10.1277) \right) \left(\frac{6.99}{2} \right) \sin 114.59^\circ$ 6.42 ↔ 6.44	 Use $\frac{1}{2}ab \sin C$ Use ratio to find area ΔABR  Use ratio to find AB Use $\frac{1}{2}ab \sin C$ 6.42 ↔ 6.44	3	10
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15				
(a)	$\left\{ \begin{array}{l} p = 108 \\ q = 2.61 \end{array} \right.$			
(b)	$\left\{ I_{2\frac{1}{19}} \right\} = \frac{130 \times 112.5}{100}$ 146.25			3
(c)	(i) 54 @ 36//45 @ 30 @ 10 $\frac{*108(162) + 120(*54) + 145(108) + 130(*36)}{360}$ or $\frac{*108(*45) + 120(15) + 145(*30) + 130(*10)}{100}$ 123.10	P1 Seen or implied 		2

	(ii) $\frac{P_{20} + 2.50}{P_{20}} \times 100 = 110 \quad @ \quad \frac{P_{21}}{P_{21} - 2.50} \times 100 = 110$ @ 2.50 x 10 27.50		5	10
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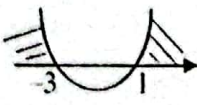
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2022



**MAJLIS PENGETUA SEKOLAH MENENGAH MALAYSIA
CAWANGAN NEGERI SEMBILAN DARUL KHUSUS**

**PROGRAM PENINGKATAN AKADEMIK TINGKATAN 5
SEKOLAH-SEKOLAH MENENGAH NEGERI SEMBILAN 2022**

**PERATURAN PERMARKAHAN
MATEMATIK TAMBAHAN KERTAS 1**

NO	PERATURAN PEMARKAHAN	MARKAH
1	$5\left(\frac{3}{2}\pi\right)$ $\frac{15}{2}\pi + 10$	K1 N1
2	$\frac{3 - (-3)}{1 - 2}$ atau $3 = -6(1) + c$ $y^2 - x^2 = -6x + 9$ $y = x - 3$ dan $y = -x + 3$	2 markah K1 K1 N1
3	(a) $4p + 4q - 4p$ atau $4p + 8q - (4p - 4q)$ $d = 4q$ Panjang aritmetik (b) $100W = \frac{10}{2}[2(4p) + (10 - 1)(4q)]$ $W = \frac{2p + 9q}{5}$	3 markah K1 K1 N1 K1 N1
4	$u' = 2x$ atau $v' = 6(2x + 1)^2$ $6x^2(2x + 1)^2 + (2x + 1)^3(2x)$ $2x(5x + 1)(2x + 1)^2$ $p = 2 \quad q = 5$	5 markah K1 K1 K1 N1 N1
5	(a) $\frac{-(-k) \pm \sqrt{(-k)^2 - 4(1)(4)}}{2(1)}$ $\frac{k \pm \sqrt{k^2 - 16}}{2}$ (b)(i) $(0 < a < p)$ (ii) $g(x) = p(x + 2)^2 + 1$ (c) $(-3 - m)^2 - 4(1)(m + 3) > 0$ $(m + 3)(m - 1) > 0$ dan  $m < -3, m > 1$	5 markah K1 N1 P1 P1 K1 K1 N1
		7 markah

6	(a)	$\frac{1}{2} \times 3^2 \times \left(\frac{\pi}{3}\right)$ atau $\frac{1}{2} \times 6^2 \times \sin 60$ $\left(\frac{1}{2} \times 6^2 \times \sin 60\right) - 3 \left(\frac{1}{2} \times 3^2 \times \left(\frac{\pi}{3}\right)\right)$ 1.449	KI KI NI
	(b)	$\frac{2\pi}{3}$ atau 2.095 rad atau 120 [Panduan : $2\pi - 2 \left(\frac{\pi}{2}\right) - \frac{\pi}{3}$ atau $360 - 2(90) - 60$] $3 \left(\frac{2\pi}{3}\right)$ $3 \left[3 \left(\frac{2\pi}{3}\right) \right] + 3(6)$ atau $3[3(2.095)] + 3(6)$ 36.85 // 36.86	KI KI KI NI
			7 markah
	7	(a)(i) $\sqrt{(-5)^2 + 2^2}$ atau $\sqrt{(5)^2 + 2^2}$ $\underline{\hat{u}} = \frac{1}{\sqrt{29}}(-5\underline{i} + 2\underline{j})$ atau setara (ii) 5 (b) $\overline{JH} = 4\underline{i} - 7\underline{j}$ $\overline{KL} = -\frac{1}{2}(4\underline{i} - 7\underline{j})$ $-2\underline{i} + \frac{7}{2}\underline{j}$	KI NI NI KI KI NI
			6 markah
8	(a)	$\frac{1}{2} (q + 8(-4) + 3(6)) - (6(8) + 3q + 1(-4)) = 36$ $-2q - 58 = 72$ atau $-2q - 58 = -72$ $q = 7$	KI KI NI
	(b)	$y - \frac{3}{2} = -\frac{5}{11} \left(x - \frac{11}{2}\right)$ ATAU $\sqrt{(x-8)^2 + (y-7)^2} = \sqrt{(x-3)^2 + (y+4)^2}$ $y = -\frac{5}{11}x + 4$	KI NI
			5 markah
9	(a)	$\int_1^3 f(x)dx + \int_3^5 f(x)dx$ $p + \frac{q}{3}$	KI NI
	(b)	$\int_1^3 2r^2x dx - \int_1^3 g(x)dx$ $\left[2r^2 \frac{x^2}{2} \right]_1^3 - r$ atau $\left[2r^2 \frac{(3)^2}{2} \right] - \left[2r^2 \frac{(1)^2}{2} \right] - r$ $8r^2 - r$	KI KI NI
			5 markah

10	(a)(i) $T_7 = 40(0.5)^{7-1}$	KI
	0.625 cm atau $\frac{5}{8}$	NI
	(ii) $n = 10$ atau $r = 3$	KI
	$T_{10} = 1(3)^{10-1}$	KI
	19683	NI
	(b) $S_n = a + ar + ar^2 + \dots + ar^{n-1}$	KI
	$rS_n - S_n = (ar + ar^2 + ar^3 + \dots + ar^n) - (a + ar + ar^2 + \dots + ar^{n-1})$	KI
	$S_n = \frac{a(r^n - 1)}{r - 1}$	NI
		8 markah
11	(a) ${}^{2n}P_n = \frac{2n!}{(2n-n)!}$	KI
	$\frac{2n \times (2n-1) \times (2n-2)!}{n! (2n-2)!} = \frac{10n}{n!}$	KI
	$n = 3$	NI
	(b) $\frac{8! \div 3!}{2(8)}$	KI
	420	NI
	(c) ${}^5C_2 \times {}^7C_2 \times {}^4C_2$	KI
	1260	NI
		7 markah
12	(a) Data X: Lengkung normal a	PI
	Data Y: Lengkung normal b	PI
	(b) Tidak Kebarangkalian kejayaan berubah dalam setiap percubaan dan setiap kesudahan bersandar kepada kesudahan sebelumnya. ATAU Kebarangkalian mendapat guli hijau kali pertama ialah 4/20, kemudian percubaan kedua, ianya 3/19 dan seterusnya ATAU setara	NI NI
		4 markah

10	(a)(i) $T_7 = 40(0.5)^{7-1}$ 0.625 cm atau $\frac{5}{8}$	KI
		NI
	(ii) $n = 10$ atau $r = 3$ $T_{10} = 1(3)^{10-1}$ 19683	KI
		KI
		NI
	(b) $S_n = a + ar + ar^2 + \dots + ar^{n-1}$ $rS_n - S_n = (ar + ar^2 + ar^3 + \dots + ar^n) - (a + ar + ar^2 + \dots + ar^{n-1})$ $S_n = \frac{a(r^n - 1)}{r - 1}$	KI
		KI
		NI
		8 markah
11	(a) ${}^{2n}P_n = \frac{2n!}{(2n-n)!}$ $\frac{2n \times (2n-1) \times (2n-2)!}{n! (2n-2)!} = \frac{10n}{n!}$ $n = 3$	KI
		KI
		NI
	(b) $\frac{8! \div 3!}{2(8)}$ 420	KI
		NI
	(c) ${}^5C_2 \times {}^7C_2 \times {}^4C_2$ 1260	KI
		NI
		7 markah
12	(a) Data X: Lengkung normal a Data Y: Lengkung normal b	PI
		PI
	(b) Tidak Kebarangkalian kejayaan berubah dalam setiap percubaan dan setiap kesudahan bersandar kepada kesudahan sebelumnya. ATAU Kebarangkalian mendapat guli hijau kali pertama ialah 4/20, kemudian percubaan kedua, ianya 3/19 dan seterusnya ATAU setara	NI
		NI
		4 markah

13	(a) $k = -1$	PI
	(b) $ 2x - 3 - 1 = 0$ $x = 1, \quad x = 2$	KI NI NI
	(c) $2x - 3 \leq 2$ dan $2x - 3 \geq -2$ (atau setara) $\frac{1}{2} \leq x \leq \frac{5}{2}$	KI NI
	(d) $ 2x - 3 - 1 = x$ $x = 4$ dan $x = \frac{2}{3}$	KI NI
		8 markah
14	(a) $\tan x = \sqrt{m^2 - 1}$	KI
	$\tan 2x = \frac{2\sqrt{m^2 - 1}}{1 - (\sqrt{m^2 - 1})^2}$	KI
	$\frac{2\sqrt{m^2 - 1}}{2 - m^2}$	NI
	(b)(i) $x^2 + y^2 = 1^2$	KI
	$\cos^2 \theta + \sin^2 \theta = 1$	NI
	(ii) $2(1 - \sin^2 \theta) - 5 = 7 \sin \theta$ $(2 \sin \theta + 1)(\sin \theta + 3) = 0$ $\theta = 210^\circ$ dan 330°	KI KI NI
		8 markah
15	(a) $\frac{\log_{12} 2^3}{\log_{12} 3^2}$ atau $\frac{6 \log_{12} 2}{\log_{12} 3}$ atau setara	KI
	$\frac{\log_{12} 4^3}{\log_{12} 3}$ atau $\frac{3 \log_{12} 2^2}{\log_{12} 3}$	KI
	$\frac{3 (\log_{12} 12 - \log_{12} 3)}{\log_{12} 3}$	KI
	$\frac{3(1 - k)}{k}$	NI
	(b) $\ln \left(\frac{x}{e^2} \right) + 3 \ln x = 10$	PI
	$\ln \left(\frac{x(x^3)}{e^2} \right) = 10 \ln e$ or $\ln \left(\frac{x^4}{e^2} \right) = \ln e^{10}$ $x^4 = e^{12}$ $x = e^3$	KI KI NI
		8 markah

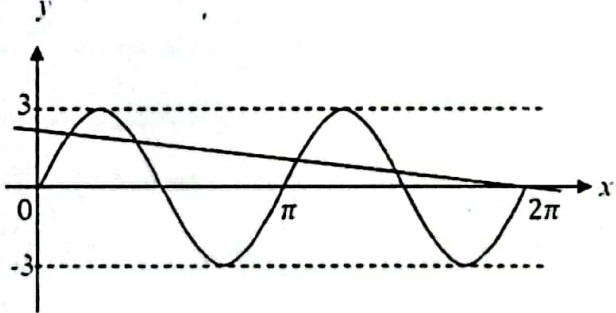
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**MAJLIS PENGETUA SEKOLAH MENENGAH MALAYSIA
CAWANGAN NEGERI SEMBILAN DARUL KIHUSUS**

**PROGRAM PENINGKATAN AKADEMIK TINGKATAN 5
SEKOLAH-SEKOLAH MENENGAH NEGERI SEMBILAN 2022**

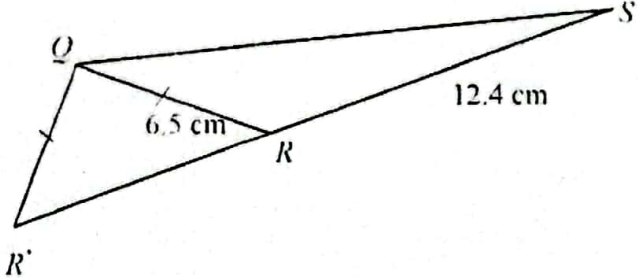
**PERATURAN PERMARKAHAN
MATEMATIK TAMBAHAN KERTAS 2**

4	(a)	$-\frac{1}{150}x^2 + \frac{2}{5}x = 0$	K1
		$x\left(-\frac{1}{150}x + \frac{2}{5}\right) = 0$	K1
		60 atau (60, 0)	N1
	(b)	<u>Gantikan koordinat :</u> $-\frac{1}{92}p^2 + q = 0$ atau $-\frac{1}{92}(46 + p)^2 + q = 3$	K1
		<u>Tukar perkara rumus :</u> $q = \frac{1}{92}p^2$ atau setara <u>Gantikan dalam persamaan kedua :</u> $-\frac{1}{92}(46 + p)^2 + \frac{1}{92}p^2 = 3$ atau setara <u>Selesaikan p atau q :</u> ($p = -26$) Tinggi maksimum = 7.348 atau $\frac{169}{23}$	K1 K1 K1 K1 N1
			8 markah
5	(a)	$\frac{\sin x}{\cos x} (1 + 2\cos^2 x - 1)$	K1
		$\sin 2x$	N1
	(b)		
	(i)	 Bentuk sin Amplitud (maksimum = 3 dan minimum = -3) 2 kitaran	P1 P1 P1
	(ii)	$y = 2 - \frac{x}{\pi}$ Graf garis lurus $y = 2 - \frac{x}{\pi}$ 5 bilangan penyelesaian	K1 K1 N1
			8 markah

6	(a)	$\int_0^2 6x - x^2 - 2x^2 dx$ atau $\left[\frac{6x^2}{2} - \frac{3x^3}{3} \right]_0^2$	K1
		$\left[\frac{6(2)^2}{2} - \frac{3(2)^3}{3} \right] - 0$	K1
		4	N1
	(b)	$\int_0^2 \pi(2x^2)^2 dx$ atau $\pi \left[\frac{4x^5}{5} \right]_0^2$	K1
		$\pi \left(\frac{4(2)^5}{5} - \frac{4(0)^5}{5} \right)$	K1
		$\frac{128}{5} \pi$	N1
			6 markah
7	(a)	$\overrightarrow{PB} = \overrightarrow{PO} + \overrightarrow{OB}$ atau $\overrightarrow{PB} = \overrightarrow{PA} + \overrightarrow{AB}$ atau $\overrightarrow{OQ} = \overrightarrow{OA} + \overrightarrow{AQ}$ atau setara	K1
	(i)	$\overrightarrow{PB} = -6\underline{x} + 4\underline{y}$	N1
	(ii)	$\overrightarrow{OQ} = \frac{9}{2}\underline{x} + 2\underline{y}$	N1
	(b)	$\overrightarrow{PR} = -\frac{12}{5}\underline{x} + \frac{8}{5}\underline{y}$ atau setara	K1
		Bandingkan pekali $\underline{x}$ atau $\underline{y}$:	K1
		$-\frac{12}{5} = -6\lambda$ atau $\frac{8}{5} = 4\lambda$ atau setara	K1
		$\lambda = \frac{2}{5}$ atau setara	K1
		$\overrightarrow{PR} = \frac{2}{5}\overrightarrow{PB}$ atau setara	N1
	(c)	$\frac{1}{2} 3\underline{x} h = 12$ ATAU $\frac{1}{2}(3PA)h$ ATAU $\frac{OAB}{PAB} = \frac{3}{1}$	
		$\frac{1}{2} 9\underline{x} \left(\frac{8}{ \underline{x} }\right)$	K1
		36	N1
		36	
			9 markah
8	(a)	$r^2 + (h - 10)^2 = 10^2$ atau $r = \sqrt{10^2 - (h - 10)^2}$	K1
		$A = \pi(10^2 - (h - 10)^2)$ atau $A = \pi(\sqrt{10^2 - (h - 10)^2})^2$	K1
		$A = \pi(20h - h^2)$	N1
	(b)	$\frac{dA}{dh} = 20\pi - 2\pi h$	K1
		$20\pi - 2\pi(12)$	K1
		$\frac{dA}{dt} = (20\pi - 2\pi(12)) \times 0.5$	K1
		-2π	N1

	(c) $\delta h = \frac{p}{100} \times 12$ atau $p = \frac{\delta h}{12} \times 100$ atau setara $\delta A = (20\pi - 2\pi(12)) \times \frac{3}{25} p$ $-\frac{12p}{25}\pi$	K1 K1 N1
		10 markah
9	(a) Lihat lampiran m/s 9	5 m
	(b) $\log_{10} y = \log_{10} h + (k - 2)\log_{10} x$ (i) $k - 2 = \frac{1.65 - 0.63}{1.20 - 0.32} = 1.159$ (terima $1.147 \leq m \leq 1.20$) atau $\log_{10} h = 0.26$ $k = 3.159$ (ii) $h = 1.820$ (iii) $x = 2.951$	PI K1 N1 N1 N1
		10 markah
10	(a) ${}^{10}C_2 \left(\frac{3}{5}\right)^2 \left(\frac{2}{5}\right)^8$ atau ${}^{10}C_1 \left(\frac{3}{5}\right)^1 \left(\frac{2}{5}\right)^9$ atau ${}^{10}C_0 \left(\frac{3}{5}\right)^0 \left(\frac{2}{5}\right)^{10}$ (i) $1 - \left[{}^{10}C_2 \left(\frac{3}{5}\right)^2 \left(\frac{2}{5}\right)^8 + {}^{10}C_1 \left(\frac{3}{5}\right)^1 \left(\frac{2}{5}\right)^9 + {}^{10}C_0 \left(\frac{3}{5}\right)^0 \left(\frac{2}{5}\right)^{10}\right]$ 0.9877 (ii) $0.6 \times 0.4 \times n = 300$ 1250	K1 K1 N1 K1 N1
	(b) $\frac{30 - 48}{6.5}$ atau $\frac{50 - 48}{6.5}$ (i) 0.6181 // 0.6180 (ii) $P(X > h) = 0.08$ atau $z = 1.406$ // 1.405 $\frac{h - 48}{6.5} = 1.406$ // 1.405 57.14 // 57.13	K1 N1 K1 K1 N1
		10 markah

11	(a)	$\sqrt{(-10 - 2h)^2 + (10 + 3h)^2} = \sqrt{113}$	KI
	(i)	$(h + 1)(13h + 87) = 0$	KI
		$h = -1$	NI
		$m_{SD} = \frac{3 - (-2)}{-2 - (-8)}$	KI
		$k = 8$	NI
	(ii)	$m_{CS} = \frac{10 - 3}{-10 - (-2)}$	KI
		$-\frac{7}{8} \times -\frac{6}{5} \neq -1$	KI
		C'S bukan laluan terpendek.	NI
	(b)	$\frac{1(-8) + 2(\frac{1}{2})}{3}$ atau $\frac{1(-2) + 2(-4)}{3}$	KI
		$E(-\frac{7}{3}, -\frac{10}{3})$	NI
			10 markah
12	(a)	$a_Q = -2$ atau $a_P = 4t - 11$	KI
		Zarah Q kerana $a_Q = -2$	NI
	(b)	$(2t - 3)(t - 4) < 0$ dan $-2t + 6 < 0$	KI
		$3 < t < 4$	NI
	(c)	$s_P = \frac{2}{3}t^3 - \frac{11}{2}t^2 + 12t + c$	PI
		apabila $t = 0$, $s_P = -6$	KI
		$s_P = \frac{2}{3}(3)^3 - \frac{11}{2}(3)^2 + 12(3) - 6$	KI
		$-\frac{3}{2}$	NI
	(d)	$2 \left[\frac{1}{2}(3)(6) \right]$ atau setara	KI
		18	NI
			10 markah

13	(a)	$x = 13$	N1
		$y = 150$	N1
		$z = 4.80$ (tidak terima 4.8)	N1
	(b)	$\frac{x}{62.50} \times 100 = 134$	K1
	(i)	$x = 83.75$	N1
	(ii)	$\frac{104(2) + 150(5) + 150(1) + 125w}{2 + 5 + 1 + w}$	K1
		$\frac{104(2) + 150(5) + 150(1) + 125w}{2 + 5 + 1 + w} = 134$ dan selesaikan w $w = 4$	K1
14	(iii)	$\frac{x}{62.50} \times 100 = 124$	N1
		$x = 77.50$ (tidak terima 77.5)	K1
			N1
			10 markah
	(a)	$QPS = 65^\circ$	P1
	(i)	$\frac{QS}{\sin 65^\circ} = \frac{9.2}{\sin 35^\circ}$ $QS = 14.54 \text{ cm}$ or 14.537 cm	K1
			N1
	(ii)	$14.54^2 = 6.5^2 + 12.4^2 - 2(6.5)(12.4)\cos QRS$ $\angle QRS = 95.48^\circ$	K1
	(iii)	$\frac{1}{2}(6.5)(12.4)\sin 95.48^\circ$ atau $\frac{1}{2}(9.2)(14.54)\sin 80^\circ$	N1
		$\frac{1}{2}(6.5)(12.4)\sin 95.48^\circ + \frac{1}{2}(9.2)(14.54)\sin 80^\circ$	K1
		105.98	N1
	(b)		
	(i)		P1
	(ii)	$QR'S = 84.52^\circ$	N1
			10 markah

15	(a)	$y - x \leq 40$	N1
		$1000x + 500y \leq 50\,000$ atau setara	N1
	(b)	Bilangan mesin cetak P adalah tidak lebih daripada 3 kali bilangan mesin cetak Q. ATAU setara. <i>The number of printer P is not more than 3 times the number of printer Q. OR equivalent.</i>	N1
	(c)	Lihat lampiran m's 10. Dua garis lurus dilukis betul. Rantau R betul.	N1N1 N1
	(d)(i)	$10 \leq y \leq 40$	N1
	(ii)	Titik maksimum (20, 60) Keuntungan maksimum = $200(20) + 150(60)$ 13 000	N1 K1 N1
			10 markah

$\log_{10} x$	0.10	0.32	0.70	0.80	1.00	1.20
$\log_{10} y$	0.40	0.63	1.00	1.22	1.41	1.65

N1

N1

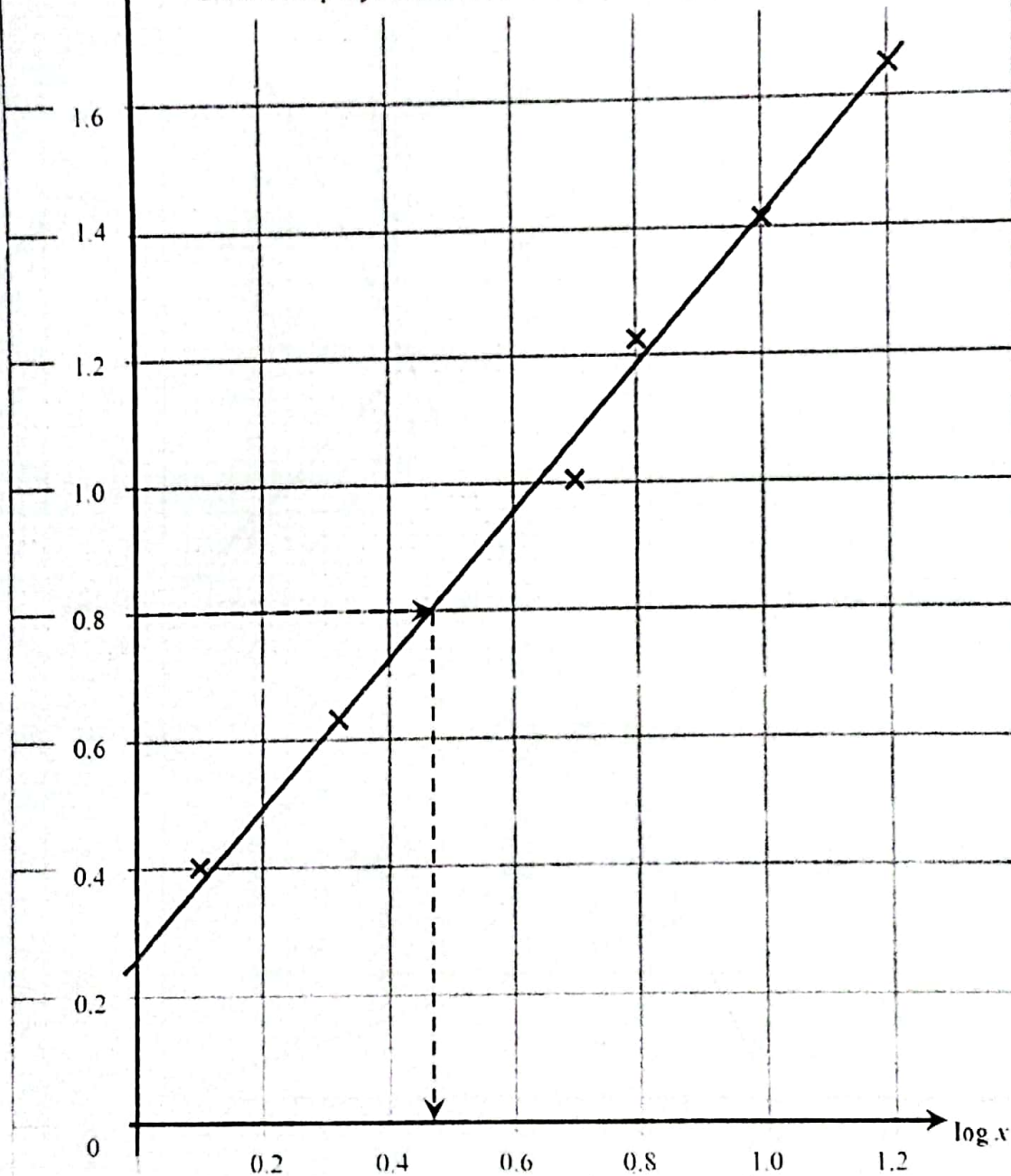
$\log y$

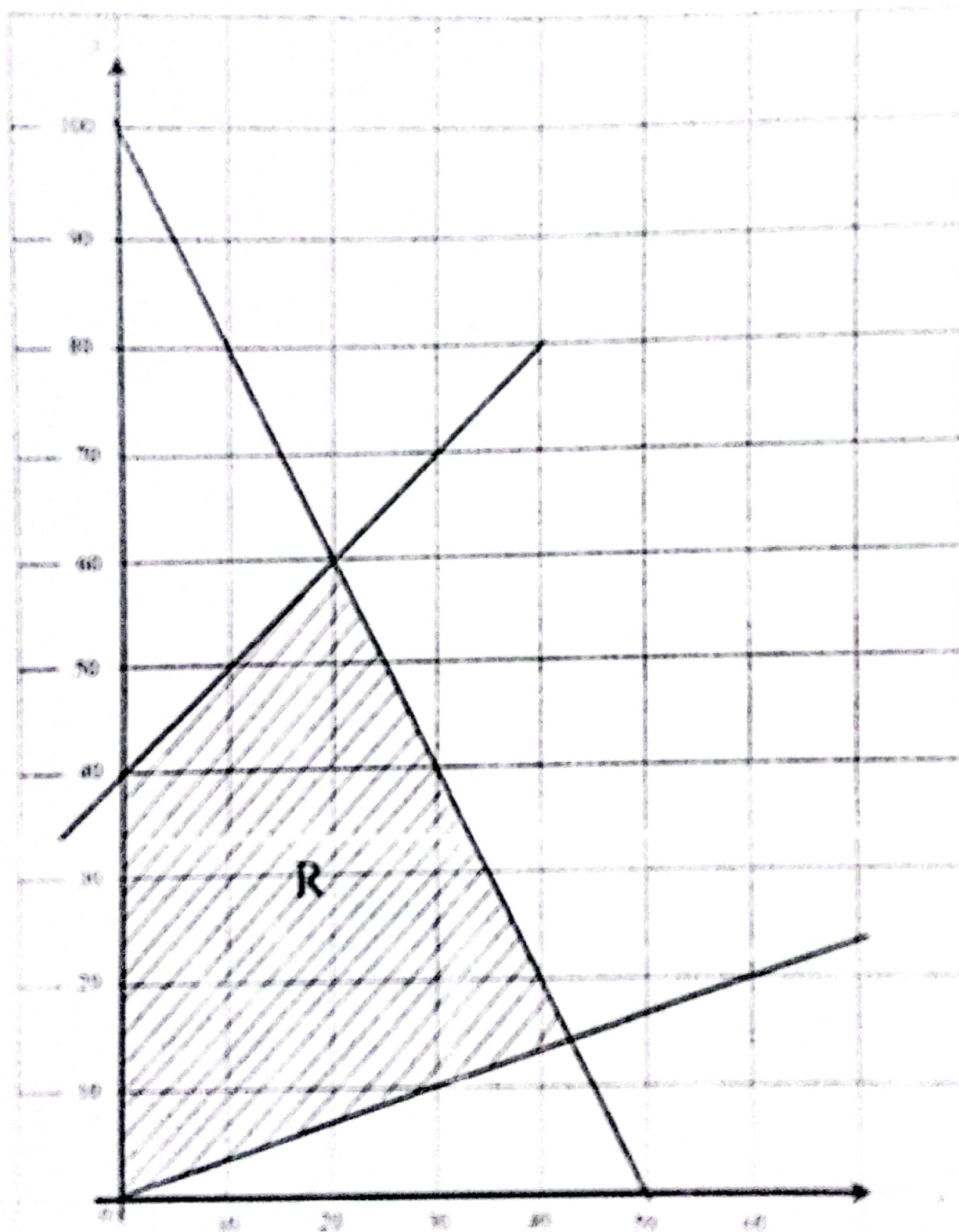
Graf garis lurus $\log y$ melawan $\log x$ dilukis, paksi-paksi betul dan skala seragam, sekurang-kurangnya satu *titik diplot betul
6 *titik diplot betul
Garis lurus penyuaian terbaik sekurang-kurangnya 5 *titik

KP

N1

N1





Nombor	Jawapan	Markah
1	(a) $\frac{dy}{dx} = 6x^2 - 12x - 18$ K1 $\frac{dy}{dx} = -18$ N1	
	(b) $(x+1)(x-3) = 0$ K1 $x = -1$ atau $x = 3$ K1 $\frac{d^2y}{dx^2} = 12(-1) - 12 = -24$ K1 $(-1, 14)$ N1	6
2	(a) $m = \frac{3 - (-3)}{4 - 1} = \frac{6}{3} = 2$ $Y = Mx + c$, dan/and $(4, 3)$ $\frac{1}{y} = 2\left(\frac{1}{x}\right) + c$ $3 = 2(4) + c$ $C = -5$ N1 $\frac{1}{y} = 2\left(\frac{1}{x}\right) - 5$ $\frac{1}{y} = \frac{2}{x} - 5$ $\frac{1}{y} = \frac{2 - 5x}{x}$ $y = \frac{x}{2 - 5x}$ N1	4
	(b) $\frac{x}{2 - 5x} = 3$ K1 $x = 6 - 15x$ $16x = 6$ $x = \frac{6}{16} = \frac{3}{8}$ N1	

3	(a)	$\begin{pmatrix} 5 \\ -12 \end{pmatrix}$ N1 $\sqrt{5^2 + (-12)^2}$ or 13 (seen) K1 $\frac{1}{13} \begin{pmatrix} 5 \\ -12 \end{pmatrix}$ N1	6
	(b)	$h + k = 0$ (seen) K1 $h = -k$ — — — — — 1 $h - k + 2 = 0$ ————— 2 $(-k) - k + 2 = 0$ K1 $-2k = -2$ $k = 1$ and $h = -1$ N1	
4	(a)	$\cos \theta = \frac{4}{5}$ K1 0.6436 N1	4
	(b)	(a) $(5 - 4) + \sqrt{5^2 + 4^2} + 5(0.6436)$ or equivalent K1 OR * $AB = \sqrt{5^2 + 4^2}$ or $AC = 5(0.6436)$ seen, award K1 7.218 N1	
5		$a + 17d = 3(a + 5d)$ K1 $d = a$ N1 $\frac{12}{2}(2a + 11d) : \frac{4}{2}(2a + 3d)$ K1 39:5 N1	4

6	(a)	$\frac{1}{2} \begin{vmatrix} -1 & -4 & -6 & -1 \\ -3 & 0 & 2 & -3 \end{vmatrix}$ $= \frac{1}{2} (-8+18) - (12-2) $ $= 0, \text{ bermaksud titik-titik adalah segaris.}$	K1 N1	5
	(b)	$m_1 = \frac{p}{2} \quad \text{or} \quad m_2 = -q^2 - 5$ $(-q^2 - 5) \left(\frac{p}{2} \right) = -1$ $q = \sqrt{\frac{2}{p} - 5}$	K1 K1 N1	
7	(a)	$\left[\frac{kx^2}{2} \right] @ 2 \int_2^5 f(x) dx = 5(2)$ $10 + \left[\frac{kx^2}{2} \right] = -\frac{1}{2}$	K1 -1 K1 N1	6
	(b)	$11(6) @ \int_6^b f(x) dx = 19$ $-11 \int_6^b f(x) dx$ -209	K1 K1 N1	
8	(a)	(i) 35 (ii) $h(x) = x^2 - 1$	P1 N1	6
	(b)	$f^2(x) = m^2x + mn + n$ $m = 6$ $6n + n = -21$ $n = -3$	K1 N1 K1 N1	

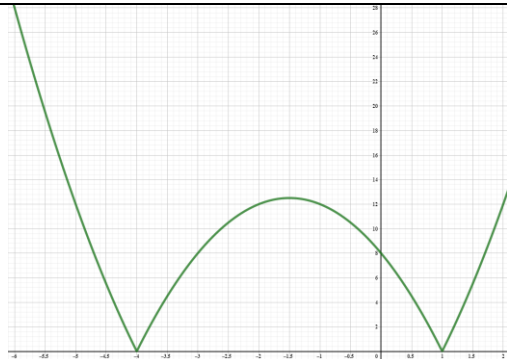
9	(a)	$\angle KOL = \pi - 2\alpha$ K1 $KL = 10(\pi - 2\alpha)$ K1 $10\pi - 20\alpha$ N1	7
	(b)	$\theta = 1$ N1 $\frac{1}{2} \times 10^2 \times (3.142 - 1)$ K1 $\frac{1}{2} \times 10^2 \times [(3.142 - 1) - \sin 122.71]$ K1 65.03 N1	
10		$ \underline{u} = 5$ (seen) P1 $\sqrt{(1-p)^2 + q^2} = 5$ K1 $1 - 2p + p^2 + q^2 = 25$ $q^2 = 2p - p^2 + 24$ K1 $q = \pm \sqrt{2p - p^2 + 24}$ N1	4
11	(a)	$\frac{(n+2)(n+1)n((n-1)!)}{(n-1)!} = 30n$ K1 $(n+2)(n+1) = 30$ K1 $n = 4$ N1	6
	(b)	Bilangan tanpa syarat, $\frac{4!}{2!} = 12$ K1 Bilangan digit 7 diikuti 2, $3! = 6$ K1 Maka, $12 - 6 = 6$ N1	
12	(a)	$3(1 - \cos^2 x) + \cos x - 1 = 0$ K1 $(3 \cos x + 2)(\cos x - 1) = 0$ K1 $0^\circ, 131^\circ 49', 228^\circ 11', 360^\circ \text{ or } 0^\circ, 131.81^\circ, 228.91^\circ, 360^\circ$ N1	6
	(b)	(i) $\sin \theta = \frac{\sqrt{t^2 - 1}}{t}$ N1 (ii) $\frac{\tan \pi - \tan \theta}{1 + \tan \pi \tan \theta}$ $-\tan \theta$ K1 $-\sqrt{t^2 - 1}$ N1	

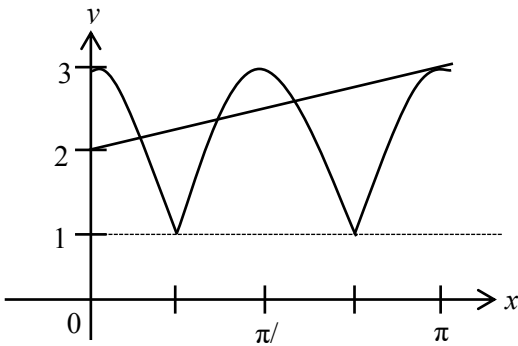
13	(a)	$(a) m(x) = 8x^2 - kx - (5 - k)$ $= 8\left(x^2 - \frac{k}{8}x\right) - (5 - k)$ $= 8\left[x^2 - \frac{k}{8}x + \left(\frac{-k}{16}\right)^2 - \left(\frac{-k}{16}\right)^2\right] - (5 - k) \quad \text{K1}$ $= 8\left(x^2 - \frac{k}{16}\right)^2 - \frac{k^2}{32} - (5 - k) \quad \text{K1}$ $= 8\left(x^2 - \frac{k}{16}\right)^2 - \frac{k^2}{32} + k - 5 \quad \text{N1}$	8
	(b)	$(a) -\frac{k^2}{32} + k - 5 = -\frac{25}{8} \quad \text{K1}$ $\frac{k^2}{32} - k + 5 = -\frac{25}{8}$ $k^2 - 32k + 60 = 0$ $(k - 2)(k - 30) = 0$ $k = 2 \text{ atau/ or } k = 30$ $\therefore k = 2 (k < 5) \quad \text{K1}$	
	(c)	$(a) m(x) = 8x^2 - 2x - (5 - 2)$ $m(x) = 8x^2 - 2x - 3$ $n(x) = 7x^2 + p - 1$ $8x^2 - 2x - 3 = 7x^2 + p - 1$ $x^2 - 2x - p - 2 = 0 \quad \text{K1}$ $b^2 - 4ac > 0$ $(-2)^2 - 4(1)(-p - 2) > 0 \quad \text{K1}$ $4p + 12 > 0$ $p > -3 \quad \text{N1}$	

14	(a)	$5^n[5^2 - 1 - 5^3 5^{-2}] = k[5^n]$ K1 $5^n[25 - 1 - 5] = 5^n[k]$ K1 $5^n[19] = 5^n[k]$ $k = 19$ N1	8
	(b)	$\frac{80 - 16\sqrt{5} + 4}{\sqrt{5} - 1} \times \frac{\sqrt{5} + 1}{\sqrt{5} + 1}$ K1 $\frac{68\sqrt{5} + 4}{4}$ K1 $p = 17$ N1 $q = 1$ N1	
	(c)	$\log_3 p^{\frac{1}{2}}$ $\frac{1}{2} \log_3 p$ $\frac{1}{2} m$ N1	
15	(a)	(a) $n = 3$ -----N1 $k = 1 - \frac{6}{125} - \frac{36}{125} - \frac{64}{125} = \frac{19}{125}$ ----- K1 $P(X = 3) = {}^3C_3 p^3 q^0 = \frac{64}{125}$ $p = \frac{4}{5}$ -----N1	8
	(b)(i)	$\mu = np$ atau $\sigma^2 = npq$ $3 = np$ $0.75 = npq$ ----- K1 $0.75 = 3q$ $q = 0.25$ $p = 0.75$ ----- N1 $n = 4$ ----- N1	
	(b)(ii)	$P(X = 2) = {}^4C_2 (0.75)^2 (0.25)^2$ ----- K1 $= 0.2109$ ----- N1	

PEPERIKSAAN PERCUBAAN TAHUN 2022
PERATURAN PEMARKAHAN KERTAS 2

NOMBOR	JAWAPAN	MARKAH
1	$x = 10 - 2y \quad \text{K1}$ $5(10 - 2y)^2 - 2(10 - 2y)(y) = 24 \quad \text{K1}$ $(3y - 17)(2y - 7) = 0 \quad \text{K1}$ $y = \frac{17}{3}, y = \frac{7}{2} \quad x = -\frac{4}{3}, x = 3 \quad \text{N1}$ $\left(-\frac{4}{3}, \frac{17}{3}\right), \left(3, \frac{7}{2}\right) \quad \text{N1}$	5
2	(a) Surd mempunyai nombor perpuluhan yang tidak berulang dan surd ialah suatu nombor tak nisbah. P1 $\sqrt{3} = 1.7320508$ <i>ialah surd</i> $\sqrt[3]{11} = 2.223980$ <i>ialah surd</i> $\sqrt{\frac{1}{4}} = 0.5$ <i>bukan surd</i> P1 $\sqrt[3]{27} = 3$ <i>bukan surd</i> Boleh juga menggunakan nilai-nilai yang lain.	7
	(b) $2^3(2^{2x-2}) = 2^{6x-3} \quad \text{K1}$ $2x + 1 = 6x - 3$ $x = 1 \quad \text{N1}$	
	(c) $\frac{\log_3 x}{\log_3 27} - \frac{\log_3 y}{\log_3 9} \quad \text{K1}$ $\frac{\log_3 3^p}{3} - \frac{\log_3 3^q}{2} \quad \text{K1}$ $\frac{p}{3} - \frac{q}{2} \quad \text{N1}$	

3	(a)	$p(3x-4)+q$ K1 $p=2$ N1 $-4(2)+q=5$ K1 $q=13$ N1	8
	(b)	(i) $x = \frac{4}{m-y}$ K1 $f^{-1}(x) = m - \frac{4}{x}, x \neq 0$ atau $f^{-1}(x) = \frac{mx-4}{x}, x \neq 0$ N1 (ii) $m^2 + 7 = 3 + (2+m)^2$ K1 $m=0$ N1	
4	(a)	$f(x) = 2 \left[x^2 + 3x + \left(\frac{3}{2}\right)^2 - \left(\frac{3}{2}\right)^2 - 4 \right]$ K1 $f(x) = 2 \left(x + \frac{3}{2} \right)^2 - \frac{25}{2}$ N1	7
	(b)	(i) $x = -\frac{3}{2}$ N1	
		(ii) Graf mempunyai titik minimum iaitu $\left(-\frac{3}{2}, -\frac{25}{2}\right)$ N1 kerana nilai $a > 0$	
	(c)	 Punca-punca=1,-4 N1 Bentuk K1 Verteks pada $x = 1.5$ N1	

5	(a)	 Shape (cosine) N1 1 cycle N1 Amplitude N1 Modulus N1	7
	(b)	$y = 2 + \frac{x}{\pi}$ K1 Draw line $y = 2 + \frac{x}{\pi}$ N1 Number of solutions = 4 N1	
6	(a)(i)	$\begin{aligned}\overrightarrow{AC} &= \overrightarrow{AO} + \overrightarrow{OC} \\ &= -3\underline{x} - 2\underline{y} + 9\underline{x} + 2\underline{y} \\ &= 6\underline{x}\end{aligned}$ N1	8
	(a)(ii)	$\begin{aligned}\overrightarrow{OM} &= \overrightarrow{OA} + \overrightarrow{AM} \\ &= \overrightarrow{OA} + \frac{1}{2}\overrightarrow{AC} \\ &= 3\underline{x} + 2\underline{y} + \frac{1}{2}(6\underline{x}) \\ &= 6\underline{x} + 2\underline{y}\end{aligned}$ K1 N1	
	(b)(i)	$\begin{aligned}\overrightarrow{OB} &= \frac{3}{2}\overrightarrow{OM} \\ &= \frac{3}{2}(6\underline{x} + 2\underline{y}) \\ &= 9\underline{x} + 3\underline{y}\end{aligned}$ K1 N1	
	(b)(ii)	$\begin{aligned}\overrightarrow{OB} &= \overrightarrow{OC} + \overrightarrow{CB} \\ &= 9\underline{x} + 2\underline{y} + 3r\underline{y} \\ &= 9\underline{x} + (2 + 3r)\underline{y}\end{aligned}$ K1 With compare, $2 + 3r = 3$ K1 $r = \frac{1}{3}$ N1	

7	(a)	$A = \frac{1}{2}x^2 \left(\frac{100-2x}{x} \right) \quad K1$ $A = 50x - x^2 \quad N1$	8
	(b)	(i) $\frac{dA}{dx} = 50 - 2x \quad K1$ $50 - 2x = 0 \quad K1$ $x = 25 \quad N1$ $\frac{d^2A}{dx^2} = -2 \quad N1$ (ii) $\theta = \frac{100 - 2(25)}{25} \quad K1$ $\theta = 2 \quad N1$	
8	(a)	$\left[\frac{mx^2}{2} + Cx \right]_0^4 = 16 \quad K1$ $y = mx + c$ Gunakan koordinat/use coordinate (4, 6) $6 = m(4) + C \quad K1$ Selesaikan menggunakan kaedah persamaan serentak $m = 1$ dan $c = 2 \quad N1 \quad N1$	10
	(b)	Luas Berlorek = Luas trapezium + Luas Di bawah Lengkung <i>Shaded area = Area of trapezium + Area under curve</i> $= \frac{1}{2}(6+2)(4) \quad K1 \quad \text{OR} \quad \left[\frac{(x-6)^3}{3(1)} \right]_4^6 \quad K1$ $= 16 + \frac{8}{3} \quad K1$ $= 18\frac{2}{3} @ \frac{56}{3} @ 18.667 \quad N1$	
	(c)	Jumlah isipadu = Isipadu janaan oleh garis lurus + Isipadu janaan oleh lengkung <i>Total Volume = Volume generated straight line + Volume generated curve</i> Use limit $\pi \left[\frac{(x+2)^3}{3(1)} \right]_0^4 \quad K1$ OR $\pi \left[\frac{(x-6)^5}{5(1)} \right]_4^6 \quad K1$ $\frac{208}{3}\pi + \frac{32}{5}\pi$ $75\frac{11}{15} @ \frac{1136}{15} @ 75.733 \quad N1$	

9	(a)	$G = \left(\frac{8(1)+2(2)}{3}, \frac{7(1)+1(2)}{3} \right)$ $G = (4,3)$	K1 N1
	(b)	$m_{RG} = \frac{5-3}{-2-4} = -\frac{1}{3}$ $m_{PQ} = 3$ $y-7=3(x-8)$ $y=3x-17$	P1 K1 N1
	(c)	$m = \frac{5-1}{-2-2} = -1$ $y-5=-1(x+2)$ $y=-x+3$	K1 N1
	(d)	(a) $2PW = 3PR$ $2\sqrt{(x-8)^2 + (y-7)^2} = 3\sqrt{(x+2)^2 + (y-5)^2}$ $5x^2 + 5y^2 + 100x - 34y - 191 = 0$	P1 K1 N1

10

10	(a)	<table><tr><td>$\frac{1}{x}$</td><td>0.67</td><td>0.50</td><td>0.33</td><td>0.25</td><td>0.20</td><td>0.17</td></tr><tr><td>$\frac{1}{y}$</td><td>0.50</td><td>1.30</td><td>2.15</td><td>2.60</td><td>2.85</td><td>2.95</td></tr></table> K1 K1	$\frac{1}{x}$	0.67	0.50	0.33	0.25	0.20	0.17	$\frac{1}{y}$	0.50	1.30	2.15	2.60	2.85	2.95	
$\frac{1}{x}$	0.67	0.50	0.33	0.25	0.20	0.17											
$\frac{1}{y}$	0.50	1.30	2.15	2.60	2.85	2.95											
	(b)	P1 K1 K1	10														
	(c)	(c) $\frac{1}{y} = \frac{p}{n} \left(\frac{1}{x} \right) + \frac{1}{n}$ K1 i) $\frac{1}{n} = 3.87$ K1 $n = 0.260$ N1 ii) $\frac{p}{n} = - \frac{2.85}{0.57}$ K1 $p = -1.3$ N1															

11	(a)(i)	$(i) P(X = 6) = {}^6C_6(p)^6(1-p)^0 = 0.04666 \quad K1$ $p^6 = 0.04666 \quad K1$ $6 \log_{10} p = \log_{10} 0.04666$ $\log_{10} p = \frac{\log_{10} 0.04666}{6}$ $p = 0.6 \quad N1$	10
	(a)(ii)	$P(X > 4) = P(X = 5) + P(X = 6)$ $= {}^6C_5(0.6)^5(0.4)^1 + {}^6C_6(0.6)^6(0.4)^0 \quad K1$ $= 0.23328 \quad N1$	
	(b)(i)	$(i) P(X > V) = 0.409$ $P\left(z > \frac{V-900}{17}\right) = 0.409 \quad K1$ $\frac{V-900}{17} = 0.23$ $V = 903.91 \quad N1$	
	(b)(ii)	$P(866 < X < 951)$ $= P\left(\frac{866-900}{17} < z < \frac{951-900}{17}\right) \quad K1$ $= P(-2 < z < 3) = 1 - P(z < -2) - P(z > 3) \quad K1$ $= 0.9759 \quad N1$	
12	(a)	$\frac{1}{2}(6)(10)\sin \angle ACB = 22 \quad K1$ $\angle ACB = 180^\circ - 47.17^\circ$ $132.83^\circ \quad N1$	10
	(b)	$AB^2 = 6^2 + 10^2 - 2(6)(10)\cos^*132.83 \quad K1$ $14.75 \text{ cm} \quad N1$	
	(c)	$\frac{\sin \angle BCD}{8} = \frac{\sin 40^\circ}{6}$ $\angle BCD = 180^\circ - 58.99$ $121.01^\circ (\text{obtuse}) \quad K1$ $\angle DBC = 180^\circ - 40^\circ - 121.01^\circ = 18.99^\circ \quad K1$ $\frac{\sin \angle CBA}{10} = \frac{\sin 132.83^\circ}{*14.75} \quad K1$ $\angle CBA = 29.82^\circ$ $\angle DBA = 29.82^\circ + 18.99^\circ = 48.81^\circ \quad N1$	
	(d)	$\frac{1}{2}(8)(14.75)\sin 48.81^\circ \quad K1$ $44.40 \text{ cm}^2 \quad N1$	

13	(a)	2 %	P1	10
	(b)	$123 = \frac{P_{18}}{10.50} \times 100$ $RM12.92$	K1 N1	
	(c)	$\frac{92}{100} = \frac{x}{125}$ $x = 115$	K1 K1 N1	
	(d)	$I_{18/14} = \frac{62.15}{55.00} \times 100$ $I_{18/14} = 113$ $\frac{98(y+2) + 123(y+4) + 115(5)}{y+2+y+4+5} = 113$ $y = 4$	K1 N1 K1 N1	
14	(a)	(a) Tiga ketaksamaan; $6x + 3y \leq 360$ $800x + 300y \geq 24000$ $x + y \leq 80$	N1 N1 N1	

15	(a)	$25m + 5n = 0$ atau $5m + n = 0$ P1 $a = 2mt + n$ K1 $2m + n = 3$ K1 $m = -1$ N1	10
	(b)	$(-t^2 + 5t) > 0$ K1 $0 < t < 5$ N1	
	(c)	$s = -\frac{t^3}{3} - \frac{5t^2}{2}$ K1 $\left(\frac{2^3}{3} + \frac{5(2)^2}{2}\right) - \left(-\frac{1^3}{3} + \frac{5(1)^2}{2}\right)$ K1 K1 $5\frac{1}{6}$ N1	

**PERATURAN
PEMARKAHAN
MATEMATIK TAMBAHAN
TINGKATAN 5**

KERTAS 1 3472/1 (PP)
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**MODUL PENINGKATAN PRESTASI MURID
TINGKATAN 5 2022**

MPSM NEGERI KEDAH

	Skema Permarkahan	Sub Markah	Jumlah Markah
1(a)	$f(x)$ ialah suatu fungsi kerana garis mencancang memotong graf hanya pada satu titik P1 or $g(x)$ bukan suatu fungsi kerana garis mencancang memotong graf lebih dari satu titik	1	4
1(b)	$3m^2 + 2 = 3[(m+3)^2] + 3$ K1 K1 $m = -\frac{14}{9}$ N1	3	
2	$m = \frac{4+(-1)}{2}$ K1 $= \frac{3}{2}$ N1 P1 - Bentuk P1 - Pintasan-x dan titik minimum	4	4

	Skema Permarkahan	Sub Markah	Jumlah Markah
3	$\frac{x}{2} + \frac{y}{3} = 1 \dots\dots\dots(1)$ $x^2 - y + y^2 = 12 \dots\dots\dots(2)$ Dari (1) : $x = \frac{6-2y}{3} \dots\dots\dots(3)$ K1 Ganti (3) dalam (2) $\left(\frac{6-2y}{3}\right)^2 - y + y^2 = 12 \quad \text{K1}$ $13y^2 - 33y - 72 = 0$ $y = \frac{-(-33) \pm \sqrt{(-33)^2 - 4(13)(-72)}}{2(13)} \quad \text{K1}$ KONONO jika tiada kaedah /pembfaktoran $y = 3.94, y = -1.40 \quad \text{N1}$ $x = -0.627, x = 2.93 \quad \text{N1}$	5	5
4 (a)	$3^{-n} (15^n - 27^n)$ $= 3^{-n} (3^n 5^n - 3^n 9^n) \quad \text{K1}$ $= 3^{-n} \cdot 3^n (5^n - 9^n)$ $= 5^n - 9^n \quad \text{N1}$	2	7
(b)	$\sqrt{4x} - \sqrt{x} = \frac{3}{\sqrt{a} - \sqrt{b}}$ $2\sqrt{x} - \sqrt{x} = \frac{3}{\sqrt{a} - \sqrt{b}} \times \frac{\sqrt{a} + \sqrt{b}}{\sqrt{a} + \sqrt{b}} \quad \text{K1}$ $\sqrt{x} = \frac{3(\sqrt{a} + \sqrt{b})}{a - b}$ $x = \frac{9(\sqrt{a} + \sqrt{b})^2}{(a - b)^2}$ $h = \frac{9}{(a - b)^2} \quad \text{N1}$	2	

(c)	$5e^{n-3} = e^{-2}$ $\frac{e^{n-3}}{e^{-2}} = \frac{1}{5}$ $e^{n-1} = \frac{1}{5}$ P1 $\ln e^{n-1} = \ln\left(\frac{1}{5}\right)$ K1 $n-1 = \ln\left(\frac{1}{5}\right)$ $n = \ln\left(\frac{1}{5}\right) + 1$ $m = \frac{1}{5}$ N1	3	
5(a)	Pak Abu, A_n : 100, 104, 108, ... Pak Kasim, K_n : 400, 402, 404, ... $A_n = 100 + (n-1)(4)$ K1 (atau) $K_n = 400 + (n-1)(2)$ $100 + (n-1)(4) > 400 + (n-1)(2)$ K1 $2n > 302$ $n > 151$ $n = 152$ N1	3	
5(b)	Jarak ayunan lengkap: 400, 340, 289, ... $S_n < 2434$ $\frac{400[1 - 0.85^n]}{1 - 0.85} < 2434$ K1 P1 $r = 0.85$ $0.85^n > 0.08725$ $a = 400$ ditunjukkan dalam formula $\lg 0.85^n > \lg 0.08725$ $n \lg 0.85 > \lg 0.08725$ $n < \frac{\lg 0.08725}{\lg 0.85}$ $n < 15.007$ $n = 15$ N1 $\therefore$ Bilangan ayunan lengkap ialah 15 ayunan.	3	6

	Skema Permarkahan	Sub Markah	Jumlah Markah
6	$\frac{y}{x^3} = m - \frac{n}{x}$ K1 (salah satu) $\frac{y}{x^2} = mx - n$ $h = m - 3$ K1 $n = 6h$ K1 $n = 6m - 18$ N1	4	4
7(a)	Koordinat P (-4, 0) dan koordinat Q (0, -8) $PB : PQ = 2 : 5$ $PB : BQ = 2 : 3$ Jawapan (a) Koordinat B = $\left(\frac{3(-4) + 2(0)}{2 + 3}, \frac{3(0) + 2(-8)}{2 + 3} \right)$ $= \left(-\frac{12}{5}, -\frac{16}{5} \right)$ P1 K1 N1	3	6
7(b)	Luas $\triangle OPB = \frac{1}{2} \begin{vmatrix} 0 & -4 & -\frac{12}{5} & 0 \\ 0 & 0 & -\frac{16}{5} & 0 \end{vmatrix}$ $= \frac{32}{5} \text{ unit}^2$ Luas $\triangle OQB = \frac{1}{2} \begin{vmatrix} 0 & -\frac{12}{5} & 0 & 0 \\ 0 & -\frac{16}{5} & -8 & 0 \end{vmatrix}$ $= \frac{48}{5} \text{ unit}^2$ Nisbah luas $\triangle OPB : \triangle OQB = \frac{32}{5} : \frac{48}{5}$ $= 2 : 3$ K1 salah satu luas segitiga K1 atau setara N1	3	

	Skema Permarkahan	Sub Markah	Jumlah Markah
8(a)	$ z = \sqrt{4^2 + (-2)^2} = 2\sqrt{5}$ N1 $\overrightarrow{ON} = \begin{pmatrix} 5 \\ 12 \end{pmatrix} + 4 \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ K1 $\overrightarrow{ON} = \begin{pmatrix} 21 \\ 4 \end{pmatrix}$ N1	3	6
(b)	$\overrightarrow{ON} = \begin{pmatrix} 5+4t \\ 12-2t \end{pmatrix}$ K1 $y=0$ $12-2t=0$ K1 $t=6$ N1	3	

	Skema Permarkahan	Sub Markah	Jumlah Markah
9(a)	$\angle BAH = 45^\circ \times \frac{\pi}{180}$ $= \frac{1}{4} \pi \text{ radian} \quad \text{N1}$	1	4
(b)	Luas Kolam Kanak-kanak or Luas Kolam Dewasa = 2 kali Kolam kanak2 $= \frac{1}{2} \times (r+2r) \times r \quad \text{or} \quad = 2 \times \frac{3r^2}{2} \quad \text{K1}$ $= \frac{3r^2}{2} \text{ meter}^2 \quad = 3r^2 \text{ meter}^2$ Luas Sektor = $3r^2$ $\frac{1}{2} r^2 \theta = 3r^2$ $= 6 \text{ rad} \quad \text{K1}$ Perimeter Kolam dewasa = $16r \text{ meter}^2$ N1	3	
10(a)	$\lim_{x \rightarrow 3} \frac{x^2 - 9}{x - 3} = \lim_{x \rightarrow 3} \frac{(x-3)(x+3)}{x-3} \quad \text{K1}$ $= \lim_{x \rightarrow 3} (x+3)$ $= 3+3$ $= 6 \quad \text{N1}$	2	6
(b)	$\frac{dA}{dr} = \frac{8}{9} r \quad \text{K1}$ $\delta A = \frac{dA}{dr} \times \delta r$ $= 200p \quad \text{K1}$ $\% \delta A = \frac{\delta A}{A} \times 100\%$ $= \frac{200p}{22500} \times 100\% \quad \text{K1}$ $= \frac{8}{9} p\% \quad \text{N1}$	4	

	Skema Permarkahan	Sub Marka h	Jumlah Marka h
11	Biar x = ketinggian menara $\tan 3\theta = \frac{x}{\alpha}; \tan 2\theta = \frac{x}{4+\alpha}; \tan \theta = \frac{x}{16+\alpha}$ $x = \alpha \tan 3\theta$ $x = \alpha \tan (2\theta + \theta)$ $x = \alpha \left[\frac{\tan 2\theta + \tan \theta}{1 - \tan 2\theta \tan \theta} \right]$ $x = \alpha \left[\frac{\frac{x}{4+\alpha} + \frac{x}{16+\alpha}}{1 - \left(\frac{x}{4+\alpha}\right)\left(\frac{x}{16+\alpha}\right)} \right]$ $x = \sqrt{64 - \alpha^2}$	P1 P1 K1 K1 N1	5
12(a)	(i) $3! = 6$ (ii) $2! = 2$ [498 dan 894]	N1 N1	2
(b)	${}^9C_5 \times 5!$ atau 9P_5 $= 15120$ $= 15120$	K1 N1	2
(c)	(i) ${}^9C_8 \times (8-1)! = 45360$ (ii) Bilangan cara $= {}^6C_1 \times 2 \times 5!$ $= 1440$	N1 K1 N1	3
13	a) $40 \left(\frac{3}{4} \right)$ $= 30$ b) $1 - \left[{}^5C_0 (0.25)^0 (0.75)^5 + {}^5C_1 (0.25)^1 (0.75)^4 \right]$ 0.3672	K1 N1 K1 guna rumus K1 guna pelengkap atau setara N1	5
13(c)	$P(X \geq 1) = P(X=1) + P(X=2) + \dots + P(X=10)$ $1 - P(X=0)$ $1 - {}^{10}C_0 \left(\frac{1}{4} \right)^0 \left(\frac{3}{4} \right)^{10}$ 0.9437	K1 N1	3

	Skema Permarkahan	Sub Markah	Jumlah Markah
14(a)	$\frac{dy}{dx} = \frac{(2x-3)(1)-(x)(2)}{(2x-3)^2}$ K1	2	8
	$\frac{x}{2x-3} + c$ N1		
14(b)	$\frac{2x^2}{2} - 4x + c$ K1	3	
	Persamaan lengkung dasar kolam $y = x^2 - 4x$ N1		
	Jarak tegak Ahmad ke dasar kolam $= 1.75 \text{ m}$ N1		
14(c)	$= \pi \left[\frac{y^2}{2} + 4y \right]_{-2}^2$ K1	3	
	$= \pi \left[\left(\frac{2^2}{2} + 4(2) \right) - \left(\frac{(-2)^2}{2} + 4(-2) \right) \right]$ K1		
	$= 16\pi \text{ m}^3$ N1		
15(a)	(i) $k = 32$ N1	5	8
	(ii) $\frac{1}{8}(t-16)^2 = 0$ K1		
	$t = 16 \text{ s}$ N1		
	(iii) $H(21) = \frac{1}{8}(21-16)^2$ K1		
$H(21) = 3.125$ N1			
$\text{Ketinggian burung helang} = 3.125 \text{ m}$			
15(b)	Titik minimum $= (6, -0.9)$ N1	3	
	$\frac{1}{10}[t^2 - 12t + 27] < 0$ K1		
	$(t-3)(t-9) < 0$ N1		
	Julat masa: $3 < t < 9$		

PERATURAN PEMARKAHAN TAMAT

SKEMA JAWAPAN

MODUL PENINGKATAN MURID TINGKATAN 5

TAHUN 2022/2023

MATEMATIK TAMBAHAN

KERTAS 2

2 JAM DAN 30 MINIT

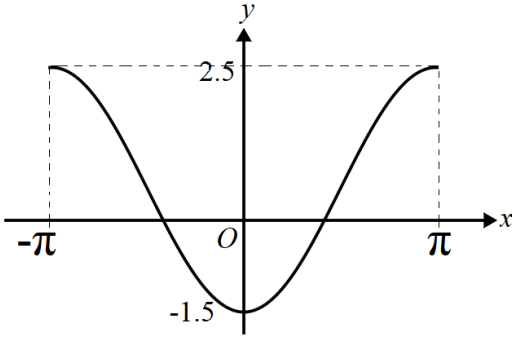
JANGAN BUKA SKEMA PEMARKAHAN INI SEHINGGA DIBERITAHU

1	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	$2x + 2y + 16 = 36$ atau $\sqrt{x^2 + y^2} = 2\sqrt{13}$ P1 $x = 10 - y$ setara P1 $\sqrt{(10 - y)^2 + y^2} = 2\sqrt{13}$ setara K1 $y^2 - 10y + 24 = 0$ $(y - 6)(y - 4) = 0$ setara K1 $y = 6, y = 4$ N1 $x = 4, x = 6$ N1 $(4 + 8) + 6$ 18 cm N1	7	7

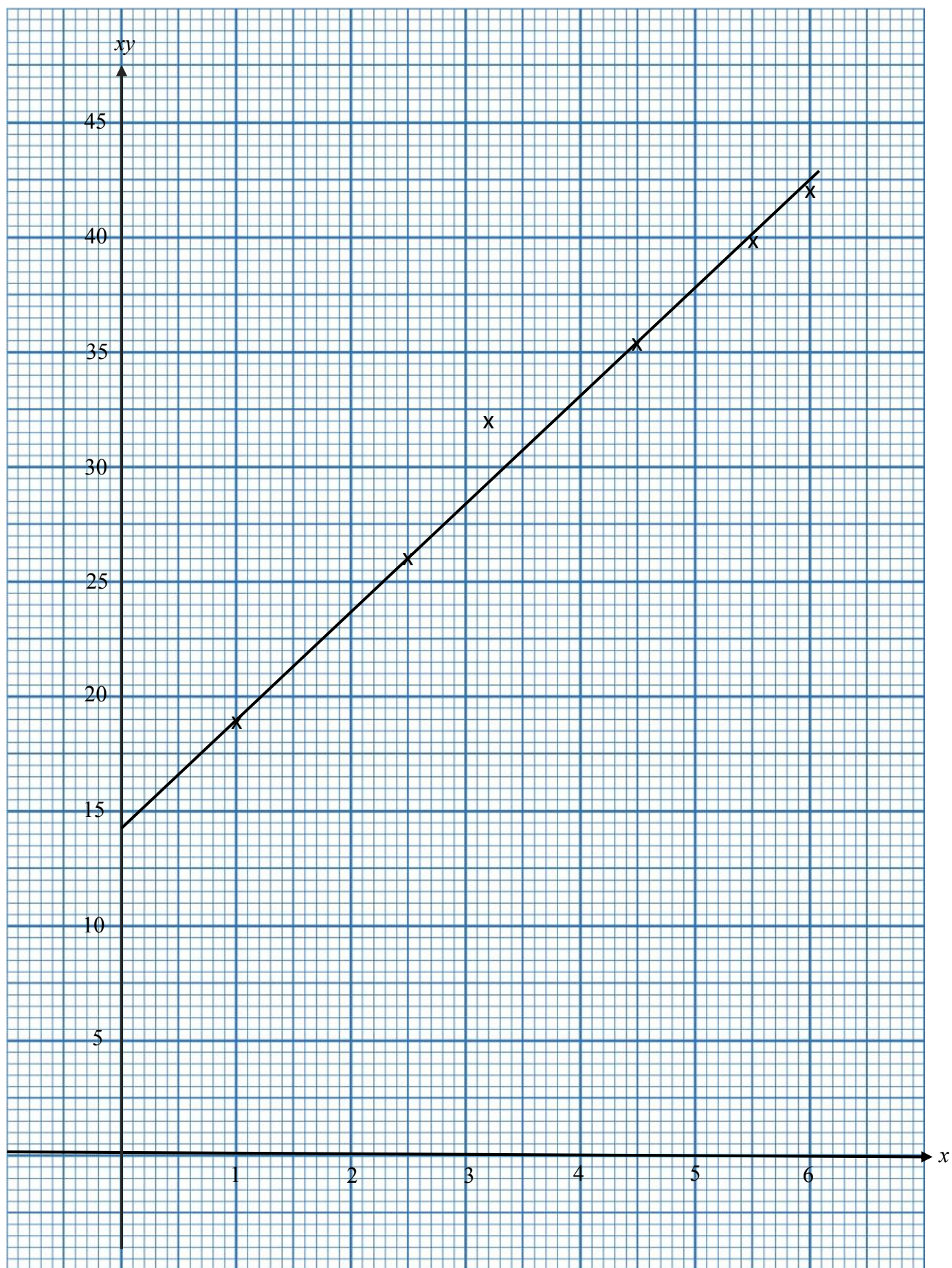
2	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	$\frac{dy}{dx} = 8(2x-3)^3$ $\frac{dy}{dx} = 8(2(1)-3)^3$ K1 ganti nilai x dalam fungsi kecerunan $\frac{dy}{dx} = -8$ $m_1 = -8$ $-8 \times m_2 = -1$ K1 $m_2 = \frac{1}{8}$ $y = \frac{1}{8}x - \frac{25}{8}$ N1	3	7
(b)	$3 - \frac{3}{x^2} = 0$ K1 $3x^3 - 3 = 0$ $x^3 = 1$ $x = 1$ $m = 1$ N1	2	
(c)	$\frac{d^2y}{dx^2} = 3 + \frac{6}{x^3}$ $\frac{d^2y}{dx^2} = 3 + \frac{6}{(1)^3}$ K1 $\frac{d^2y}{dx^2} > 0$ minimum N1	2	

3	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	$m = \tan \theta$ $m = \tan 135^\circ$ atau setara K1 $m = -1$ N1 $y - 4 = -1(x + 2)$ atau setara K1 $y = -x + 2$ N1	4	8
(b)	$m_{CD} = 1$ $y - 0 = 1(x - 4) / 0 = 4 + c$ $y = x - 4$ N1 $x - 4 = -x + 2$ K1 $x = 3$ $y = 3 - 4$ $y = -1$ $C(3, -1)$ N1	3	
(c)	$x = 3$ N1	1	

4	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	$hk(x) = 2\left(\frac{x}{p}\right) + 3$ K1 $h^{-1}(x) = \frac{px-3p}{2}$ K1 banding $h^{-1}(x) = x-3$ $p=2$ N1	3	7
(b)(i)	$k^2(x) = p(px)$ K1 ganti $p=2$ $k^2(x) = 4x$ N1	2	
(b)(ii)	$k(x) = 2x$ $k^2(x) = 4x$ $k^3(x) = 9x$ $k^4(x) = 16x$ tulis $k^3(x)$ atau $k^4(x)$ K1 $k^n(x) = n^2x$ N1	2	

5	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	$\frac{1+\cos x}{\sin x} = \cot \frac{x}{2}$ $\frac{1+2\cos^2 \frac{x}{2}-1}{2\sin \frac{x}{2}\cos \frac{x}{2}} \quad \text{K1}$ $\frac{\cos \frac{x}{2}}{\sin \frac{x}{2}} \quad \text{K1}$ $\cot \frac{x}{2} \quad \text{N1}$	4	8
(b)	 Bentuk graf sinus P1 $\frac{1}{2}$ kitaran P1 Amplitud P1 anjakan keatas P1	4	

6	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	Rujuk graf Graf garis lurus xy melawan x dilukis K1 ▪ Paksi-paksi betul dan skala seragam Sekurang-kurangnya 5 titik diplot dengan betul N1 Garis penyuaiian terbaik N1	3	7
(b)(i)	$xy = \sqrt{r}x + \frac{r}{t}$ P1 $r = 21.16$ N1 (ikut jawapan daripada nilai kecerunan calon) $t = 1.459$ N1 (ikut jawapan daripada nilai r calon) $y = 9.06$ N1 (ikut jawapan daripada nilai r calon)	4	



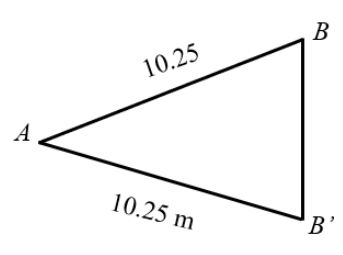
7	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)(i)	$\overrightarrow{AP} = \frac{3}{4}(\overrightarrow{AO} + \overrightarrow{OB}) \text{ tulis Hukum K1}$ $\overrightarrow{AP} = -\frac{3}{4}\underline{u} + \frac{3}{4}\underline{v}$ $\overrightarrow{OP} = \underline{u} + \frac{3}{4}\underline{v} - \frac{3}{4}\underline{u} \text{ N1}$ $\overrightarrow{OP} = \frac{1}{4}(\underline{u} + 3\underline{v}) \text{ Terbukti N1}$	3	7
(a)(ii)	$\overrightarrow{PQ} = -\frac{1}{4}\underline{u} - \frac{3}{4}\underline{v} + \frac{2}{3}\underline{w} \text{ N1}$	1	
(b)	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AO} + \overrightarrow{OC} \text{ Tulis hukum K1}$ $-\frac{1}{4}\underline{u} - \frac{3}{4}\underline{v} + \frac{2}{3}\underline{w} = \frac{6}{5}(-\underline{v} + \underline{w}) \text{ K1}$ $\underline{w} = \frac{27\underline{v} - 15\underline{u}}{32} \text{ N1}$	3	

8	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)(i)	$\frac{dy}{dx} = 3x^2$ atau $\frac{dy}{dx} = -2x$ K1 -2 N1 Lengkung $y = -x^2 + 2$ N1	3	10
(a)(ii)	$\int_0^1 -x^2 + 2 \, dx - \int_0^1 x^3 \, dx$ K1 $\left[-\frac{x^3}{3} + 2x \right]_0^1 - \left[\frac{x^4}{4} \right]_0^1$ K1 $\left(\left[-\frac{(1)^3}{3} + 2(1) \right] - \left[-\frac{(0)^3}{3} + 2(0) \right] \right) - \left(\left[\frac{(1)^4}{4} \right] - \left[\frac{0^4}{4} \right] \right)$ K1 $\frac{17}{12} \text{ unit}^2$ N1	4	
(b)	$\pi \int_0^k 2x \, dx = 9\pi$ $\left[\frac{2x^2}{2} \right]_0^k = 9$ K1 $(k^2) - (0) = 9$ K1 $k = 3$ N1	3	

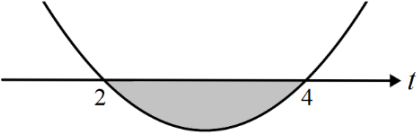
9	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	Luas Poligon Sekata $= \frac{1}{2} \times r^2 \times \sin 30^\circ \times 12$ $= 3r^2 \quad \text{P1}$ Luas Kawasan Tidak Berlorek $= (2 \times \text{Luas tembereng}) + \text{Luas Segitiga}$ $= 0.1810r^2 + \frac{1}{4}r^2 \quad \text{K1}$ $= 0.431r^2 \quad \text{N1}$ Luas Kawasan Berlorek $= \text{Luas Poligon} - \text{Luas kawasan tidak berlorek}$ $= 3r^2 - 0.431r^2 \quad \text{K1}$ $= 2.569r^2 \text{ cm}^2 \quad \text{N1}$	5	10
(b)(i)	Panjang sisi x 8 $\frac{BS}{\sin 30} = \frac{10}{\sin 75} \quad \text{K1}$ $BS = 5.176$ $\therefore = 5.176 \times 8$ $= 41.408 \text{ cm} \quad \text{N1}$ Panjang Lengkuk Berlorek $= r\theta$ $= 10(60 \times \frac{\pi}{180})$ $= 10.47 \text{ cm} \quad \text{N1}$ Panjang Lengkuk Berlorek $= 10.47 \times 8$ $= 83.76 \text{ cm} \quad \text{N1}$ Perimeter Kawasan Berlorek $= 41.408 + 83.76$ $= 125.168 \text{ cm} \quad \text{N1}$	5	

10	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)(i)	$x - 10 = 90 - x$ K1 $x = 50$ $d = 40$ N1 $T_{20} = 10 + (20 - 1)(40)$ K1 770 N1	4	10
(a)(ii)	$S_8 = \frac{8}{2}[2(10) + (8 - 1)(40)]$ K1 $1200 - 770$ 430 N1	2	
(c)	$850 = 10 + (n - 1)40$ K1 $n = 22$ $\text{RM}10 \times 22$ K1 $\text{RM}220$ N1 Cukup , kerana tidak melebihi RM250 N1	4	

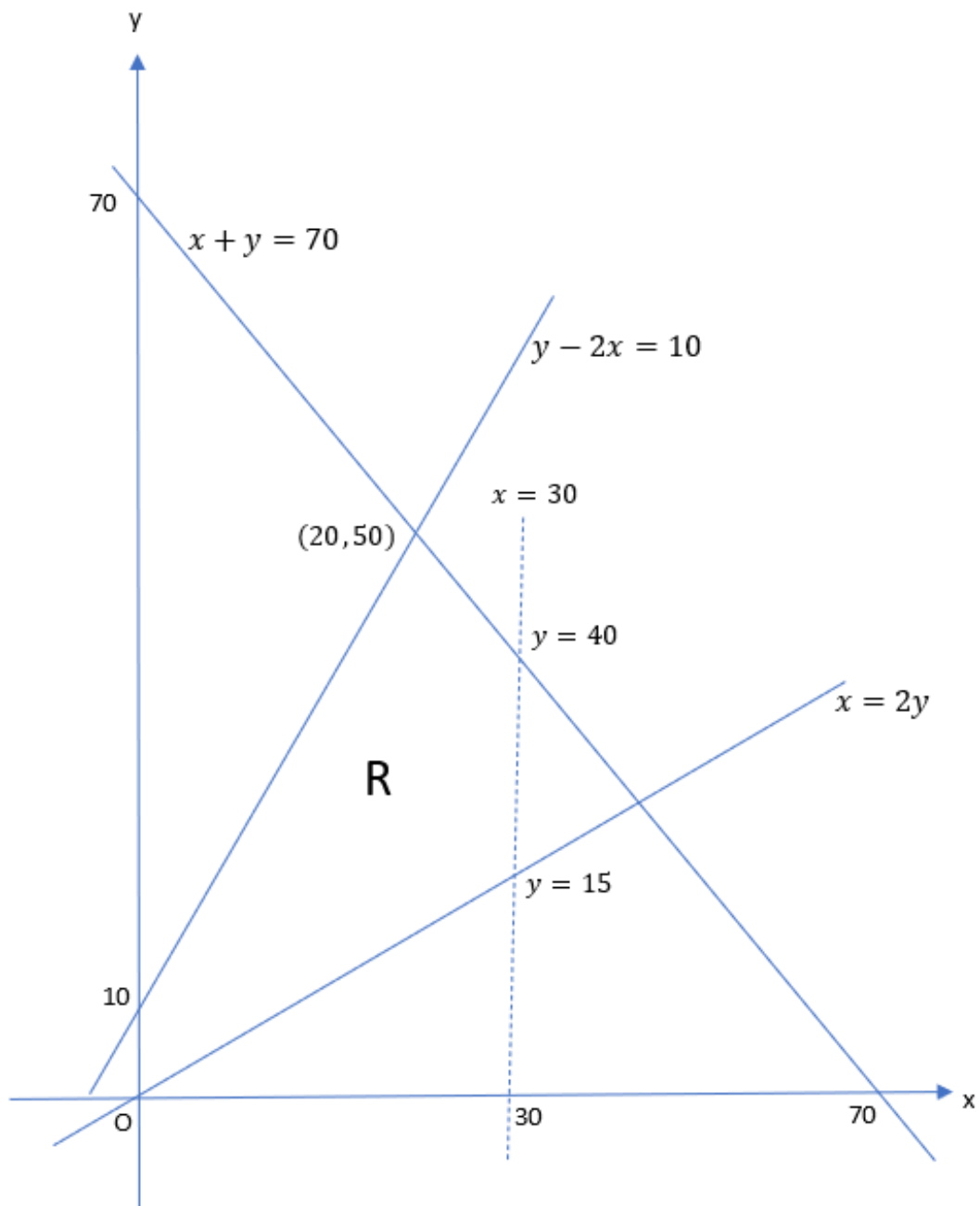
11	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)(i)	$5q = 4$ $q = \frac{4}{5}$ $p = \frac{1}{5}$ N1 $n\left(\frac{1}{5}\right)\left(\frac{4}{5}\right) = 4$ $n = 25$ N1	3	10
(a)(ii)	${}^{25}C_2 \left(\frac{1}{5}\right)^2 \left(\frac{4}{5}\right)^{23}$ K1 0.0708 N1	2	
(b)(i)	$P\left(\frac{3.5 - 4.5}{1.1} < Z \leq \frac{6.5 - 4.5}{1.1}\right)$ K1 0.7837 N1	2	
(b)(ii)	$P(Z < m) = 0.02$ or $P(Z > m) = 0.98$ $Z = 2.054$ N1 $-2.054 = \frac{m - 4.5}{1.1}$ K1 2.241 kg N1	3	

12	Skema Permarkahan	Sub Markah	Jumlah Markah
(a) (i)	$AB = \sqrt{10^2 + 2.26^2} \quad \text{or} \quad AF = \sqrt{10^2 + 6.26^2}$ $AB = 10.25 \quad \quad \quad AF = 11.80 \quad \quad \quad \text{K1}$ $4^2 = 11.80^2 + 10.25^2 - 2(11.80)(10.25) \cos \angle BAF \quad \text{K1}$ $\angle BAF = 19.30^\circ \quad \quad \quad \text{N1}$	3	10
(a)(ii)	$\frac{11.80}{\sin \angle DCG} = \frac{4}{\sin 19.30^\circ} \quad \text{K1}$ $\angle DCG = 77.17 \quad \quad \quad \text{N1}$	2	
(a)(iii)	$s = \frac{11.80 + 7.21 + 13.83}{2} \quad \text{K1}$ $s = 16.42$ $\text{Luas } DFG = \sqrt{16.42(16.42 - 11.80)(16.42 - 7.21)(16.42 - 13.83)} \quad \text{K1}$ $= 42.54 \quad \text{N1}$	3	
(b)	 K1 $\angle BAB' = 25.66^\circ \quad \text{NI}$	2	

13	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)(i)	$\frac{720}{Q_0} \times 100 = 120 \quad \text{K1}$ $Q_0 = \text{RM}600.00 \quad \text{N1}$		
(a)(ii)	$126.3 = \frac{(120 \times 144) + (x \times 108) + (150 \times 72) + (108 \times 36)}{(144 + 108 + 72 + 36)} \quad \text{K1}$ $= 125 \quad \text{N1}$	4	
(b)	$I_{\frac{22}{20}} = \frac{(108 \times 144) + (125 \times 108) + (157.5 \times 72) + (108 \times 36)}{(144 + 108 + 72 + 36)} \quad \text{K1}$ Semua Indeks harga $\frac{2022}{2020}$ betul K1 123 N1 Jumlah perbelanjaan pada tahun 2022 meningkat 23% berbanding tahun 2020 N1	4	10
(c)	$\frac{Q_1}{4000} \times 100 = 123 \quad \text{K1}$ $Q_1 = \text{RM } 4920.00 \quad \text{N1}$	2	

14	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	ganti $t = 0$ $(0)^2 - 6(0) + 8$ K1 8 ms^{-1} N1	2	10
(b)	$a = 0$ $\frac{dV}{dt} = 2t - 6$ K1 $0 = 2t - 6$ $t = 3$ $v = (3)^2 - 6(3) + 8$ K1 -1 ms^{-1} N1	3	
(c)	$v < 0$ $t^2 - 6t + 8 < 0$ N1  K1 $2 < t < 4$ N1	3	
(d)	$\int_0^2 t^2 - 6t + 8 \, dt + \left \int_2^4 t^2 - 6t + 8 \, dt \right $ $\left[\frac{t^3}{3} - \frac{6t^2}{2} + 8t \right]_0^2 + \left \left[\frac{t^3}{3} - \frac{6t^2}{2} + 8t \right]_2^4 \right $ K1 ganti had untuk mendapatkan nilai K1 $8.67 \text{ m} / \frac{26}{3} \text{ m}$ N1	3	

15	Skema Permarkahan	Sub Markah	Jumlah Markah
(a)	I $x + y \leq 70$N1 II $x \leq 2y$N1 III $y - 2x \leq 10$N1 Atau Setara	3	10
(b)	Rujuk graf: -Lukis dengan betul sekurang-kurangnya satu garis lurus daripada *ketaksamaan melibatkan x dan yK1 -Lukis dengan betul semua *garisan lurus daripada *ketaksamaan melibatkan x dan y ...N1 -Tanda R dengan betul N1 <u>Nota:</u> Terima garis putus-putus dan garis penuh.	3	
(c)	(i) $15 \leq y \leq 40$N1 (ii) Koordinat (20, 50)N1 Ganti mana-mana titik dalam *kawasan berlorek dalam $10x + 20y$K1 RM1200N1	4	



PERATURAN PEMARKAHAN TAMAT



**MAJLIS PENGETUA SEKOLAH MALAYSIA (MPSM)
CAWANGAN KELANTAN**

**PERCUBAAN SPM
2022**

**MATEMATIK TAMBAHAN
KERTAS 1**

UNTUK KEGUNAAN PEMERIKSA SAHAJA

**SKEMA
PEMARKAHAN**

PERATURAN PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM TAHUN 2022

MATEMATIK TAMBAHAN (3472/1)

TINGKATAN 5

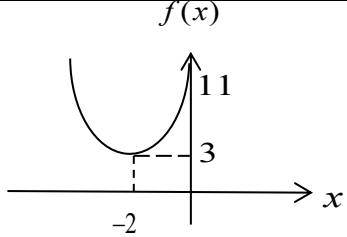
KERTAS 1

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
1 (a)	$3\sqrt{5}$	P1	4
1 (b)	$256^{\frac{1}{2x+1}}$ atau $512^{\frac{1}{2x+2}}$ atau 2^8 atau 2^9	K1	
	$\frac{8}{2x+1} = \frac{9}{2x+2}$	K1	
	$x = \frac{7}{2}$	N1	
2	$xy = \frac{1}{k}x^2 - \frac{h}{k}$	P1	4
	$\frac{1}{3} = \frac{1}{h}$	K1	
	$\frac{-h}{k} = -2$	K1	
	$h:k = 2:1$	N1	
3 (a)	$\cos\theta = -p$	P1	6
	$-\frac{1}{p}$	N1	
3 (b)	$\tan\theta = -\frac{q}{p}$ or $q = \sqrt{1-p^2}$	P1	
	$\frac{1 + \left(-\frac{q}{p}\right)}{1 - \left(-\frac{q}{p}\right)}$	K1	
	$\frac{p-q}{p+q}$	K1	

	$\frac{p - \sqrt{1 - p^2}}{p + \sqrt{1 - p^2}}$ atau SETARA	N1	
4 (a)	$(x+2)(x-2) < 0$ $-2 < x < 2$	K1 N1	5
4 (b)	$HTP = \alpha \times \frac{1}{\alpha} = \frac{2}{m}$ $(-5)^2 - 4(1)(1)$ 21	K1 K1 N1	
5	$Let\ x = a$ <i>titik persilangan</i> $(a, \frac{7-a^2}{2})$ $\int_{-a}^a \frac{7}{2} - \frac{x^2}{2} dx - (2a \times \frac{7-a^2}{2}) = \frac{2}{3}$ $\left[\frac{7x}{2} - \frac{x^3}{6} \right]_{-a}^a - (7a - a^3) = \frac{2}{3}$ $a = 1$ $y = p = \frac{7-1^2}{2} = 3$	 K1 K1 N1 N1	4
6 (a)(i)	$\overrightarrow{LN} = \overrightarrow{LM} + \overrightarrow{MN}$ $\underline{a} - \underline{b}$	K1 N1	7
(ii)	$-2\underline{a} - 6\underline{b}$	N1	
6 (b)(i)	$\overrightarrow{OR} = 3 \begin{pmatrix} -3 \\ -2 \end{pmatrix} - 4 \begin{pmatrix} -1 \\ 1 \end{pmatrix}$ $R(-5, -2)$	K1 K1	
(ii)	$ \overrightarrow{QR} = \sqrt{(-4)^2 + (-3)^2}$ 5	K1 N1	
7 (a)	$x^2 - 7x + 12 = 0$ $(x-3)(x-4) = 0$ $a = 3$ dan $b = 4$	K1 N1	7

7 (b)	let $\frac{x+1}{x+2} = y$, atau apa-apa huruf selain x dan m $x = \frac{2y-1}{1-y}$ $f(y) = \frac{\frac{2y-1}{1-y}}{\frac{2y-1}{1-y} + 3}$ $\frac{2m-1}{2-m} = 2$ $m = \frac{5}{4}$	K1	
		N1	
		K1	
		K1	
		N1	
8 (a)	$m_{AB} = -\frac{1}{2}$ (use $m_1 \times m_2 = -1$) $y-3 = -\frac{1}{2}(x+10)$ $y = -\frac{x}{2} - 2$	K1	6
		K1	
		N1	
8 (b)	$-\frac{x}{2} - 2 = 2x - 7$ $x = 2$ Aina(2, -3)	K1	5
		N1	
		N1	
9(a)	$xy, \frac{1}{4}xy, \frac{1}{16}xy \dots$ $r = \frac{1}{4}$	P1	5
		N1	
9(b)	$a = 12800$ $(12800)\left(\frac{1}{4}\right)^{n-1} = \frac{25}{512}$ $n = 10$	P1	
		K1	
		N1	

10	$2\log_a p + \log_a q = h$ atau $\log_a q - 3\log_a p = k$ $\log_a p = \frac{h-k}{5}$ $\log_a q = \frac{3h+2k}{5}$ $\frac{h-k}{5} - \left(\frac{3h+2k}{5}\right)$ $\frac{-2h-3k}{5}$	P1 K1 K1 K1 N1	5
11 (a)	$r^2 + 2r = 0$ $r = 0$ dan $r = -2$	K1 N1	6
11 (b)	Kes 1 (tiada secaman) ${}^7P_5 = 2520$ Kes 2 (hanya 1 secaman) $\frac{{}^2C_1 \times {}^5C_3 \times 5!}{2!} = 1200$ Kes 3 (2 secaman) $\frac{{}^2C_2 \times {}^5C_1 \times 5!}{2!2!} = 150$ 3870	K1 K1 K1 N1	
12 (a) (b)	sisihan piawai, $\sigma = \sqrt{npq} = \sqrt{100 \times 0.95 \times 0.05}$ $\frac{\sqrt{19}}{2} = 2.1794$ $P(X=1) = P(X=2)$ ${}^nC_1 (0.05)^1 (0.95)^{n-1} = {}^nC_2 (0.05)^2 (0.95)^{n-2}$ $n = \frac{{}^nC_2}{19}$ atau $19n = \frac{n!}{(n-2)!2!}$ $n = 39$	K1 N1 K1 K1 N1	5
13(a)	$a\left(x^2 + \frac{b}{a}x + \frac{c}{a}\right) = 0$ $(x-\alpha)(x-\beta) = 0$ $x^2 - (\alpha+\beta)x + \alpha\beta = 0$ $\alpha + \beta = -\frac{b}{a}$ $\alpha\beta = \frac{c}{a}$	P1 K1 K1 N1 N1	8

(b)	 Graf minimum dan pintasan-$y=11$ Titik minimum $(-2, 3)$ $f(x) = 2(x-1)^2 + 3$	N1 N1 N1	
14(a)	$\frac{3(x+\delta x)^2 - 6(x+\delta x) + 5 - (3x^2 - 6x + 5)}{\delta x}$ $\lim_{\delta x \rightarrow 0} 6x + 3\delta x - 6$ $\frac{dy}{dx} = 6x - 6$	K1 N1	8
14(b)	$6x - 6 = 0$ $(1, 2)$	K1 N1	
14(c)	$m_{\text{tangen}} = 6(2) - 6$ $y - 5 = -\frac{1}{6}(x - 2)$ $y = -\frac{1}{6}x + \frac{16}{3}$	K1 N1	
15(a)	(a) $\angle COD = 2 \sin^{-1} \left(\frac{8.66}{10} \right)$ atau 120° 2.095	K1 N1	
15(b)	$S_{BD} = 10 \left(30 \times \frac{3.142}{180} \right) = 5.237$ Perimeter = $2(5.237) + 20 + 17.32$ 47.79 cm	K1 K1 N1	8
15(c)	$\frac{1}{2} \times 10^2 \times \sin 120^\circ$ atau $2 \left(\frac{1}{2} \times 10^2 \times \left[30^\circ \times \frac{3.142}{180} \right] \right)$ $\frac{1}{2} \times 10^2 \times \sin 120^\circ$ + $2 \left(\frac{1}{2} \times 10^2 \times \left[30^\circ \times \frac{3.142}{180} \right] \right)$ 95.67 cm	K1 K1 N1	



**MAJLIS PENGETUA SEKOLAH MALAYSIA (MPSM)
CAWANGAN KELANTAN**

**PERCUBAAN SPM
2022**

**MATEMATIK TAMBAHAN
KERTAS 2**

UNTUK KEGUNAAN PEMERIKSA SAHAJA

**SKEMA
PEMARKAHAN**

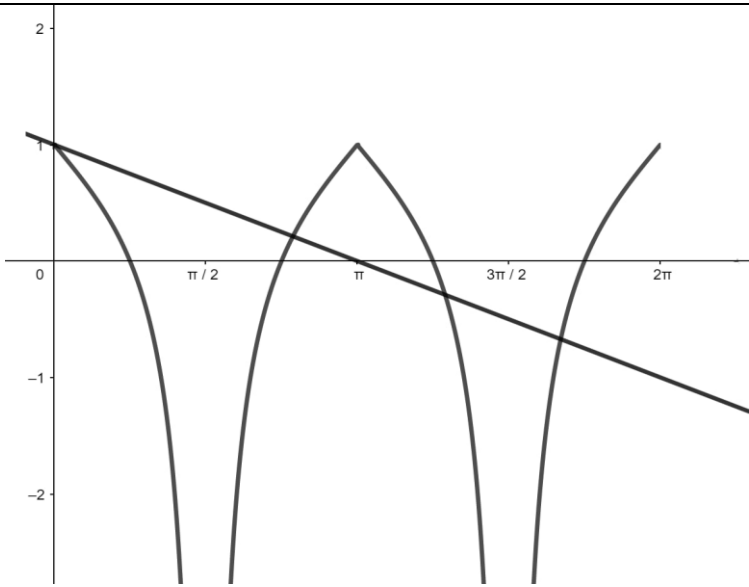
PERATURAN PEMARKAHAN PEPERIKSAAN PERCUBAAN TAHUN 2022

MATEMATIK TAMBAHAN (3472/2)

TINGKATAN 5

KERTAS 2

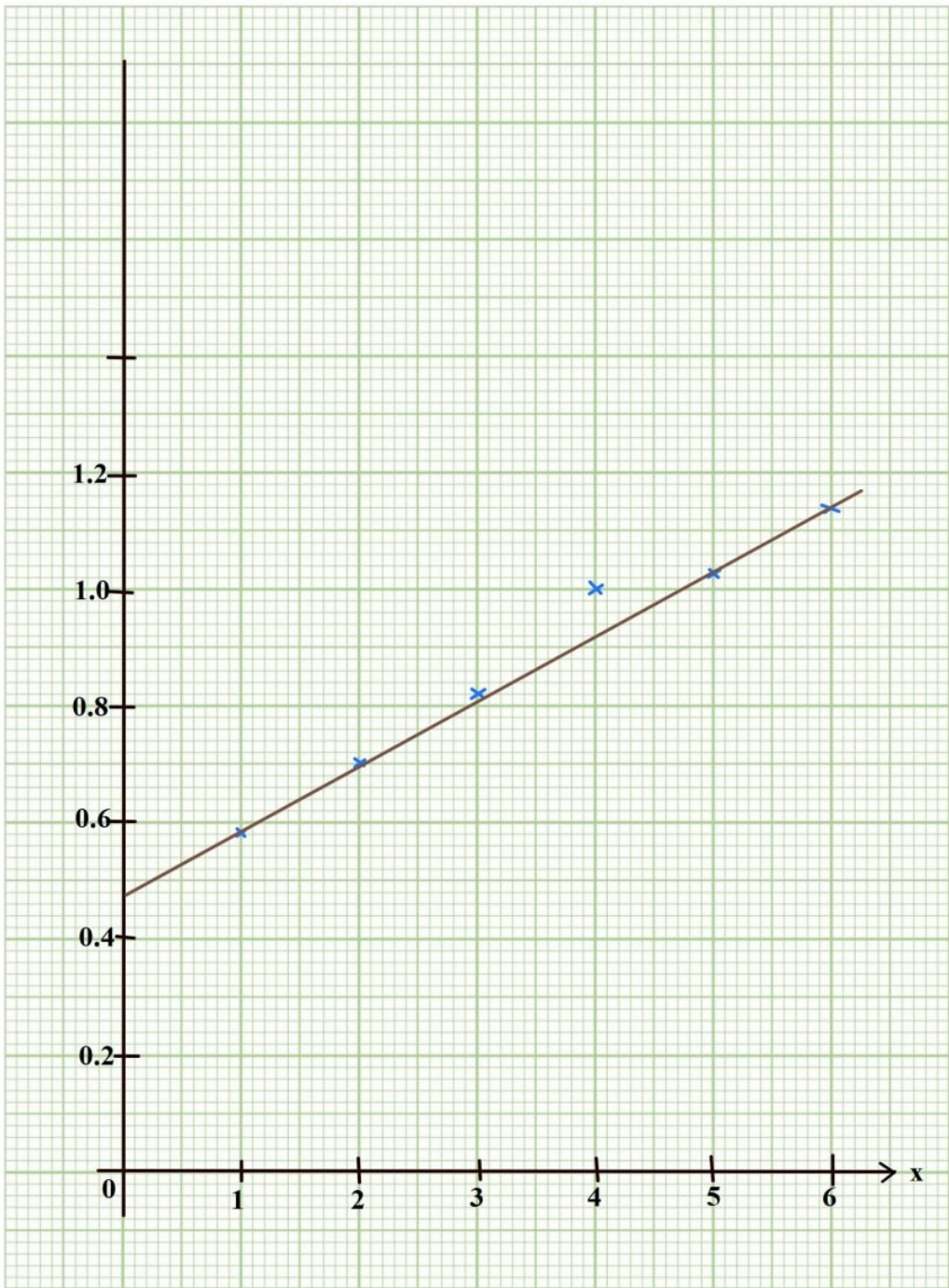
NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
1 (a)	$\cos \theta = \frac{10}{12}$	K1	6
	$\theta = 0.5857$	N1	
1 (b)	$\text{Luas } \triangle OTR = \frac{1}{2}(10)(6.633) \text{ atau } \frac{1}{2}(10)(12)\sin 33.56^\circ$	K1	
	$\text{Luas sektor } ORS = \frac{1}{2}(12)^2(0.5857)$	K1	
	$\text{Luas berlorek} = \text{Luas sektor } ORS - \text{Luas } \triangle OTR$	K1	
	$\text{Luas berlorek} = 9.0054$	N1	
2	$x + y + z = 140$ --- (1)	P1	8
	$3000x + 5000y + 6000z = 630,000$ --- (2)	P1	
	$5500x + 9000y + 11000z = 1,145,000$ --- (3)	P1	
	atau		
	$2500x + 4000y + 5000z = 515000$		
	Hapuskan anu pertama dengan Penggantian@Penghapusan	K1	
	Hapuskan anu kedua dengan Penggantian@Penghapusan	K1	
	$z = 30$ @ $y = 60$ @ $x = 50$	N1	
	$y = 60$ @ $x = 50$ @ $z = 30$	N1	
	$125cc = 50, 150cc = 60, 155cc = 30$ (Accept x, y and z)	N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
3(a)	 Shape of $\tan x$ 1 cycle for $0 \leq x \leq 2\pi$ Modulus graph shifted 1	N1 N1 N1 N1	7
(b)	$-\frac{x}{\pi} + 1$ Graf linier, m negatif dan pintasan $-y = 1$ Bil penyelesaian = 4	K1 N1 N1	
4(a)	Kecerunan tangen pada titik A atau kecerunan garis AB = 4 <i>Kecerunan garis AC</i> , $m_2 = -\frac{1}{4}$ <i>Guna</i> $y - 7 = m_2(x - 2)$ atau setara $y = -\frac{1}{4}x + \frac{15}{2}$	K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
4(b)	$\frac{1}{2}[-5(-4) + (-2)(-1) + 6(3a) + 4(4a) -$ $(-2)4 - 6(-4) - 4a(-1) - (5)(3a)]$ $\frac{1}{2}(53a + 54) = 80$ $a = 2$	K1 K1 N1	7
5 (a)	${}^{10}P_3$ atau ${}^{10}C_3 \times 3!$ 720	K1 N1	6
5 (b)	$(10 - 1)!$	K1	
(i)	362880	N1	
5 (b)	$(8 - 1)! \times 2! \times 2!$	K1	8
(ii)	20160	Ni	
6 (a)	$T_n = S_n - S_{n-1}$ $T_n = an^2 + bn - [a(n-1)^2 + b(n-1)]$ $T_n = 2an - a + b$	K1 N1	
6 (b)	$16a + 4b = 44$ atau $64a + 8b = 152$ $64a + 2(44 - 16a) = 152$ Penghapusan/Penggantian $a = 2$ dan $b = 3$	K1 K1 N1	8
6 (c)	$T_n = 4n + 1$ $T_1 = 4(1) + 1$ atau $T_2 = 4(2) + 1$ atau $T_1 = S_1 = 2(1)^2 + 3(1)$ atau $S_2 = 2(2)^2 + 3(2)$ $d = 9 - 5$ atau $d = T_n - T_{n-1}$ $d = 4$	K1 K1 N1	

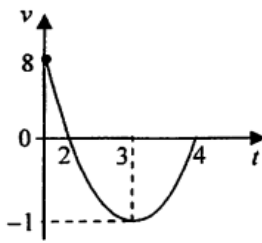
NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
7(a)	$Z = 2(6-k)^2 + 3k^2$ atau $Z = 2h^2 + 3(6-h)^2$ Pembezaan, $\frac{dZ}{dk}$ atau $\frac{dZ}{dh}$ $\frac{dZ}{dk} = 10k - 24$ atau $\frac{dZ}{dh} = 10h - 36$ Guna $\frac{dZ}{dk} = 0$ atau $\frac{dZ}{dh} = 0$ $k = \frac{12}{5}$ dan $h = \frac{18}{5}$ bezakan $\frac{dZ}{dk}$ atau $\frac{dZ}{dh}$ untuk mencari nilai $\frac{d^2Z}{dk^2} = 10$ atau $\frac{d^2Z}{dh^2} = 18$ Titik minimum	P1 K1 K1 K1 N1	8
(b)	$\frac{dy}{dx} = 2(3x-1)(3)$ $2(3x-1)(3) = -6$ (0,1)	K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH							
8(a)	<table><tr><td>$\log_{10} y$</td><td>0.58</td><td>0.70</td><td>0.82</td><td>1.00</td><td>1.03</td><td>1.14</td></tr></table>	$\log_{10} y$	0.58	0.70	0.82	1.00	1.03	1.14	N1	10
$\log_{10} y$	0.58	0.70	0.82	1.00	1.03	1.14				
(b)	Plot $\log_{10} y$ melawan x (Paksi betul dan skala seragam) 6 titik diplot dengan betul. Garis penyuaian terbaik (sekurang-kurangnya 5 titik mesti betul).	K1								
		N1								
		N1								
(c)(i)	$\log_{10} y = \left(\frac{1}{2} \log_{10} n\right) x + \frac{1}{2} \log_{10} p$ $\frac{1}{2} \log_{10} p = 0.48$ $p = 9.12$ $\frac{1}{2} \log_{10} n = \frac{1.03 - 0.70}{5 - 2} \text{ (guna titik pada garis)}$ $n = 1.66$	P1 K1 N1 K1 N1								
(ii)	$y = 8.318$	N1								

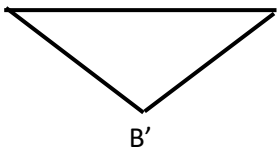
NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH														
8(b)	 The graph shows a scatter plot with a line of best fit on a green grid. The x-axis is labeled 'x' and has major tick marks from 0 to 6. The y-axis has major tick marks from 0.2 to 1.2. There are six data points plotted as blue 'x' marks. A brown line of best fit is drawn through the points, showing a positive linear correlation. <table><tr><th>x</th><th>y</th></tr><tr><td>1</td><td>0.58</td></tr><tr><td>2</td><td>0.70</td></tr><tr><td>3</td><td>0.82</td></tr><tr><td>4</td><td>1.00</td></tr><tr><td>5</td><td>1.02</td></tr><tr><td>6</td><td>1.15</td></tr></table>			x	y	1	0.58	2	0.70	3	0.82	4	1.00	5	1.02	6	1.15
x	y																
1	0.58																
2	0.70																
3	0.82																
4	1.00																
5	1.02																
6	1.15																

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
9 (a)	$LM = LO + OM$ $LM = -\frac{1}{2}a + 3b$	K1 N1	10
9 (b)	$AP = -\frac{1}{2}a + kLM$ $AP = \left(-\frac{1}{2} - \frac{1}{2}k\right)a + 3kb$	K1 N1	
9(c)(i)	$\left(-\frac{1}{2} - \frac{1}{2}k\right)a + 3kb = \lambda(-a + b)$ $\left(-\frac{1}{2} - \frac{1}{2}k\right) = -\lambda \text{ dan } 3k = \lambda$ $\left(-\frac{1}{2} - \frac{1}{2}k\right) = -3k \text{ , (hapuskan satu unknown)}$ $k = \frac{1}{5}$	K1 K1 K1 N1	
9(c)(ii)	$AP = \frac{3}{5}AB$ $\frac{AP}{PB} = \frac{3}{5}$	K1 N1	
10 (a)	$\int_5^6 6y - y^2 dy \text{ or } \frac{1}{2}(5)(5) \text{ or } \int_0^5 y dy$ $A_1 = \left[3y^2 - \frac{y^3}{3}\right]_5^6$ Masukan had $\int_5^6$ ke dalam A_1 Total area = $\frac{8}{3} + \frac{25}{2} \quad (A_1 + A_2)$ $15 \frac{1}{6} \text{ or } \frac{91}{6} \text{ units}^2$	K1 K1 K1 K1 N1	

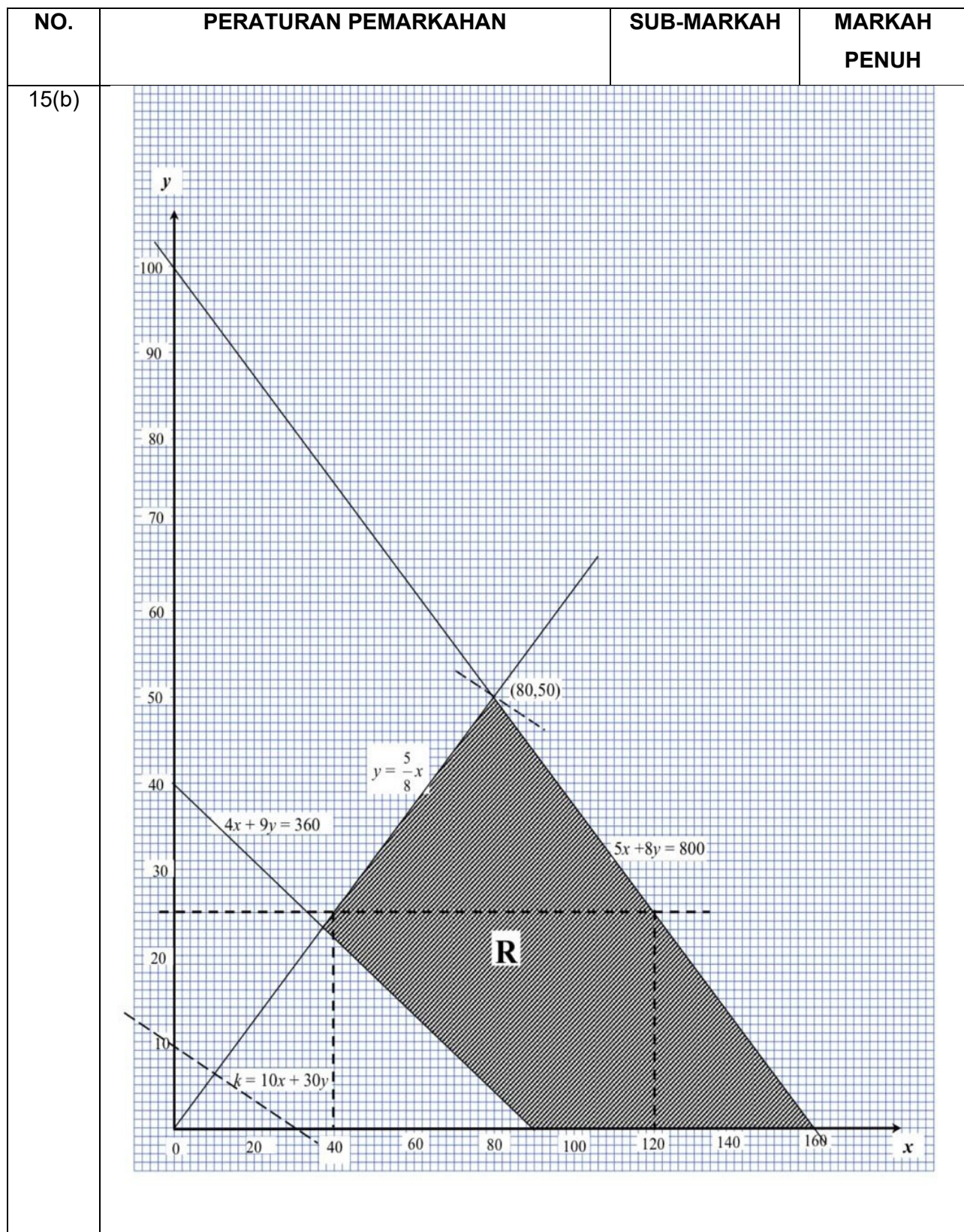
NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
10 (b)	$V = \pi \int_0^{12} x + 4 dx - \frac{1}{9} \pi \int_0^{12} x^2 dx$ $= \pi \left[\frac{x^2}{2} + 4x \right]_0^{12} - \frac{1}{9} \pi \left[\frac{x^3}{3} \right]_0^{12}$ Masukan had $\int_0^{12}$ ke dalam A_1 atau A_2 $= 120\pi - 64\pi \quad (A_1 > A_2)$ $= 56\pi$	K1 K1 K1 K1 N1	10
11 (a)(i)	$np = 150$ atau $\sqrt{npq} = 9.5$ $\sqrt{150q} = 9.5$ $p = 0.3983$	K1 K1 N1	10
11(a) (ii)	${}^{10}C_8 (0.3983)^8 (0.6017)^2$ atau ${}^{10}C_9 (0.3983)^9 (0.6017)^1$ atau ${}^{10}C_{10} (0.3983)^{10} (0.6017)^0$ $1 - {}^{10}C_8 (0.3983)^8 (0.6017)^2 - {}^{10}C_9 (0.3983)^9 (0.6017)^1$ $- {}^{10}C_{10} (0.3983)^{10} (0.6017)^0$ 0.9881	K1 K1 N1	
11 (b)	$z = \frac{18 - 34.5}{12.75}$ atau $z = \frac{21 - 34.5}{12.75}$ $P(18 < X < 21) = P(z < -1.059) - P(z < -1.294)$ $= 0.1448 - 0.0978$ <i>Baucar</i> = 0.047×500 24@25	K1 K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
12(a)	$\frac{dv}{dt} = 2t - 6 = 0$ $t = 3$ $v(3) = -1$	K1 N1	
12 (b)	$(t-2)(t-4) > 0$ $0 \leq t < 2, t > 4$	K1 N1	
(c)	 • Bentuk graf minimum • Melalui titik (0, 8) dan (4, 0)	P1 P1	
(d)	Guna limit betul $\int_0^2 v dt + \left \int_2^4 v dt \right $	K1	
(e)	$\left \left[\frac{t^3}{3} - 3t^2 + 8t \right]_0^2 + \left[\frac{t^3}{3} - 3t^2 + 8t \right]_2^4 \right $ $\left \left[\frac{2^3}{3} - 3(2)^2 + 8(2) \right] - 0 \right +$ $\left \left[\frac{(4)^3}{3} - 3(4)^2 + 8(4) \right] - \left[\frac{2^3}{3} - 3(2)^2 + 8(2) \right] \right $ 8	K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
13 (a)	$\frac{96.00}{Q_{2020}} \times 100 = 120$ <i>RM80.00</i>	K1 N1	10
(b)	$\frac{115}{100} \times \frac{140}{100} \times 100 \text{ or } \frac{105}{100} \times \frac{120}{100} \times 100 \text{ or } \frac{90}{100} \times \frac{150}{100} \times 100$ <i>J = 161</i> <i>K = 126</i> <i>L = 160</i> <i>M = 135</i> Betul keempat-empat Betul tiga	K1 N2 N1	
(c)(i)	$\frac{161 + 126 + 160 + 135}{4}$ <i>145.5</i>	K1 N1	
(ii)	$\frac{70.50}{Q_{2020}} \times 100 = 145.5 \quad \text{atau} \quad \frac{145.5 \times 100}{142.5}$ $\frac{Q_{2021}}{48.45} \times 100 = 142.5 \quad \text{atau} \quad \frac{70.50}{Q_{2021}} \times 100 = 102.11$ <i>RM69.04 atau RM69.05 (guna kaedah jadual)</i>	K1 K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
14(a)	$\frac{\sin \angle ABE}{8} = \frac{\sin 30^\circ}{6}$ $\angle ABE = 41.81^\circ$ $EC^2 = 6^2 + 10^2 - 2(6)(10)\cos 138.19^\circ$ $EC = 15.01$	K1 N1 K1 N1	10
14(b)	$\frac{1}{2}(12)(15.01)\sin \angle CDE = 50$ $\angle CDE = 33.72^\circ$	K1 N1	
14(c)(i)&(ii)	 $\angle A'E'B' = 108.19^\circ - 96.38^\circ = 11.18^\circ$ $\text{Luas } \triangle A'B'E' = \frac{1}{2}(8)(6)\sin 11.18^\circ$ $\text{Luas } \triangle A'B'E' = 4.912$	N1 K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
15(a)	$8x + 18y \geq 720$ atau setara $5x + 8y \leq 800$ atau setara $8y \leq 5x$ atau setara	N1 N1 N1	10
(b)	Lukis dgn betul sekurang-kurangnya satu garis lurus drp ketaksamaan yg melibatkan x dan y Lukis dgn betul ketiga-tiga garis lurus rantau berlorek	K1 K1 N1	
(c)	(i) Bil. maksimum = 120 Bil. minimum = 40 (ii) Gunakan $10x + 30y$ utk titik dalam rantau $10(80) + 30(50)$ RM 2300	N1 N1 K1 N1	



SKEMA PEMARKAHAN

No.	Skema Pemarkahan	Submarks	Total Marks
1(a)	$3k^{\frac{1}{2}+(-\frac{1}{3})}$	1	4
	$3k^{\frac{1}{6}}$	1	
1(b)	$(5^x)(5) - (5^x)(5)^{-1} + (5^x)$	1	
	29(5 ^{x-1}) boleh dibahagi tepat dengan 29 bagi semua integer positif x atau 5 ^{x-1}	1	
2	$\cos \angle AOL = \frac{16}{20}$ atau $\sin \angle AOL = \frac{12}{20}$ atau $\tan \angle AOL = \frac{12}{16}$	1	4
	$\angle AOB = 73.74^\circ$ atau 1.287 rad	1	
	20×1.287 atau $\frac{73.74}{360} \times 2\pi(20)$	1	
	25.74	1	
3	$xy = 7 - x$	1	4
	$a = 7$	1	
	$3 = 7 - b$ ATAU $-1 = \frac{7-3}{0-b}$	1	
	$b = 4$ $b = 4$	1	
4(a)	$\cos x = \frac{90}{L}$	1	
	$L = \frac{90}{\cos x}$		
	$= \frac{90}{(1-2\sin^2 \frac{x}{2})}$	1	
	$= \frac{90}{1-2(2t)^2}$ $= \frac{90}{1-8t^2}$	1	

4(b)	$\cos \frac{x}{2} = \sqrt{1 - 4t^2}$ $\frac{2t}{\sqrt{1-4t^2}}$	1	5
5(a)	$99N = 54$ $N = \frac{6}{11}$	1	
5(b)	$\frac{1}{2}(\sqrt{5} + \sqrt{2})(2\sqrt{5} - \sqrt{2})$ $= \frac{1}{2}[(2 \times 5) - \sqrt{2}\sqrt{5} + 2\sqrt{2}\sqrt{5} - 2] \text{ atau setara}$ $= 4 + \frac{1}{2}\sqrt{10}$	1	5
6(a)	$2\overrightarrow{AB} = \overrightarrow{DC}$ $2\overrightarrow{AB} = -\overrightarrow{CD}$ $2[(h+2)\underline{i} - 3\underline{j}] = -(2\underline{i} + 3k\underline{j})$ $2(h+2)\underline{i} - 6\underline{j} = -2\underline{i} - 3k\underline{j}$ <i>Bandingkan</i> $2(h+2) = -2$ $2h+4 = -2$ $h = -3$ <i>Bandingkan</i> $-3k = -6$ $k = 2$	1	
6(b)	$ \overrightarrow{AB} = \sqrt{(-1)^2 + (-3)^2}$ $= \sqrt{10}$ vektor unit dalam arah $\overrightarrow{AB} = \frac{-\underline{i}-3\underline{j}}{\sqrt{10}}$	1	5
7(a)	$f(x) = \frac{4}{(1-2x)^3}$ $f'(x) = (4)(-3)(1-2x)^{-4}(-2)$ $= 24(1-2x)^{-4}$ m + n = 20	1	

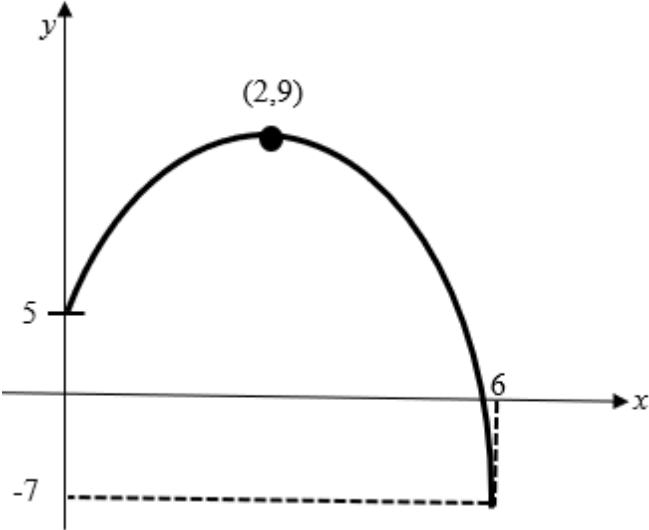
7(b)	$\frac{1}{p} \int f'(x) dx = -\frac{1}{81}$ $\frac{1}{p} \left(\frac{4}{(1-2x)^3} \right) = -\frac{1}{81}$ $\frac{1}{p} \left\{ \frac{4}{[1-2(2)]^3} \right\} = -\frac{1}{81}$ p = 12	1	1	5
8(a) (i)	$C(x,y) = \left(\frac{2(-12)+1(3)}{1+2}, \frac{2(1)+1(7)}{1+2} \right)$ $= (-7, 3)$	1	1	6
(a) (ii)	$y - 1 = \frac{2}{5}(x - (-12))$ $y = \frac{2}{5}x + \frac{29}{5}$ or equivalent	1	1	
8(b)	$\sqrt{(x-3)^2 + (y-7)^2} = 6$ $x^2 - 6x + 9 + y^2 - 14y + 49 = 36$ $x^2 + y^2 - 6x - 14y + 22 = 0$	1	1	
9(a)	$\sqrt{25p(1-p)} = \sqrt{\frac{50}{9}}$ or $25p(1-p) = \frac{50}{9}$ $9p^2 - 9p + 2 = 0$ $p = \frac{1}{3}$ $25 \times \frac{1}{3}$ $\frac{25}{3}$	1	1	6
9(b)(i)	0.7881	1		
(ii)	Skor-z = -0.8 $\frac{X - 84}{5} = -0.8$ X = 80	1	1	

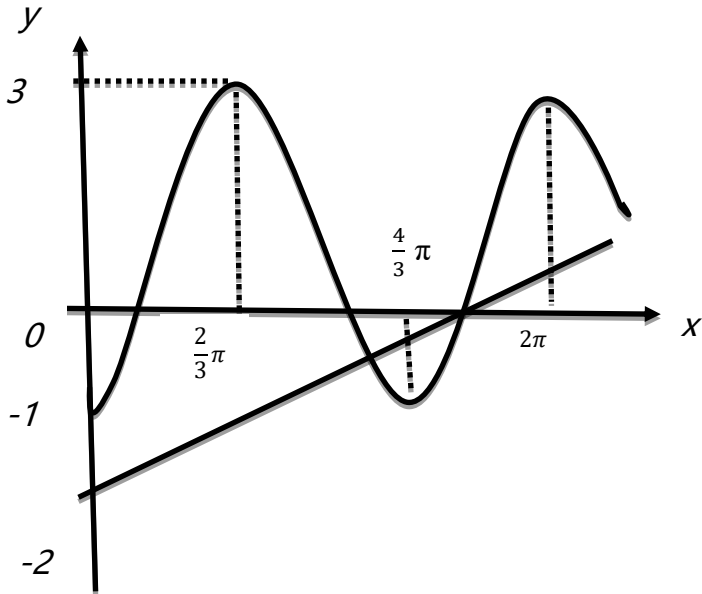
10(a)	a b c b a digit pertama : hanya 9 pilihan sahaja (kecuali 0) digit ke-5: 1 pilihan sahaja, iaitu ikut pilihan digit pertama. digit ke-2: 10 pilihan digit ke-4: 1 pilihan sahaja, iaitu ikut pilihan digit ke-2 digit ke-3: 10 pilihan. Skema: Digit pertama, 9 Digit kedua atau ketiga, 10 atau Digit ke-empat atau ke-lima, 1 $9 \times 10 \times 10 \times 1 \times 1$ $= 900$	1 1 1 1	
10(b)	${}^8C_6 \times {}^6C_3$ 560	1 1	6
11(a)	$3x + 2y + z = 90$ $4x + 3y + z = 122$ $6x + y + 4z = 148$	1 (mana2 satu betul) 1 (semua betul)	
11(b)	Hapuskan salah satu pemboleh ubah $x + y = 32$ $10x + 11y = 340$ or other valid method Hapuskan satu lagi pemboleh ubah sehingga tinggal satu pemboleh ubah $x = 12, y = 20, z = 14$	1 1 1,1,1	7
12(a)(i)	Selanjut	1	
12(a)(ii)	Domain = $0 \leq x \leq 2\sqrt{2} + 2$ atau setara Kodomain = $0 \leq f(x) \leq 8$ Julat = $0 \leq f(x) \leq 8$	1 1 1	

14(a)(i)	$S_n = a + (a+d) + (a+2d) + \dots + [a+(n-2)d] + [a+(n-1)d]$ atau (hasil tambah n sebutan pertama ditulis dengan terbalikkan susunan) $S_n = [a+(n-1)d] + [a+(n-2)d] + \dots + (a+2d) + (a+d) + a$ $2S_n = [2a+(n-1)d] + [2a+(n-1)d] + \dots + [2a+(n-1)d]$ $2S_n = n[2a+(n-1)d]$ dan lihat $S_n = n/2 [2a+(n-1)d]$	1 1 1	8
14(a)(ii)	$S_n = \frac{n}{2} [2(3) + (n-1)(4)]$ $2n^2 + n$	1 1	
14(b)	$2n^2 + n = 1275$ $3 + (25-1)(4)$ atau $1275 - [2(24)2 + 24]$ atau $\frac{25}{2} [3 + x] = 1275$ $x = 99$	1 1 1	
15(a)	Biarkan panjang = y $2x + 2y + \pi x = 120$ $y = 60 - x - \frac{1}{2} \pi x$ $L = 2xy - \frac{1}{2} \pi x^2$ $L = 2x \left(60 - x - \frac{1}{2} \pi x \right) - \frac{1}{2} \pi x^2$ $L = 120x - 2x^2 - \frac{3}{2} \pi x^2$	1 1 1	8
15(b)	$\frac{dL}{dx} = 120 - 4x - 3\pi x$ Bila L maksimum, $\frac{dL}{dx} = 0$ $120 - 4x - 3\pi x = 0$ $x = \frac{120}{(4+3\pi)}$	1 1 1	
15(c)	$\frac{dL}{dt} = -0.02$ $\frac{dA}{dr} = 8\pi$, Biar A = luas semi bulatan $\frac{dr}{dt} = \frac{\frac{dA}{dt}}{\frac{dA}{dr}}$ $\frac{dr}{dt} = -\frac{0.02}{8\pi}$ $= -\frac{1}{400\pi}$	1 1	

**Peraturan Pemarkahan Ujian Diagnostik 3 Tingkatan 5 Matematik Tambahan
(Kertas 2 / 2022)**

No	Solutions and marking Scheme	Sub marks	Total Marks
1	$y = 3x - 2$ $2x^2 + 3y^2 - 5xy - 16 = 0$ $2x^2 + 3(3x - 2)^2 - 5x(3x - 2) - 16 = 0$ $7x^2 - 13x - 2 = 0$ $(x - 2)(7x + 1) = 0$ $x = 2 \quad x = -\frac{1}{7}$ $y = 3(2) - 2$ $= 4$ $y = 3(-\frac{1}{7}) - 2$ $= -2\frac{3}{7}$	1 1 1 1 1	5
2(a)	$b > 0$ atau $b \neq 1$	1	6
2(b)	$\log_p(\frac{p}{\sqrt{q}} \times \sqrt{p}\sqrt{q})$ $1 + \frac{1}{2} \log_n n$ atau setara $\frac{3}{2}$	1 1 1	
2(c)	$\log_{14} 6 = \frac{\log_2 6}{\log_2 14}$ atau $\frac{\log_2 3 + \log_2 2}{\log_2 7 + \log_2 2}$ $\frac{x + 1 - y}{y}$	1 1	

3(a) i)	$\frac{x^{10}}{x^5}$ atau $\frac{x^{15}}{x^{10}}$ atau $\frac{x^{20}}{x^{15}}$	1	7
	x^5	1	
	(a) ii) $\frac{1}{31} = \frac{x^5}{1-x^5}$	1	
	$\frac{1}{2}$	1	
	(b) $2ar - a = ar^2 - 2ar$ $\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)}$ $2 + \sqrt{3}$ or equivalent	1 1 1	
4 (a)	$2 - p = 0$ or $3q = 9$	1	8
	$p = 2, q = 3$	1, 1	
	(b) At $x = 0, f(x) = 5$ or $x = 6, f(x) = -7$	1	
	Maximum point	1	
	Correct shape	1	
(c)			
	(i) $f(x) = (x - 2)^2 - 9$	1	
	(ii) $f(x) = -(x + 2)^2 + 9$	1	

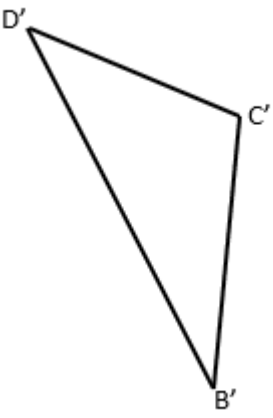
5(a)	$\frac{\sqrt{3^2 + 4^2}}{5}$ atau $\frac{9 - 4}{5}$	1 1	8
	(b) $\tan \angle OAB = \frac{3}{4}$ atau $\sin \angle OAB = \frac{3}{5}$ atau $\cos \angle OAB = \frac{4}{5}$ 2.4985 / 2.4984	1 1	
	(c) $\frac{1}{2}(5)^2(2.4985)$ $\frac{1}{2}(5)(5)(\sin 2.4985)$ atau $\frac{1}{2}(5)(5)(\sin 143.13)$ $\frac{1}{2}(5)^2(2.4985) - \frac{1}{2}(5)(5)(\sin 2.4985)$ atau $\frac{1}{2}(5)^2(2.4985) - \frac{1}{2}(5)(5)(\sin 143.13)$ 23.73 / 23.74	1 1 1 1	
6 (a)	Gunakan $\frac{a}{c} = \sin x$ dan $\frac{b}{c} = \cos x$ dalam teorem Pythagoras $a^2 + b^2 = c^2$ $\sin^2 x + \cos^2 x = 1$	1 1	8
	(b) i)  y = $\frac{x}{3} - \frac{3}{2}$ (b) ii) Sketch *straight line correctly Number of solutions = 2	1 (negative cos graph) 1 (shifted vertically +1) 1 ($\frac{3}{2}$ cycle in 360°) 1 1 1	

7	(a) i. $\overrightarrow{TS} = \overrightarrow{TR} + \overrightarrow{RS}$ or $\overrightarrow{TK} = \overrightarrow{TR} + \overrightarrow{RK}$ $\overrightarrow{TS} = -8\hat{x} + 10\hat{y}$ ii. $\overrightarrow{TK} = -8\hat{x} + 6\hat{y}$ (b) i. $\overrightarrow{TQ} = \overrightarrow{TR} + \overrightarrow{RQ}$ $= -8\hat{x} + n(\overrightarrow{RL})$ $= -8\hat{x} + n(\overrightarrow{RT} + \overrightarrow{TL})$ $= -8\hat{x} + n(8\hat{x} + \frac{1}{3}(-8\hat{x} + 10\hat{y}))$ $= -8\hat{x} + \frac{16}{3}n\hat{x} + \frac{10}{3}n\hat{y}$ $\overrightarrow{TQ} = \left[\frac{16}{3}n - 8\right]\hat{x} + \frac{10}{3}n\hat{y}$ ii. $\left[\frac{16n}{3} - 8\right]\hat{x} + \frac{10}{3}n\hat{y} = \lambda[-8\hat{x} + 6\hat{y}]$ or equivalent $-8\lambda = \frac{16n}{3} - 8$ or $\frac{10n}{3} = 6\lambda$ $n = \frac{9}{11}$	1 1 1 1 1 1 1 1	8														
8	(a) <table border="1"><tr><td>R</td><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>10</td></tr><tr><td>$\frac{P - 200}{R}$</td><td>1.00</td><td>-0.10</td><td>-0.50</td><td>-2.00</td><td>-2.88</td><td>-4.00</td></tr></table> Graf (Rujuk Lampiran) 1 titik diplot dengan betul dan skala yang seragam 6 titik diplot dengan betul Garis lurus penyuaian terbaik (b) i) $P - 200 = aR - bR^2$ $\frac{P - 200}{R} = -bR + a$ pintasan-Y , $a = 1.45 \leftrightarrow 1.55$ (b) ii) kecerunan , $-b = m$ and use any two points on LBF to m $b = 0.55 \leftrightarrow 0.56$	R		1	3	4	6	8	10	$\frac{P - 200}{R}$	1.00	-0.10	-0.50	-2.00	-2.88	-4.00	1 1 1 1 1 1 1 1
R	1	3	4	6	8	10											
$\frac{P - 200}{R}$	1.00	-0.10	-0.50	-2.00	-2.88	-4.00											

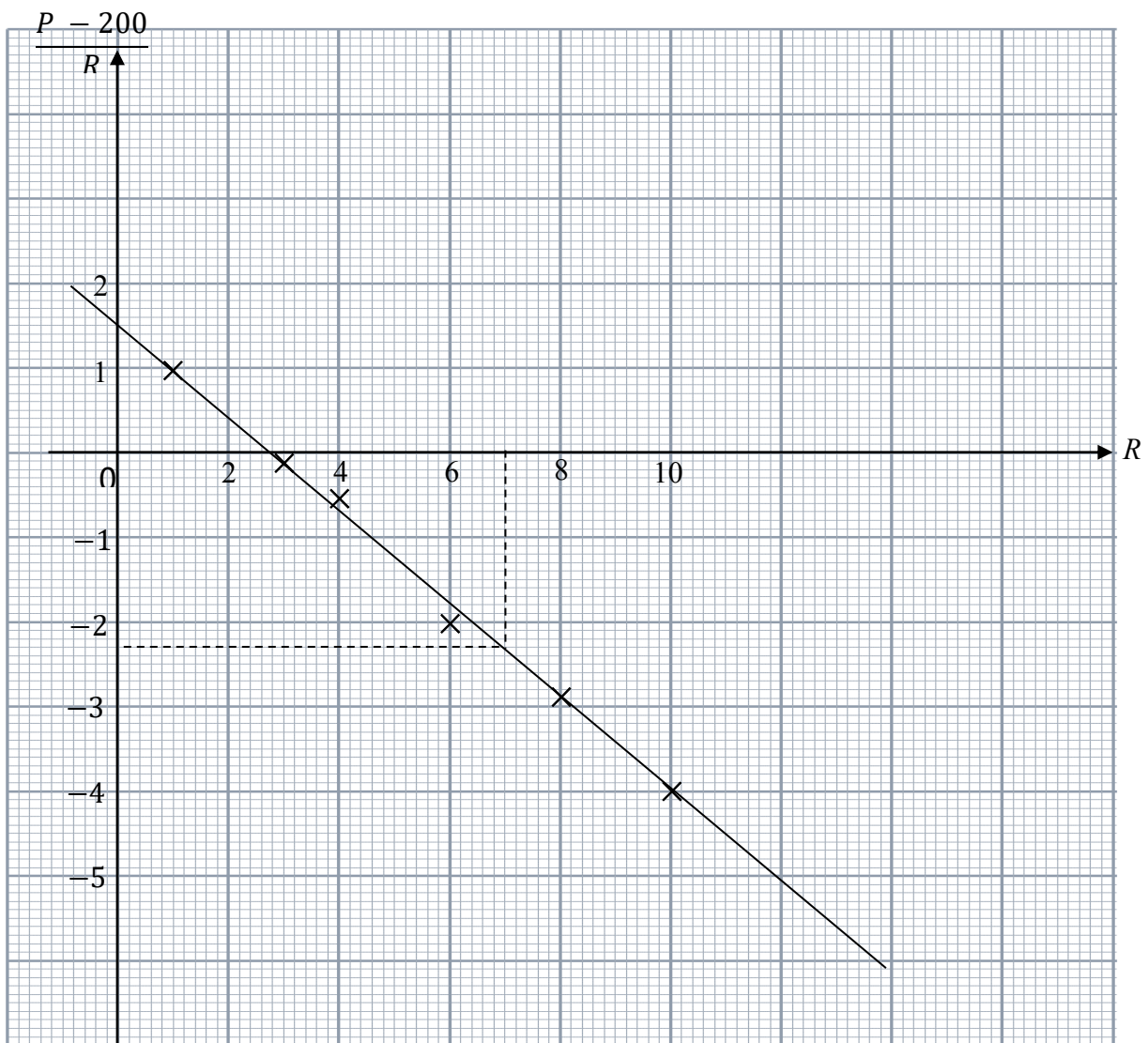
(c)	Bila $R = 7$ $\frac{P-200}{R} = -2.3$ $P = 183.9$	1 1	
9	$m_{HG} = m_{EF} = 2$ $y - 13 = 2(x - 8)$ $y - 13 = 2x - 16$ $y = 2x - 3$	1 1	10
	$m_{EH} = -\frac{1}{2}$ $y - 3 = -\frac{1}{2}(x - (-2))$ $y - 3 = -\frac{1}{2}x - 1$ $y = -\frac{1}{2}x + 2$	1 1 1	
	$2x - 3 = -\frac{1}{2}x + 2$ $\frac{5}{2}x = 5$ $x = 2$ <i>or</i> $y = 2(2) - 3$ $= 1$ $H(2, 1)$	1 1	
	$\text{Luas segi empat tepat } EFGH = 2 \times \Delta EGH$ $= 2 \times \frac{1}{2} \begin{vmatrix} -2 & 8 & 2 & -2 \\ 3 & 13 & 1 & 3 \end{vmatrix}$ $= (-2)(13) + (8)(1) + (2)(3) - ((3)(8) + (13)(2) + (1)(-2)) $ $= -12 - 48 $ $= 60 \text{ unit}^2$	1 1 1	

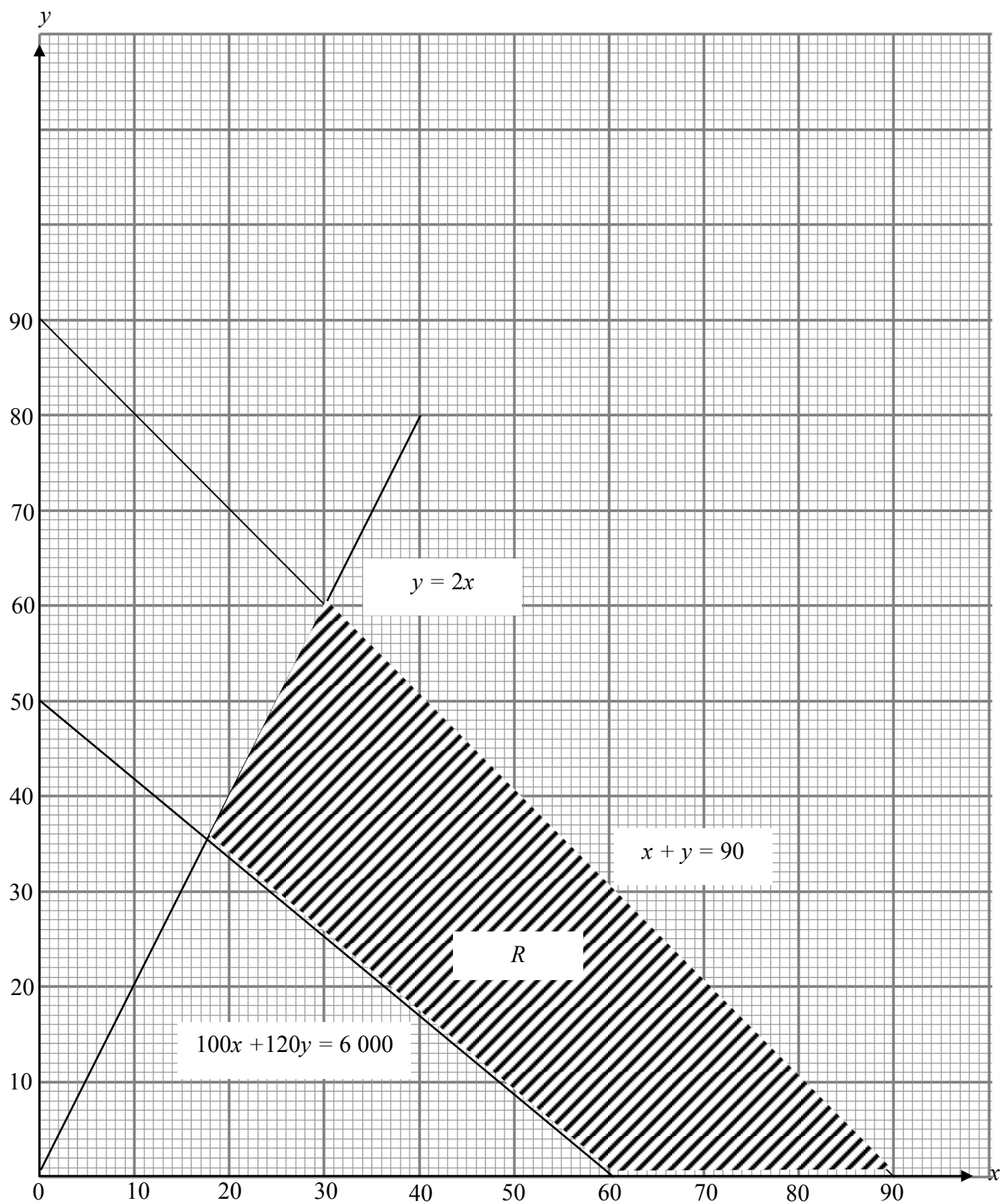
10	$\frac{dy}{dx} = 2x - \frac{2}{x^2}$ Pada titik pegun , $\frac{dy}{dx} = 0$, $x = k$, maka $2k - \frac{2}{k^2} = 0$ $k = 1$	1 1	10																
	<table><tr><td>x</td><td>0.5</td><td>1</td><td>1.5</td></tr><tr><td>$\frac{dy}{dx}$</td><td>-7</td><td>0</td><td>$2\frac{1}{9}$</td></tr><tr><td>tangen tangent</td><td></td><td></td><td></td></tr><tr><td colspan="4">(1, 8) merupakan titik minimum.</td></tr></table>	x		0.5	1	1.5	$\frac{dy}{dx}$	-7	0	$2\frac{1}{9}$	tangen tangent				(1, 8) merupakan titik minimum.				1 1 1
x	0.5	1		1.5															
$\frac{dy}{dx}$	-7	0	$2\frac{1}{9}$																
tangen tangent																			
(1, 8) merupakan titik minimum.																			
	$\int_0^3 (y^2 + 10) dy \text{ or } \frac{1}{2} (1 + k)(3)$ $\int_0^3 (y^2 + 10) dy - \frac{1}{2} (1 + k)(3) = 9$ $\left[\frac{y^3}{3} + 10y \right]_0^3 - \frac{3}{2} - \frac{3}{2}k = 9$ $\left[\left(\frac{3^3}{3} + 10 \times 3 \right) - 0 \right] - \frac{3}{2} - \frac{3}{2}k = 9$ $k = 19$	1 1 1 1 1																	

11	(a) i)	$\frac{16.5-12}{\sigma} = 2.25$ $\sigma = 2$	1	10
			1	
	(a) ii)	Skor -z = 0.566 / 0.567	1	
		$\frac{m-12}{2} = 0.566$ atau $\frac{m-12}{2} = 0.567$	1	
		m = 13.13	1	
	(b) i)	${}^6C_0 \left(\frac{3}{7}\right)^0 \left(\frac{4}{7}\right)^6$ =0.03482	1	
			1	
	(b) ii)	1- P(X=0)+P(X=1) +P(X=2) @ P(X=3) + P(X = 4) + P(X =5) +P(X=6) $1 - {}^6C_0 \left(\frac{3}{7}\right)^0 \left(\frac{4}{7}\right)^6 - {}^6C_1 \left(\frac{3}{7}\right)^1 \left(\frac{4}{7}\right)^5 - {}^6C_2 \left(\frac{3}{7}\right)^2 \left(\frac{4}{7}\right)^4$ or ${}^6C_3 \left(\frac{3}{7}\right)^3 \left(\frac{4}{7}\right)^3 + {}^6C_4 \left(\frac{3}{7}\right)^4 \left(\frac{4}{7}\right)^2 + {}^6C_5 \left(\frac{3}{7}\right)^5 \left(\frac{4}{7}\right)^1 + {}^6C_6 \left(\frac{3}{7}\right)^6 \left(\frac{4}{7}\right)^0$ =0.5147@ 0.5148	1	
			1	
12 (a)		56°35'	1	
		$\frac{BD}{\sin 76^\circ 25'} = \frac{10.2}{\sin 56^\circ 35'}$	1	
		11.88	1	
		$8.4^2 = 10^2 + 11.88^2 - 2(10)(11.88)\cos \angle ADB$	1	
(b)		44.12	1	

(c)		1	10
	$\angle B'C'D' = 103^\circ 35'$ or equivalent	1	
(d)	$A_1 = \frac{1}{2}(10)(11.88)\sin 44.12^\circ$ or $A_2 = \frac{1}{2}(11.88)(10.2)\sin 47^\circ$	1	
	$A_1 + A_2 = 41.35 + 44.31$	1	
	85.66	1	
13 (a)	$x = \frac{12}{8} \times 100$ or $\frac{4}{y} \times 100 = 80$	1	10
	$x = 150$ $y = 5$	1,1	
(b)	$\frac{z+1}{z} \times 100 = 140$ OR $\frac{z}{z-1} \times 100 = 140$	1	
	Harga pada tahun 2012 = 3.50	1	
(c) i)	$\frac{150(3.85) + 140(3.25) + 125(0.7) + 80(2.2)}{3.85 + 3.25 + 0.7 + 2.2}$	1	
	129.6	1	
	Menaik/ increase 29.6%	1	
(c) ii)	$\frac{P_{2012}}{4072} \times 100 = 129.6$ dan $*P_{2012} \times 115\%$	1	
	6068.91	1	
	OR		

	$I_{2013/2011} = \frac{129.6 \times 115}{100}$ 6068.91	1 1	
14 (a)	22 $-8t^2 + 8t + 10 = 0$ atau $6t^2 - 9t - 12 = 0$ $t = 1.7247$ atau $t = -0.7247$ (diabaikan kerana $t > 0$) or $t = 2.3508$ atau $t = -0.8508$ (diabaikan kerana $t > 0$) Zarah Q	1 1 1 1	10
(b)	$6t^2 - 9t - 12 = * (-8t^2 + 8t + 10)$ $r = 2$ atau -0.7857 (diabaikan kerana $t > 0$)	1 1	
(c)	$(8t - 8t^2 + 10) - (6t^2 - 9t - 12)$ atau $17t - 14t^2 + 22$ $17 - 28t = 0$ $17(0.6071) - 14(0.6071)^2 + 22$ or equivalent 27.16m	1 1 1 1	
15 (a)	$x + y \leq 90$ $y \leq 2x$ $100x + 120y \geq 6\,000$ or equivalent	1 1 1	10
(b)	Graf (Rujuk Lampiran) 1 garis dilukis betul Semua garis dilukis betul Kawasan R betul	1 1 1	
(c) i)	36	1	
ii)	(30, 60) $100(30) + 120(60)$ RM 2 040	1 1 1	





SULIT

**PROGRAM GEMPUR KECEMERLANGAN
SIJIL PELAJARAN MALAYSIA 2022
NEGERI PERLIS**

**SIJIL PELAJARAN MALAYSIA 2022
MATEMATIK TAMBAHAN
Kertas 1
Peraturan Pemarkahan
November**

3472/1(PP)

UNTUK KEGUNAAN PEMERIKSA SAHAJA

Peraturan pemarkahan ini mengandungi 16 halaman bercetak

No.	Cadangan Penyelesaian Dan Skema Pemarkahan	Markah	Jumlah Markah
2	Gantikan (3,5) ke dalam $y = \frac{p}{x} + 1$ $5 = \frac{p}{3} + 1$ (K1) $p = 12$ (N1) i) $f^{-1}(x) = \frac{12}{x-1}$ (N1) ii) $f^{-1}g(2) = f^{-1}((2-1)^2 + 2)$ (K1) $f^{-1}g(2) = 6$ (N1)		5

No.	Cadangan Penyelesaian Dan Skema Pemarkahan	Markah	Jumlah Markah
3			
(a)	Guna $\lim_{x \rightarrow 6} \frac{(x-6)}{(x-6)(x+6)}$ (K1) $= \frac{1}{(6+6)}$ $= \frac{1}{12}$ (N1)	2	
(b)	Cari $\frac{dy}{dx}$ dan samakan dengan 4 $\begin{aligned} 8x - 12 &= 4 \\ x &= 2 \end{aligned}$ (K1) Gantikan $x = 2$ ke dalam persamaan $y = 4x^2 - 12x + 9$ $\begin{aligned} y &= 4(2)^2 - 12(2) + 9 \\ y &= 1 \end{aligned}$ (K1) Koordinat = (2, 1) (N1)	3	
			5

No.	Cadangan Penyelesaian Dan Skema Pemarkahan	Markah	Jumlah Markah
4	<u>Menggunakan Surd Konjugat</u> $= \left(\frac{2-\sqrt{3}}{2+\sqrt{3}}\right)\left(\frac{2-\sqrt{3}}{2-\sqrt{3}}\right) + \left(\frac{8}{\sqrt{12}}\right)\left(\frac{\sqrt{12}}{\sqrt{12}}\right) \quad (K1)$ $= \frac{(2-\sqrt{3})(2-\sqrt{3})}{4-3} + \frac{(8\sqrt{12})}{12} \quad (K1)$ $= 7 - 4\sqrt{3} + \frac{4\sqrt{3}}{3} \quad (K1)$ $= \frac{21-12\sqrt{3}+4\sqrt{3}}{3} \quad (K1)$ $= \frac{21-8\sqrt{3}}{3} \quad (N1)$		5

No.	Cadangan Penyelesaian Dan Skema Pemarkahan	Markah	Jumlah Markah
5			
(a)	${}^4C_2 + {}^5C_4$ atau ${}^4C_3 + {}^5C_3$ atau ${}^4C_4 + {}^5C_2$ P1 ${}^4C_2 + {}^5C_4 \times {}^4C_3 + {}^5C_3 \times {}^4C_4 + {}^5C_2$ K1 80 N1	3	
(b)	3P_2 P1 $5 \times {}^3P_2$ K1 30 N1	3	
			7

No.	Cadangan Penyelesaian Dan Skema Pemarkahan	Markah	Jumlah Markah
6	$\alpha + \beta = -\frac{2}{3}$ Atau $\alpha\beta = \frac{7}{3}$ dilihat P1		
(a)	$\begin{aligned} HTP &= \alpha + 1 + \beta + 1 \\ &= \alpha + \beta + 2 \\ &= -\frac{2}{3} + 2 \\ &= \frac{4}{3} \end{aligned}$ ATAU K1 $\begin{aligned} HDP &= (\alpha + 1)(\beta + 1) \\ &= \alpha\beta + \alpha + \beta + 1 \\ &= \frac{7}{3} + \left(-\frac{2}{3}\right) + 1 \\ &= \frac{8}{3} \end{aligned}$ $x^2 - \frac{4}{3}x + \frac{8}{3} = 0 \quad \text{atau} \quad 3x^2 - 4x + 8 = 0 \quad \text{N1}$	3	
(b)	$HTP = \frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ $HTP = \frac{\alpha^2 + \beta^2}{\alpha\beta}$ $HTP = \frac{(\alpha+\beta)^2 + -2\alpha\beta}{\alpha\beta} \quad \text{P1}$ $\begin{aligned} &= \frac{\left(-\frac{2}{3}\right)^2 + -2\left(\frac{7}{3}\right)}{\frac{7}{3}} \\ &= \frac{-28}{21} \end{aligned}$ ATAU K1 $\begin{aligned} HDP &= \left(\frac{\alpha}{\beta}\right)\left(\frac{\beta}{\alpha}\right) \\ &= \left(\frac{7}{3}\right) / \left(\frac{7}{3}\right) \\ &= 1 \end{aligned}$ $x^2 - \left(-\frac{28}{21}\right)x + 1 = 0 \quad \text{atau} \quad 21x^2 + 28x + 21 = 0 \quad \text{N1}$	3	6

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
7			
(a)	$\frac{y-0}{x-m} = m$ N1	1	
(b)	$(1, 6)$ $-6 = m(1) - m^2$ $m^2 - m - 6 = 0$ $(m - 3)(m + 2) = 0$ K1 $m = 3, m = -2$ N1	2	
(c)	$m = 3$ $y = 3x - 9$ P1 $x^2 - (3x - 9) = 7 - 6x$ $x^2 + 3x + 2 = 0$ $(x + 1)(x + 2) = 0$ K1 $x = -1, \quad x = -2$ $y = 3(-1) - 9 \quad , \quad y = 3(-2) - 9$ $y = -12 \quad \quad \quad y = -15$ $(-1, -12), \quad (-2, -15)$ N1	3	
			6

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
8	<u>Bank P</u> $a = 45000$ dan $r = 1.05$ P1 $S_5 = \frac{45000 ((1.05)^5 - 1)}{1.05 - 1}$ K1 $S_5 = RM\ 248\ 653.00$ N1 <u>Bank Q</u> $a = 47000$ dan $d = 2000$ $S_5 = \frac{5}{2} [2(47000) + 4(2000)]$ K1 $= \frac{5}{2} [102000]$ $= RM\ 255000.00$ NI Bank Q N1		6

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
9	$\frac{dy}{dx} = 5$ $\int x + 3 \, dx$ $\frac{x^2}{2} + 3x + c = 5$ (K1) Ganti $x = -2$ ke dalam $\frac{x^2}{2} + 3x + c = 5$ (K1) $c = 9$ $\frac{dy}{dx} = \frac{x^2}{2} + 3x + 9 *$ $y = \int \frac{dy}{dx} \, dx$ $y = \frac{x^3}{2(3)} + \frac{3x^2}{2} + 9x + c$ Ganti $y = -11$ dan $x = -2$ $-11 = \frac{(-2)^3}{2(3)} + \frac{3(-2)^2}{2} + 9(-2) + c$ (K1) $c = \frac{7}{2}$ (N1) $y = \frac{x^3}{6} + \frac{3x^2}{2} + 9x + \frac{7}{3}$ (N1)	5	5

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
10	$\sin \alpha = \frac{\sqrt{5}}{3}$ P1 $= \sqrt{(6)^2 - 1^2}$ $= \sqrt{5} \text{ ATAU } -\sqrt{5}$ P1 dilihat $\cos \beta = \frac{-\sqrt{5}}{\sqrt{6}}$ P1 $\cos(\alpha + \beta) = \left(-\frac{2}{3}\right)\left(\frac{-\sqrt{5}}{\sqrt{6}}\right) - \left(\frac{-\sqrt{5}}{3}\right)\left(\frac{1}{\sqrt{6}}\right)$ K1 $\frac{\sqrt{5}}{3\sqrt{6}}$ N1	5	5

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
11			
(a)	$\frac{16}{x} \quad \text{atau} \quad \frac{20}{x+2} \quad \boxed{\text{P1}}$ $\frac{16}{x} = \frac{20}{x+2} \quad \textcircled{\text{K1}}$ $x = 8 \quad \boxed{\text{N1}}$ $\theta = 2 \text{ rad} \quad \textcircled{\text{N1}}$	4	
(b)	$\frac{1}{2} \times 10^2 \times (2) \quad \text{atau} \quad \frac{1}{2} \times 8^2 \times (2) \quad \textcircled{\text{K1}}$ $\frac{1}{2} \times 10^2 \times (2) + \frac{1}{2} \times 8^2 \times (2) \quad \textcircled{\text{K1}}$ $36 \text{ cm}^2 \quad \boxed{\text{N1}}$	3	
			7

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
12			
(a)	$P(z < k) = 1 - 0.7645$ K1 $k = -0.721$ N1	2	
(b)	$\frac{56.4 - \mu}{4.2} = -0.721$ K1 $k = 53.3718$ N1	2	
			4

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
13			
(a)	$\binom{6}{2k-1} = \lambda \binom{3}{4}$ K1 $\lambda = 2$ N1 $k = \frac{9}{2}$ N1	3	
(b)			
(i)	$\overrightarrow{AD} = 2(\overrightarrow{BA} + \overrightarrow{AT})$ N1 $-i - 4j$ N1		
(ii)	$\overrightarrow{DT} = \frac{5}{2}i + 5j$ N1 $\overrightarrow{DT} = \left \sqrt{\left(\frac{5}{2}\right)^2 + 5^2} \right$ K1 $\sqrt{\frac{125}{4}} \text{ unit}^2$ N1	5	
			8

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
14	$\frac{1}{2x^{\frac{1}{2}}}$ P1 $\frac{dy}{dx} = \sqrt{x}(1) + (x - 1)\left(\frac{1}{2\sqrt{x}}\right)$ K1 $\sqrt{x} + \frac{(x-1)}{2\sqrt{x}}$ N1 2.75 N1 (a) $\delta y = 2.75 \times 0.01$ K1 0.0275 N1 (b) $\frac{dy}{dx} = 2.75 \times 0.4$ K1 1.1 N1	4	8

No.	Cadangan Penyelesaian Dan Skema Permarkahan	Markah	Jumlah Markah
15			
(a)	$\log_{10} y = \log_{10} kx^3$ K1 $\log_{10} y = 3 \log_{10} x + \log_{10} k$ N1 $\frac{h-4}{3-0} = 3$ K1 $\log_{10} k = 4$ K1 $h = 13$ N1 10000 N1	6	
(b)	$\frac{y}{x} = \frac{-5}{4}x^2 + 5$ K1 $y = \frac{-5}{4}x^3 + 5x$ N1	2	
			8

**PROGRAM GEMPUR KECEMERLANGAN
SIJIL PELAJARAN MALAYSIA 2022
NEGERI PERLIS**

SIJIL PELAJARAN MALAYSIA 2022
MATEMATIK TAMBAHAN
Kertas 2
Peraturan Pemarkahan
November

3472/2(PP)

UNTUK KEGUNAAN PEMERIKSA SAHAJA

Peraturan pemarkahan ini mengandungi 18 halaman bercetak

No.	Solution and Mark Scheme	Sub Marks	Total Marks
1	$10p + 10p + 16p + q = 112$ P1 $16pq + 8p(6p) = 528$ P1 $q = 56 - 18p$ P1 Hapus satu anu (melibatkan satu persamaan linear dan satu persamaan tak linear dalam sebutan p dan q) $p(56 - 18p) + 3p^2 = 33$ K1 Selesaikan persamaan kuadratik $ax^2 + bx + c = 0$ for $b \neq 0$ K1 Pemfaktoran $(p - 3)(15p - 11) = 0$ Rumus $p = \frac{-(-56) \pm \sqrt{(-56)^2 - 4(15)(33)}}{2(15)}$ N1 $p = 3 \text{ or } p = \frac{11}{15}$ N1 $q = 2$		7

No.	Solution and Mark Scheme	Sub Marks	Total Marks
2			
(a)	$a = 8 \text{ atau } d = 12$ P1 $\frac{n}{2}[2(8) + (n - 1)12] = 400$ K1 $(n - 8)(3n + 2) = 0$ K1 8 N1	4	
(b)	$T_8 = 8 + 7(12)$ K1 92 K1	2	
			6

No.	Solution and Mark Scheme	Sub Marks	Total Marks
3			
(a)	<u>Tulis hukum segitiga</u> (K1) $\overrightarrow{PT} = \overrightarrow{PQ} + \overrightarrow{QT}$ $\frac{15}{4}x + \frac{7}{4}y \quad \boxed{\text{N1}} \quad \boxed{\text{N1}} \quad \frac{-45}{4}x + \frac{7}{4}y$	3	
(b)	Guna $\overrightarrow{PU} = \lambda \overrightarrow{PT}$ (P1) <u>Samakan pekali x dan y</u> (K1) $\frac{45}{4}\lambda = 9 \quad \text{atau} \quad \frac{7}{4}\lambda = k$ $\boxed{\text{N1}} \quad \lambda = \frac{4}{5}$ $\text{(N1)} \quad k = \frac{7}{5}$	4	
			7

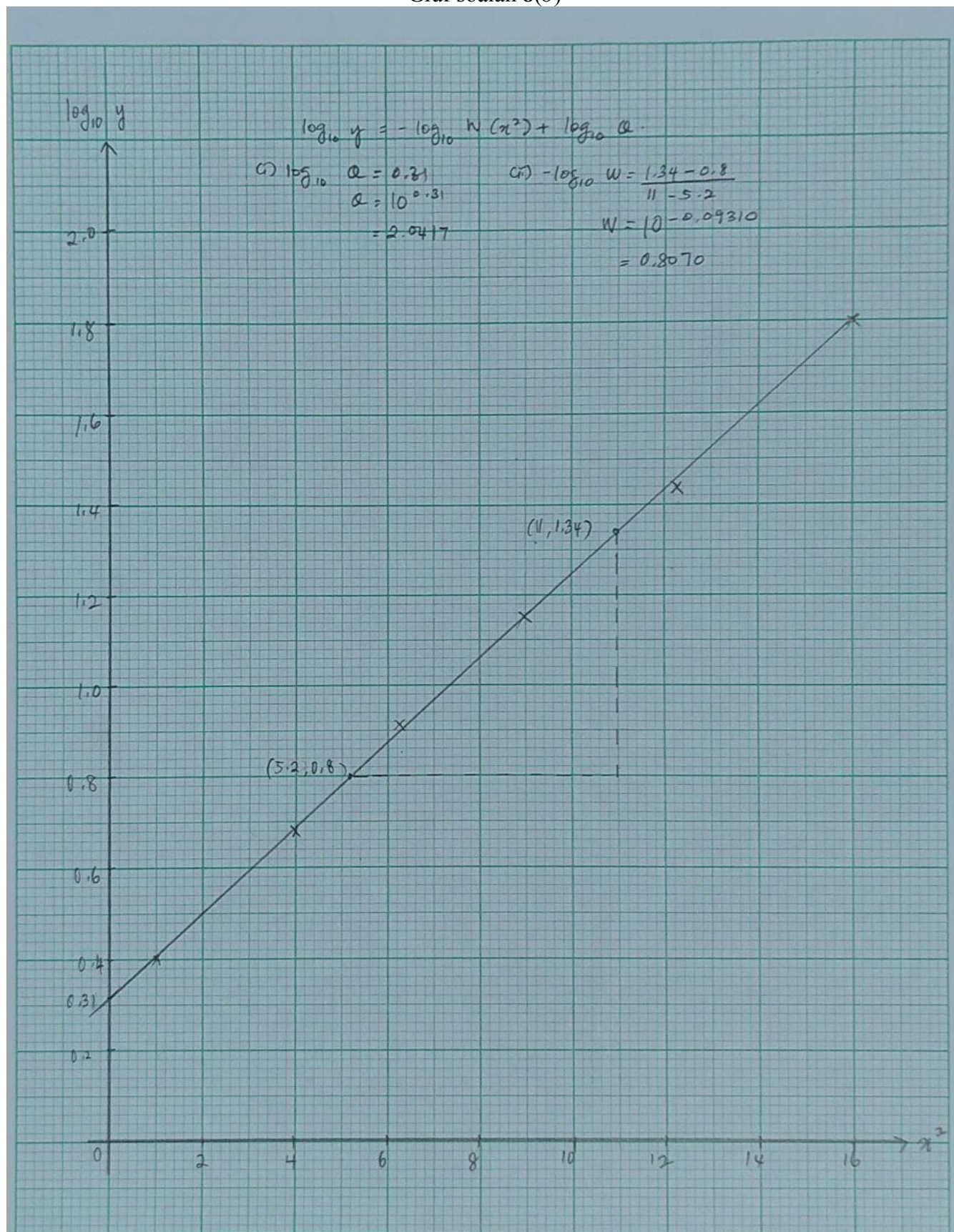
No.	Solution and Mark Scheme	Sub Marks	Total Marks
5	Mencari luas sektor K1 $\frac{1}{2} \times 7^2 \times \frac{\pi}{2}$ Mencari luas segitiga K1 $\frac{1}{2} \times 7 \times 7$ $8 \left[\frac{1}{2} \times 7^2 \times \frac{\pi}{2} - \left[\frac{1}{2} \times 7 \times 7 \right] \right]$ K1 111.88 cm^2 N1 111.88×150 K1 16782 cm^2 N1	6	6

No.	Solution and Mark Scheme	Sub Marks	Total Marks
6			
(a)	$f(0) = -(0)^2 + p(0) - 15$ (K1) (0,-15) (N1)	2	
(b)	$f(x) = -\left[x^2 - px + \left(\frac{-p}{2}\right)^2 - \left(\frac{-p}{2}\right)^2 + 15\right]$ (K1) $G\left(\frac{p}{2}, \frac{p^2}{4} - 15\right)$ (N1) Bandingkan koordinat-x atau koordinat-y $\frac{p}{2} = 3$ atau $\frac{p^2}{4} - 15 = h$ (K1) $h = -6$ (N1)	4	
(c)	$(-x + 2)(x - 4) > 0$ (K1) $2 < x < 4$ (N1)	2	
			8

No.	Solution and Mark Scheme	Sub Marks	Total Marks
7			
(a)	Tukar ke asas 3 K1 $\frac{(3^3)^{m+2n}}{(3^2)^m}$ Menggantikan $3^m = x$ dan $3^n = y$ K1 $\frac{x^3 \times y^6}{x^2}$ xy^6 N1 <td>3</td> <td></td>	3	
(b)	$\log_3 x = m$ atau $\log_3 y = n$ P1 Guna hukum $\log_a \frac{b}{c} = \log_a b - \log_a c$ K1 $\log_{81} 243x - \log_{81} y^2$ Guna hukum $\log_a b = \frac{\log_c b}{\log_c a}$ K1 $\frac{\log_3 243x}{\log_3 81}$ atau $\frac{\log_3 y^2}{\log_3 81}$ Guna hukum $\log_a b^c = c \log_a b$ K1 $3\log_3 3$ atau $5\log_3 3$ N1 $\frac{5+m-2n}{4}$	5	8

No.	Solution and Mark Scheme	Sub Marks	Total Marks														
8																	
(a)	N1 <table><tr><td>$\log_{10} y$</td><td>0.400</td><td>0.679</td><td>0.914</td><td>1.153</td><td>1.440</td><td>1.800</td></tr><tr><td>x^2</td><td>1.00</td><td>4.00</td><td>6.25</td><td>9.00</td><td>12.25</td><td>16.00</td></tr></table> N1	$\log_{10} y$	0.400	0.679	0.914	1.153	1.440	1.800	x^2	1.00	4.00	6.25	9.00	12.25	16.00	2	
$\log_{10} y$	0.400	0.679	0.914	1.153	1.440	1.800											
x^2	1.00	4.00	6.25	9.00	12.25	16.00											
	Plot $\log_{10} y$ melawan x (paksi betul dan skala seragam) K1 6 titik diplot dengan betul N1 Garis lurus penyuaian terbaik N1	3															
(b)	$\log_{10} y = -\log_{10} W (x^2) + \log_{10} Q$ P1																
(i), (ii)	$Guna c = \log_{10} Q$ atau $Guna m = -\log_{10} W$ K1																
	$Q = 2.0417$ N1 N1 $W = 0.8128$ ($2.0 \leq Q \leq 2.1$)																
(iii)	$y = 17.78$ N1	5															
			10														

Graf soalan 8(b)



No.	Solution and Mark Scheme	Sub Marks	Total Marks
9			
(a)	$x = 2$ atau $y = 10$ P1 dilihat Cari luas trapezium K1 $\frac{1}{2}(4 + 10)3$ Kamirkan $\int 2x^2 - 8 \, dx$ K1 $\left[\frac{2x^3}{3} - 8x\right]$ Ganti had $\int_2^3$ ke dalam $\int 2x^2 - 8 \, dx$ K1 $\left(\frac{2(3)^3}{3} - 8(3)\right) - \left(\frac{2(2)^3}{3} - 8(2)\right)$ Luas trapezium – luas dibawah graf K1 $21 - \frac{14}{3}$ N1 $\frac{49}{3}$	6	
(b)	$h = 4$ P1 dilihat Kamirkan $\int \pi x^2 \, dy$ K1 $\left[\frac{y^2}{4} + 4y\right]$ Guna had $\int_0^4$ kedalam $\left[\frac{y^2}{4} + 4y\right]$ K1 $\pi \left[\frac{(4)^2}{4} + 4(4) - 0\right]$ N1 20π	4	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
10			
(a)	$\frac{y-8}{x-4} = \frac{-2}{3}$ (K1) (N1) $3y = -2x + 32$	2	
(b)	$\frac{2(x)+3(0)}{5} = 4$ atau $\frac{2(y)+3(-11)}{5} = -5$ (K1) (N1) R(10,4)	2	
(c)	$\frac{1}{2} (16 + (-110)) - (80) $ (K1) (N1) 134	2	
(d)			
(i)	$\sqrt{(x-4)^2 + (y-8)^2} = 10$ (K1) (N1) $x^2 + y^2 - 8x - 16y - 20 = 0$	2	
(ii)	<u>Ganti $x = 0$ dan guna $b^2 - 4ac$</u> (K1) $(-16)^2 - 4(1)(-20) = 336$ (N1) $b^2 - 4ac > 0$ Memintas paksi-y	2	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
11	(a)		
	(i)		
	$40q = 28$ (K1)		
	(N1) $p = \frac{3}{10}$	2	
	(ii)		
	Guna ${}^nC_r \times (\frac{3}{10})^r \times (\frac{7}{10})^{n-r}$ (K1)		
	$P(X \geq 3) = P(X = 3) + P(X = 4) + P(X = 5)$ (P1)		
	0.16308 (N1)	3	
(b)	(i)		
	$P\left(Z > \frac{4.5-3.8}{0.7}\right)$ (K1)		
(ii)	(N1) 0.1587	2	
	$z = \pm 0.468$ (P1)		
	$\frac{m-3.8}{0.7} = 0.468$ (K1)		
	(N1) $m = 4.1276$	3	
			10

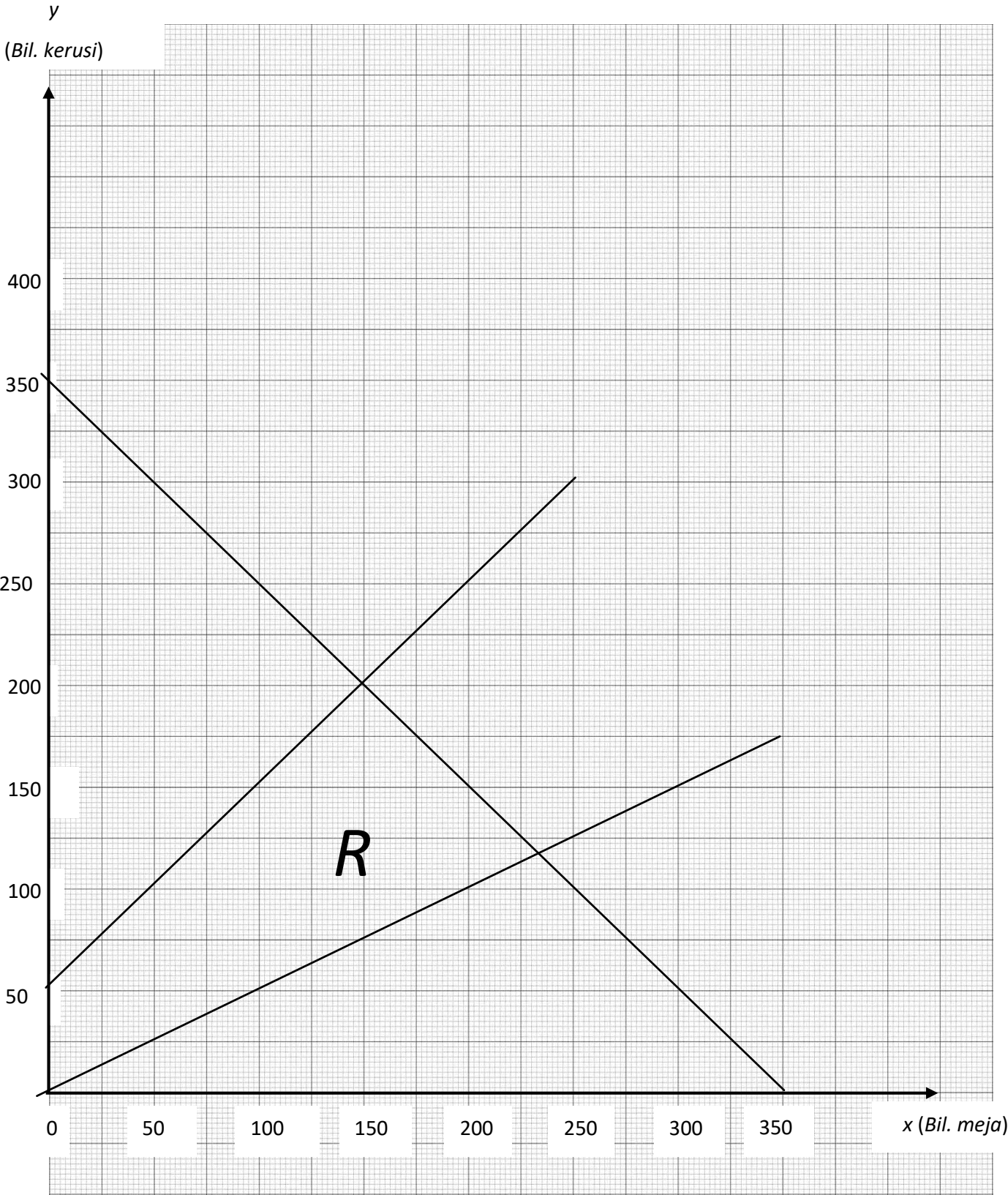
No.	Solution and Mark Scheme	Sub Marks	Total Marks
12			
(a)	Bezakan $2t^2 - \frac{1}{3}t^3 + 21t$ (K1) $v = 4t - t^2 + 21$ (K1) $v = 4(0) - 0^2 + 21$ (N1) $v = 21$	3	
(b)	Guna $4 - 2t = 0$ (K1) $t = 2$ Ganti $t = 2$ kedalam $4t - t^2 + 21$ (K1) $v = 4(2) - 2^2 + 21$ (N1) 25	3	
(c)	Guna had $\int_0^7$ kedalam $2t^2 - \frac{1}{3}t^3 + 21t$ (K1) $\left[2(7)^2 + \frac{(7)^3}{3} + 21(7)\right] - \left[2(0)^2 + \frac{(0)^3}{3} + 21(0)\right]$ (N1) 130.67	4	
			10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
13			
(a)	120, 110, 125, 115, 125 N1	1	
(b)			
(i)	$p = 5$ P1		
	$\frac{120(70)+110(5)+125(10)+115(5)+125(10)}{70+5+10+5+10}$ K1		
	N1 120.25	3	
(ii)	$23320 \times \frac{100}{120.25}$ K1		
	N1 RM 19 392.93	2	
(c)			
	$1.50 \times \frac{120.25}{100}$ K1		
	N1 RM 1.80		
	$1.80 - 1.50$ K1		
	N1 RM 0.30	4	10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
14			
(a)	Guna $AC^2 = 14^2 + 10^2 - 2(14)(10)\cos 55^\circ$ (K1) N1 11.64	2	
(b)	$\frac{\sin ADC}{11.64} = \frac{\sin 30^\circ}{8.6}$ (K1) N1 $42.59^\circ, 137.41^\circ$	2	
(c)			
(i)	Sudut CAD = $180^\circ - 30^\circ - 42.59^\circ$ P1 $\frac{CD}{\sin 107.41^\circ} = \frac{8.6}{\sin 30^\circ}$ (K1) N1 16.41 cm	3	
(ii)	$\frac{1}{2} \times 10 \times 14 \times \sin 55^\circ$ atau $\frac{1}{2} \times 11.64 \times 16.41 \times \sin 30^\circ$ (K1) <u>Luas ABC + Luas ADC</u> (K1) $57.34 + 47.75$ N1 105.09 cm^2	3	
			10

No.	Solution and Mark Scheme	Sub Marks	Total Marks
15			
(a)	$x + y \leq 350$ $x \leq 2y$ $y - x \leq 50$ N1 N1 N1	3	
(b)	Lukis dengan betul sekurang-kurangnya satu garis lurus dari ketaksamaan yang melibatkan x dan y K1		
	Lukis dengan betul semua garis lurus N1		
	Rantau dilorek dengan betul N1	3	
(c)	(230,120) N1		
(i)	Ganti mana-mana titik di dalam rantau berlorek dalam prs $50x + 40y$ K1		
	N1 RM 16300.00		
(ii)	$75 \leq y \leq 200$ N1	4	10

Graf soalan 15(b)





i-MODUL KECEMERLANGAN SPM SMKA DAN SABK 2022

PEPERIKSAAN PERCUBAAN SPM 2022

MATEMATIK TAMBAHAN

Kertas 1

PERATURAN PEMARKAHAN

UNTUK KEGUNAAN PEMERIKSA SAHAJA

AMARAN

Peraturan pemarkahan ini SULIT dan **Hak Cipta Majlis Pengetua SMKA dan Majlis Pengetua SABK**. Kegunaan khusus untuk guru-guru tingkatan 5 di SMKA dan SABK sahaja. Peraturan ini tidak boleh dikeluarkan dalam apa jua bentuk media cetak.

Peraturan pemarkahan ini mengandungi 6 halaman bercetak

CADANGAN PERATURAN PEMARKAHAN (SKEMA)
Kertas 1

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
1	$\tan\left(\frac{\pi}{2} - A\right) = \cot A$ $= \frac{1}{k}$	K1 NI	2
2	$f^{-1}(x) = \frac{x-1}{2}$ $\frac{\frac{10+x}{x} - 1}{2}$ $g(x) = \frac{5}{x}, x \neq 0$ $g(5) = 1$	K1 K1 K1 NI	4
3 (a)	$2(3) = p - 4(0) \text{ atau } y = \frac{p}{2} - 2(x+1)^2$ $p = 6$	K1 N1	5
(b)	$y + 4x = -2x^2 + 1$ $m = -2$ $c = 1$	K1 N1 N1	
4	$m = \frac{5}{3}$ $y - 0 = \frac{5}{3}\left(x - \frac{1}{3}\right)$ $y = \frac{5}{3}x - \frac{5}{9} \text{ atau setara}$	K1 K1 N1	3
5 (a)	$2^x(2^3) = (2^{-4})^{2x+3}$ $2^{x+3} = 2^{-8x-12}$ $x + 3 = -8x - 12$ $x = -\frac{5}{3}$	K1 K1 N1	7

(b)	$360 = 759e^{-0.325h}$ $\ln 0.4743 = \ln e^{-0.325h}$ $-0.7459 = -0.325h$ $h = 2.2951$	K1 K1 K1 N1	
6 a)	$\left[\frac{(2p+7)^4}{2(4)} \right]^{-3}$ $\left[\frac{(2(-3)+7)^4}{2(4)} \right] - \left[\frac{\left(2(-\frac{7}{2})+7\right)^4}{2(4)} \right]$ $\frac{1}{8}$	K1 K1 NI	6
b)	$g(x) = \frac{-x^2}{2} + 5x + c$ $g'(x) = -x + 5 = 0$ $x = 5$ $10 = \frac{-(5)^2}{2} + 5(5) + c \text{ atau } c = -\frac{5}{2}$ $g(x) = \frac{-x^2}{2} + 5x - \frac{5}{2}$	K1 K1 K1 NI	
7 (a)	$\frac{1 - (1 - 2\sin^2 x)}{1 + (2\cos^2 x - 1)}$ $= \frac{2\sin^2 x}{2\cos^2 x}$ $= \tan x$	K1 K1 NI	6
(b)	$a^2 + b^2 = c^2$ $\frac{a^2}{c^2} + \frac{b^2}{c^2} = \frac{c^2}{c^2}$ $\left(\frac{a}{c}\right)^2 + \left(\frac{b}{c}\right)^2 = 1$ $(\cos \theta)^2 + (\sin \theta)^2 = 1$ $\sin^2 \theta + \cos^2 \theta = 1$	K1 K1 NI	

8 (a)	$66, 72.6, 79.86, \dots$ $r = 1.1$ $T_5 = 66(1.1^{5-1})$ 96.63 minit	K1 K1 NI	6
(b)	$\frac{66(1.1^n - 1)}{1.1 - 1} \leq 720$ $n \log 1.1 \leq \log 2.09$ $n \leq 7.73$ $n = 7$	K1 KI N1	
9 (a)	$\overrightarrow{CO} = -\frac{2}{3}\overrightarrow{AB} + \overrightarrow{BO}$ $\overrightarrow{CO} = -\frac{2}{3}\vec{y} + \vec{x}$	K1 NI	5
(b)	$\overrightarrow{OC} = \frac{2}{3}\vec{y} - \vec{x}$ $\frac{2}{3}\begin{pmatrix} -3 \\ 0 \end{pmatrix} - \begin{pmatrix} 2 \\ -3 \end{pmatrix} = \begin{pmatrix} -4 \\ 3 \end{pmatrix}$ $ \overrightarrow{OC} = \sqrt{(-4)^2 + 3^2}$ vektor unit $\overrightarrow{OC} = \frac{1}{5}\begin{pmatrix} -4 \\ 3 \end{pmatrix}$	K1 K1 N1	
10 (a)	$f'(x) = \lim_{\delta x \rightarrow 0} \frac{(x + \delta x)^2 + 5(x + \delta x) - (x^2 + 5x)}{\delta x}$ $f'(x) = \lim_{\delta x \rightarrow 0} \frac{2x\delta x + (\delta x)^2 + 5\delta x}{\delta x}$ $f'(x) = \lim_{\delta x \rightarrow 0} 2x + \delta x + 5$ $f'(x) = 2x + 5$	K1 K1 N1	8
(b)	$m_T = 2(1) + 5$ $y - 6 = 7(x - 1)$ $y = 7x - 1$	K1 K1 N1	
(c)	$y - 6 = -\frac{1}{7}(x - 1)$ $y = -\frac{1}{7}x + \frac{43}{7}$	K1 N1	

11 (a)	(i) ${}^5P_2 \times {}^3P_2 \times {}^2P_1$ 240	K1 N1	7
	(ii) ${}^2P_1 \times {}^8P_3 \times {}^1P_1$ 672	K1 N1	
(b)	(i) 5005	N1	7
	(ii) ${}^{10}C_6 \times {}^5C_3$ 2100	K1 N1	
12 (a)	$\frac{1}{2}r^2(2\pi - \theta) = 5(\frac{1}{2}r^2\theta)$ $\theta = \frac{\pi}{3}$	K1 N1	4
(b)	$r + r + r(\frac{\pi}{3}) = 15$ $\theta = 4.922$	K1 N1	
13 (a)	$-3 \left[x^2 + \frac{4}{3}x + \left(\frac{-4/3}{2} \right)^2 - \left(\frac{-4/3}{2} \right)^2 - \frac{2}{3} \right]$ $-3 \left(x - \frac{2}{3} \right)^2 + \frac{10}{3}$ Nilai maksimum, $y = \frac{10}{3}$ Paksi simetri, $x = \frac{2}{3}$	K1 K1 N1 N1	8
b i)	Kelebaran graf bertambah dan kedudukan graf tidak berubah. Paksi simetri dan nilai maksimum graf tidak berubah.	N1 N1	
b ii)	Bentuk graf yang sama dan bergerak ke kanan secara mengufuk 3 unit. Persamaan paksi simetri, $x = \frac{5}{3}$ dan nilai maksimumnya tidak berubah.	N1 N1	



i-MODUL KECEMERLANGAN SPM SMKA DAN SABK 2022

PEPERIKSAAN PERCUBAAN SPM 2022

MATEMATIK TAMBAHAN

Kertas 2

PERATURAN PEMARKAHAN

UNTUK KEGUNAAN PEMERIKSA SAHAJA

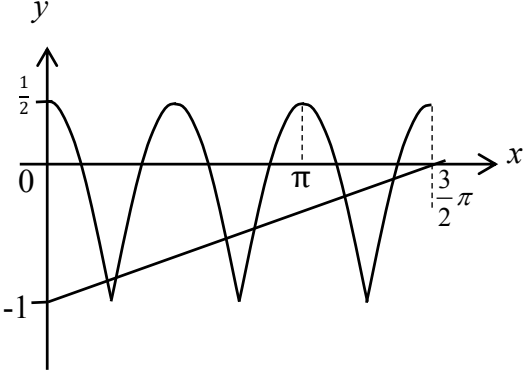
AMARAN

Peraturan pemarkahan ini **SULIT** dan **Hak Cipta Majlis Pengetua SMKA** dan **Majlis Pengetua SABK**. Kegunaan khusus untuk guru-guru tingkatan 5 di SMKA dan SABK sahaja. Peraturan ini tidak boleh dikeluarkan dalam apa jua bentuk media cetak.

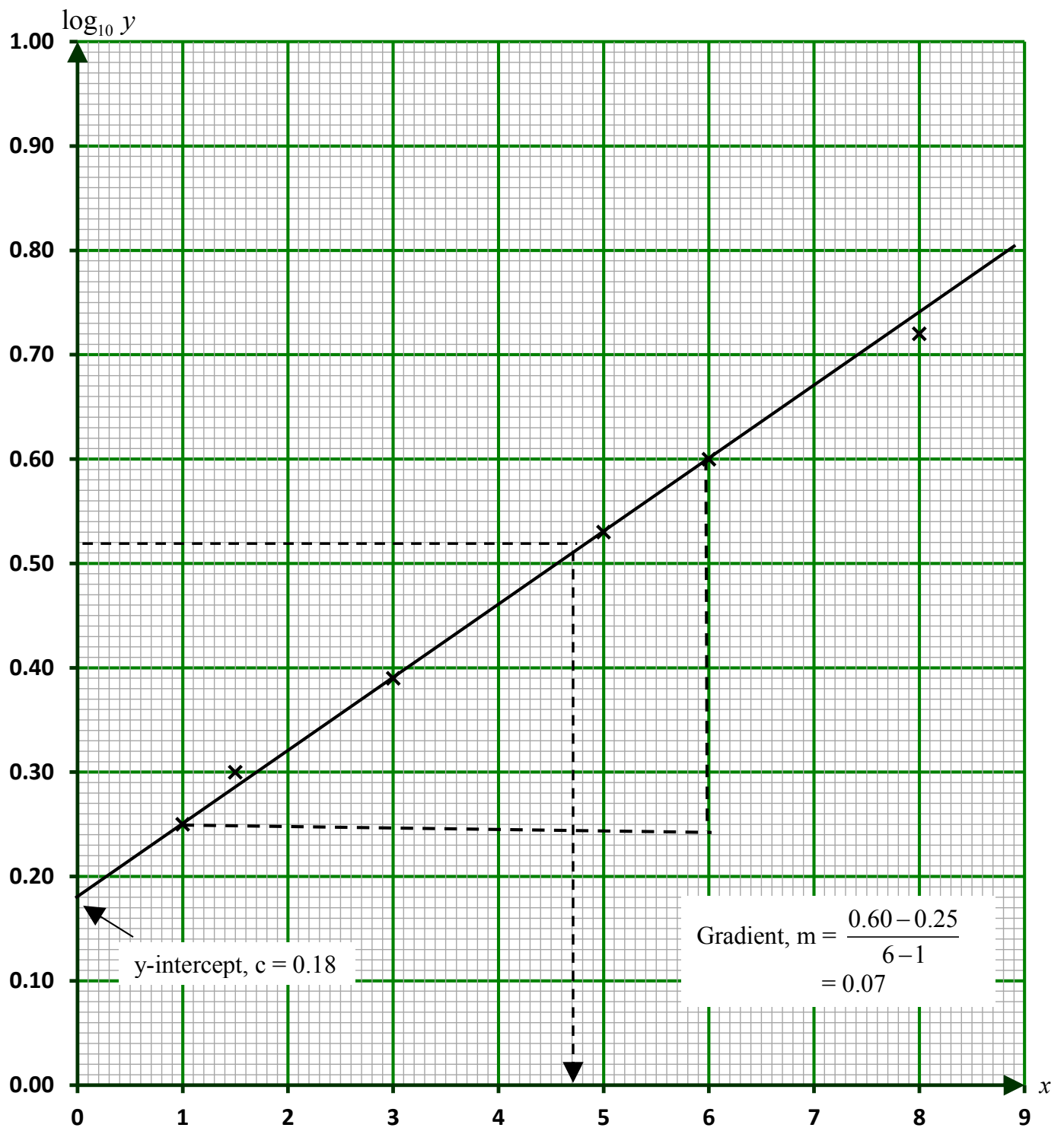
Peraturan pemarkahan ini mengandungi **13** halaman bercetak

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Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
3	$2x + 3y = 36$ $xy = 54$ $y = \frac{54}{x}$ $2x + 3\left(\frac{54}{x}\right) = 36$ $x^2 - 18x + 81 = 0$ $x = \frac{-(-18) \pm \sqrt{(-18)^2 - 4(1)(81)}}{2(1)}$ $x = 9, y = 6$	P1 P1 K1 K1 K1 N1, N1	7
4(a)	$\frac{m(7) + n(-3)}{m + n} = 3$ $4m = 6n$ <i>or</i> $\frac{m}{n} = \frac{6}{4}$ $m : n = 3 : 2$	K1 K1 NI	7
4 (b)	$\frac{3(6) + 2(p)}{5} = 4$ $18 + 2p = 20$ $p = 1$	K1 N1	
4 (c)	$\frac{1}{2} [(0)(1) + (-3)(6) + (7)(9)] - [(-3)(9) + (7)(1) + (0)(6)] $ $\frac{1}{2} 45 - (-20) $ $\frac{1}{2} 65 $ $32.5 \parallel 32 \frac{1}{2} \parallel \frac{65}{2} \text{ units}^2$	 K1 N1	

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
6 (a)	Panjang lengkok $s = r\theta$ $s = 6 \times \frac{2}{3}\pi$ $s = 4\pi @12.567$ Perimeter $= 4\pi + 6 + 6$ $= 12 + 4\pi @24.567$ Luas $= \frac{1}{2}(6)^2\left(\frac{2\pi}{3}\right)$ $= 12\pi @37.7$	N1 N1 K1 N1	8
6 (b)	$a^2 = b^2 + c^2 - 2bc \cos A$ $a^2 = 6^2 + 6^2 - 2(6)(6)\cos 120^\circ$ $a = \sqrt{108}$ $= \sqrt{36 \times 3}$ $= 6\sqrt{3}$	K1 K1 N1 N1	
7 (a)	Graf kosinus/ <i>Cosinus graph</i> $1\frac{1}{2}$ kitaran / <i>cycle</i> Amplitud = $1\frac{1}{2}$ (Maksimum ; $\frac{1}{2}$, Minimum ; -1) Mutlak DAN anjakan 1 unit ke bawah <i>Absolute AND move 1 unit down</i> 	P1 P1 P1 P1	8
7 (b)	$3(y+1) - 4x = -2x$ Garis lurus / <i>Straight line</i> 6 bilangan penyelesaian / <i>6 no of solution</i>	K2 K1 N1	

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh														
8(a)	<table border="1"><tr><td>x</td><td>1</td><td>1.5</td><td>3</td><td>5</td><td>6</td><td>8</td></tr><tr><td>$\log_{10} y$</td><td>0.25</td><td>0.30</td><td>0.39</td><td>0.53</td><td>0.60</td><td>0.72</td></tr></table>	x	1	1.5	3	5	6	8	$\log_{10} y$	0.25	0.30	0.39	0.53	0.60	0.72	N1	10
x	1	1.5	3	5	6	8											
$\log_{10} y$	0.25	0.30	0.39	0.53	0.60	0.72											
8(b)	Rujuk pada graf / <i>Refer to graph</i> Garis lurus dan 6 titik diplot betul Garis lurus penyuaian terbaik	K1 NINI															
8 (c)	$\log_{10} y = \log_{10} ab^{3x}$ $\log_{10} y = \log_{10} a + \log_{10} b^{3x}$ $\log_{10} y = \log_{10} a + (3x)\log_{10} b$ $\log_{10} y = (3 \log_{10} b)x + \log_{10} a$	NI															
(i)	Apabila / <i>When</i> $y = 3.2$, $\log_{10} y = \log_{10} 3.2 = 0.51$ Daripada graf / <i>from the graph</i> $\log_{10} 3.2 = 0.51 \rightarrow x = 4.7$	N1 K1															
(ii)	$m = 3 \log_{10} b$ $0.07 = 3 \log_{10} b$ $\frac{0.07}{3} = \log_{10} b$ $b = 1.06$	N1 K1															
(iii)	$c = \log_{10} a$ $0.18 \leftrightarrow 0.19 = \log_{10} a$ $1.515 \leftrightarrow 1.550 = a$	N1															

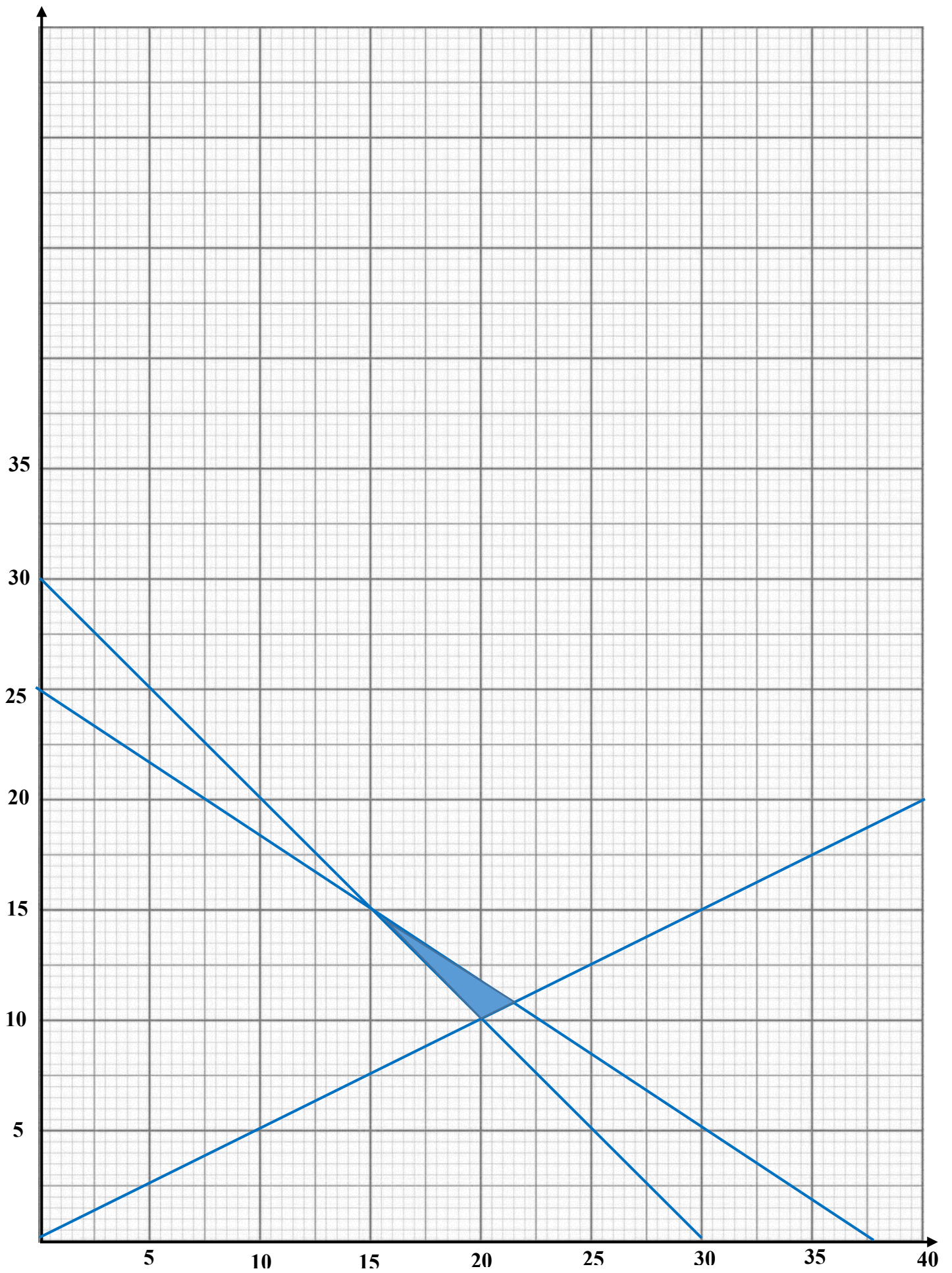


Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
9 (a)	Cari had / punca DAN pemfaktoran <i>Find the limits / roots AND factorisation</i> $f(x) = (-x-2)(x+5)$ Pengamiran mana-mana dua luas <i>Integration any two areas</i> $\left \int_{-7}^{-5} -x^2 - 7x - 10 \, dx \right = \left \left[-\frac{x^3}{3} - \frac{7x^2}{2} - 10x \right]_{-7}^{-5} \right $ @ $\left \int_{-5}^{-2} -x^2 - 7x - 10 \, dx \right = \left \left[-\frac{x^3}{3} - \frac{7x^2}{2} - 10x \right]_{-5}^{-2} \right $ @ $\left \int_{-2}^0 -x^2 - 7x - 10 \, dx \right = \left \left[-\frac{x^3}{3} - \frac{7x^2}{2} - 10x \right]_{-2}^0 \right $ Ganti had ke dalam mana-mana fungsi <i>Substitute limit to any functions</i> $\left(-\frac{(-5)^3}{3} - \frac{7(-5)^2}{2} - 10(-5) \right) - \left(-\frac{(-7)^3}{3} - \frac{7(-7)^2}{2} - 10(-7) \right) = \frac{26}{3}$ @ $\left(-\frac{(-2)^3}{3} - \frac{7(-2)^2}{2} - 10(-2) \right) - \left(-\frac{(-5)^3}{3} - \frac{7(-5)^2}{2} - 10(-5) \right) = \frac{9}{2}$ @ $\left(-\frac{(0)^3}{3} - \frac{7(0)^2}{2} - 10(0) \right) - \left(-\frac{(-2)^3}{3} - \frac{7(-2)^2}{2} - 10(-2) \right) = \frac{26}{3}$ Jumlah luas / <i>Total area</i> $= \frac{26}{3} + \frac{9}{2} + \frac{26}{3}$ $= \frac{131}{6}$	K1 K1 K1 K1 K1 K1 N1	6

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
9 (b)	$= \pi \left \int_{-5}^{-2} (-x^2 - 7x - 10)^2 dx \right $ $= \pi \left \int_{-5}^{-2} x^4 + 14x^3 + 59x^2 + 150x + 100 dx \right $ Pengamiran / <i>Integration</i> $= \pi \left(\frac{x^5}{5} + \frac{7x^4}{2} + \frac{59x^3}{3} + 75x^2 + 100x \right)_{-5}^{-2}$ Ganti had / <i>Substitute limits</i> $= \pi \left[\left(\frac{(-2)^5}{5} + \frac{7(-2)^4}{2} + \frac{59(-2)^3}{3} + 75(-2)^2 + 100(-2) \right) - \left(\frac{(-5)^5}{5} + \frac{7(-5)^4}{2} + \frac{59(-5)^3}{3} + 75(-5)^2 + 100(-5) \right) \right]$ $= \frac{81}{10} \pi$	K1 K1 K1 N1	4
10(a)(i)	$\overrightarrow{SQ} = -6\hat{x} + 3\hat{y}$	N1	5
(ii)	$\overrightarrow{PL} = 3\hat{y} + \frac{1}{3}(6\hat{x} - 3\hat{y})$	K1	
	$\overrightarrow{PL} = 2\hat{x} + 2\hat{y}$	N1	
10	$\overrightarrow{PR} = \frac{1}{b}(2\hat{x} + 2\hat{y})$	K1	
(b)(i)	$\overrightarrow{PR} = \frac{2}{b}\hat{x} + \frac{2}{b}\hat{y}$ $\overrightarrow{SR} = \overrightarrow{SP} + \overrightarrow{PR}$ $\overrightarrow{SR} = (-6 + \frac{2}{b})\hat{x} + \frac{2}{b}\hat{y}$	N1	

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
10(b)(ii)	Perbandingan & menyelesaikan persamaan serentak <i>Comparison & solving using simultaneous equation</i> $-6 + \frac{2}{b} = -2 \quad \text{or} \quad 2a = \frac{2}{b}$ $a = 2$ $b = \frac{1}{2}$	K1 N1 N1	5
10 (c)	$\frac{1}{2}(6 x)(5) = 120$ $ x = 8 \text{ unit}$	K1 N1	
11			10
(a)(i)	$P(X=3) = {}^5C_3(0.6)^3(0.4)^2$ 0.3456	K1 N1	
(a)(ii)	$P(X=4)+P(X=5)$ ${}^5C_4(0.6)^4(0.4)^1 + {}^5C_5(0.6)^5(0.4)^0$ (menggunakan rumus Taburan Binomial) 0.3370	P1 K1 N1	
(b)(i)	$P\left(\frac{110-130}{16} < Z < \frac{152-130}{16}\right)$ $1 - 0.1056 - 0.0845$ 0.8099	K1 N1	
(b)(ii)	$P(X > 150) = P\left(Z > \frac{150-130}{16}\right)$ $0.1056 // 0.1057$ $1163 // 1164 // 1165$	K1 N1 N1	

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
14(a)	guna rumus $I = \frac{Q_{22}}{Q_{19}} \times 100$ a = 130, b = RM4.50, c = RM7.26 kesemua betul 2 betul	K1 N1,N1	10
14(b)	seen 740 $\frac{114(740) + 130(80) + 150(40) + 113(140)}{1000}$ 116.58	P1 K1 N1	
14(c)	$\frac{120}{100} \times m = 11.50$ $m = 9.58$ $\frac{P_{22}}{9.58} \times 100 = 116.58$ $P_{22} = 11.17$ $\frac{125}{100} \times 11.17$ 5.56	K1 N1 K1 N1	
15(a)	$0.4x + 0.6y \leq 15$ @ $4x + 6y \leq 150$ $x + y \geq 30$ $2y \geq x$	N1 N1 N1	
15(b)	Rujuk pada graf / <i>Refer to graf</i>	K1,N1,N1	10
15(c)	$0.1x + 0.2y$ $x = 15, y = 15$ Keuntungan = RM 4.50	K1 N1, N1 N1	



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Percubaan

SPM

Matematik

Tambahan

Kertas 1

Peraturan

PUTRAJAYA K1

PERCUBAAN SPM TAHUN 2022

MATEMATIK TAMBAHAN

Tingkatan 5

KERTAS 1

PERATURAN PEMARKAHAN

SOALAN	PERATURAN PEMARKAHAN	MARKAH	JUMLAH MARKAH
1 (a)	$g^{-1}(x) = \frac{2\left(\frac{-2x-6}{x-3}\right) - 1}{\left(\frac{-2x-6}{x-3}\right)}$ $g^{-1}(x) = \frac{5x+9}{2x+6}, x \neq 3$ $g(x) = \frac{-6x+9}{2x-5}, x \neq \frac{5}{2}$	K1 N1 N1	3
(b)	$g(p) = 2$ $\frac{-6(p)+9}{2(p)-5} = 2$ $p = \frac{19}{10}$	K1 N1	2
			5 M
2 (a)	Menggunakan pembezaian $b^2 - 4ac = 0$ Menggantikan nilai a, b dan c $(1+q)^2 - 4(1+q)(p+q) = 0$ $p = \frac{1-3q}{4}$	K1 N1	2
(b)	Menggunakan pembezaian $b^2 - 4ac > 0 \text{ dan}$ menggantikan nilai $a, b, c \text{ dan } p = -2.$ $(1+q)^2 - 4(1+q)(-2+q) > 0$ Menyelesaikan ketaksamaan kuadratik $(1+q)(3-q) > 0$ atau $(q+1)(q-3) < 0$ $-1 < q < 3$	K1 K1 N1	3

3 (a)	$\frac{dy}{dx} = 6x + 3px^2$ $-3 = 6(-1) + 3p(-1)^2$ $p = 1$	K1 K1 N1	3
(b)	Kecerunan normal $m_2 = \frac{1}{3}$ $y = \frac{1}{3}x + 1$	K1 N1	2
(c)	$\delta r = 0.005$ $\frac{dv}{dr} = 16\pi r + 2\pi r^2$ $\frac{\delta v}{0.005} = 16\pi(3) + 2\pi(3^2)$ $\delta v = 0.33 \pi$	K1 K1 N1	2
4	$4\sqrt{5} - 3 \times 5$ $4\sqrt{5} - 15$	K1 N1	2
5	$6x - 7y = -34$ @ mana-mana persamaan dalam 2 pembolehubah $11y = 44$ @ mana-mana persamaan dalam 1 pembolehubah $x = -1$ $y = 4$ $z = -4$	K1 K1 N1 N1 N1	5 5 M
6	$y = \frac{3x^2}{2 - x^3}$ $\frac{1}{y} = \frac{2 - x^3}{3x^2}$ $\frac{1}{xy} = \frac{2}{3} \left(\frac{1}{x^3} \right) - \frac{1}{3}$ $h = \frac{2}{3}(-4) - \frac{1}{3} \quad \text{atau} \quad 1 = \frac{2}{3}(k) - \frac{1}{3}$ $h = -3$ $k = 2$	K1 K1 N1 N1	4

7. (a)			
(i)	$p = -\frac{1}{2}$	N1	
(ii)	$2x + 6 = -\frac{1}{2}x - 4$ $\frac{5}{2}x = -10$ $x = -4$ $y = 2(-4) + 6$ $y = -2$ Coordinate H= $(-4, -2)$	K1 N1	3
(b)	$\frac{1}{2} (p - 3)(1 - 3p) + 6p^2 - 3p(p - 3) = 8$ $(p - 3)(1 - 3p) + 6p^2 - 3p(p - 3) = \pm 16$ $19p = 19$ $p = 1$ Atau $19p = -13$ $p = -\frac{13}{19}$	K1 N1 N1	3
			6 M
8. (a)	$d = 9 - 5 = 4$	N1	1
(b)	$T_{13} = 5 + 12(4)$ $= 53$	K1 N1	2
(c)	$S_{23} - S_{13} = \frac{23}{2} [2(5) + 22(4)] - \frac{13}{2} [2(5) + 12(4)]$ $= 750$	K1 N1	2
			5 M

9. (a)	$6! \times 3$ 2160	K1 N1	2
(b)	$4! \times 3!$ 144	K1 N1	2
10. (a)			
(i)	$-\frac{5}{12}$	N1	3
(ii)	$\left(\frac{5}{13}\right)\left(\frac{4}{5}\right) - \left(-\frac{12}{13}\right)\left(\frac{3}{5}\right)$	K1	
	$\frac{56}{65}$	N1	
(b)	$1 - \sin^2 x - 2\sin x - 1 = 0$ $\sin x(\sin x - 2) = 0$ $x = 0^\circ, 180^\circ, 360^\circ$	K1 K1 N1	3
			6M
11. (a)			
(i)	$\overrightarrow{QT} = \frac{1}{4}(15\tilde{x} + 7\tilde{y})$	N1	3
(ii)	$\overrightarrow{PT} = \overrightarrow{PQ} + \overrightarrow{QT}$ - -----tunjukkan penambahan segitiga	K1	
	$-15\tilde{x} + \frac{1}{4}(15\tilde{x} + 7\tilde{y})$ $-\frac{45}{4}\tilde{x} + \frac{7}{4}\tilde{y}$	N1	
(b) (i)	10 unit $\begin{pmatrix} -6 \\ 8 \end{pmatrix} + \begin{pmatrix} 4 \\ p \end{pmatrix} = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$ $8 + p = 0$ $p = -8$	N1 K1 N1	3
			6M
12.(a)	$\frac{dy}{dx} = -2x$	K1	3

14.(a)	$\mu = 250$ $P\left(Z > \frac{298-250}{\sigma}\right) = 0.2611$ $0.64 = \frac{298-250}{\sigma}$ $\sigma = 75$	K1 K1 K1 N1	4
(b)	$(-0.667 < Z < 0.2)$ $1 - 0.2523 - 0.4207$ 0.327 26 orang	K1 K1 K1 N1	4
			8M
15.(a)	$90t^2 - 150t$	N1	1
(b)	$90t^2 - 150t = 187.5$ $90t^2 - 150t - 187.5 = 0$ $12t^2 - 20t - 25 = 0$ $(6t + 5)(2t - 5) = 0$ $t = 2.5 \text{ jam atau } 150 \text{ minit}$	K1 K1 K1 N1	4
(c)	$Jumlah \text{ masa} = 2.5 + 0.5 = 3 \text{ jam}$ $187.5 \div 3$ 62.5	K1 K1 N1	3
			8M

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Percubaan
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Kertas 2
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Pemarkahan
November
2022**

PUTRAJAYA K2

PERCUBAAN SPM TAHUN 2022

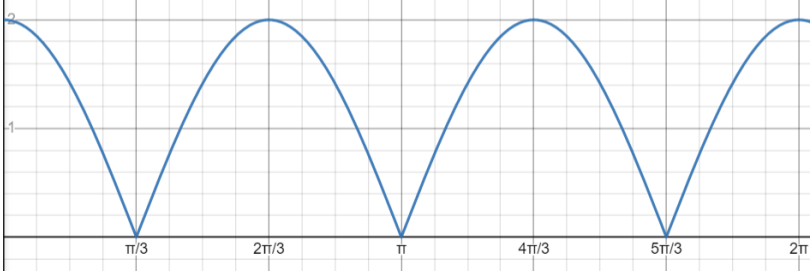
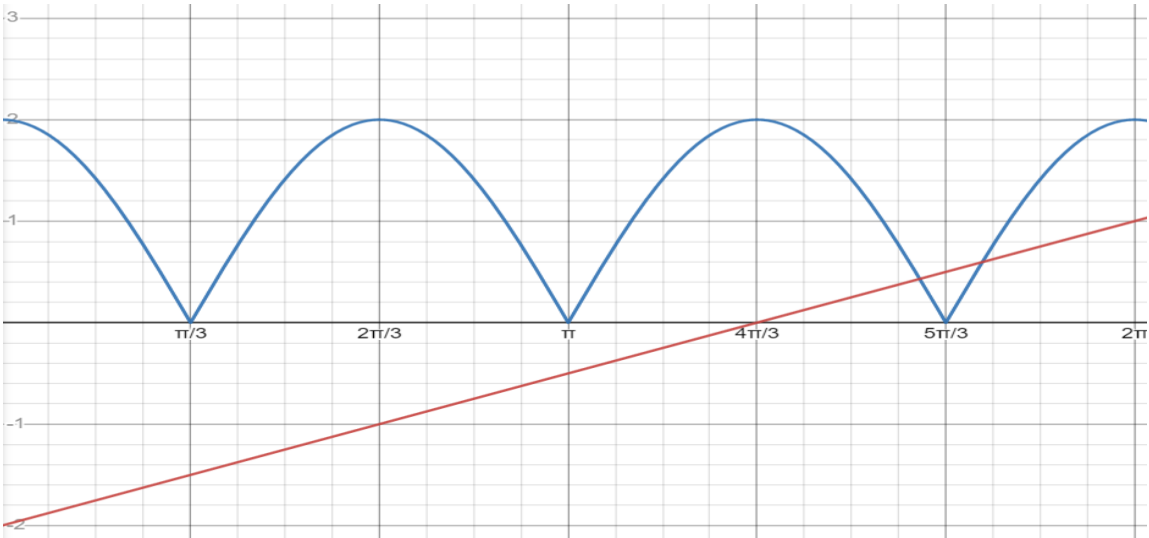
MATEMATIK TAMBAHAN Tingkatan 5

KERTAS 2

PERATURAN PEMARKAHAN

UNTUK KEGUNAAN PEMERIKSA SAHAJA

PERATURAN PERMARKAHAN KERTAS 2

No		JAWAPAN	MARKAH	
1	(a)	LHS (Factorise) $\cot^2 A (1 - \cos^2 A)$ $\cot^2 A (\sin^2 A)$ $\frac{\cot^2 A}{\sin^2 A} (\sin^2 A)$ $\cos^2 A$ (proved)	K1 N1	2
	(b)(i)	 $y = 2 \left \cos \frac{3}{2} x \right $ bentuk graf kos Amplitud 2 dilihat Kitaran 2π	P1 P1 P1	3
	(ii)	$\frac{y}{2} = \left(\frac{3}{4\pi} x - 1 \right)$ $y = 2 \left(\frac{3}{4\pi} x - 1 \right)$ or $y = \left(\frac{3}{2\pi} x - 2 \right)$ Garis lurus dilukis  NOS : 2	N1 K1 N1	3
			7 M	

No		JAWAPAN	MARKAH	
2	(a)	$\left(\frac{5-1}{-2+1}\right) \times M_{CB} = -1$ $m_{CB} = \frac{1}{4}$ $(y - 5) = \frac{1}{4}(x + 2) \text{ or } c = \frac{11}{2}$ $y = \frac{1}{4}x + \frac{11}{2} \text{ or } 4y = x + 22$	K1	
			K1	
			N1	
	(b)	$\frac{-2(3)+x}{4} = 0 \text{ or } \frac{5(3)+y}{4} = \frac{11}{2}$ $B(6, 7)$	K1	
			N1	
	(c)	$\sqrt{(x-6)^2 + (y-7)^2} = 5$ $x^2 + y^2 - 12x - 14y + 60 = 0$	K1	
			N1	
			7M	
3	(a)	$a = 16, d = 2$ $T_{14} = 16 + 13(2)$ $= 42 \text{ m}$ Isi padu cerucuk $= \pi r^2 h$ $= \pi(4^2)(42)$ $= 672\pi \text{ m}^3$	K1	
			N1	
			N1	3
	(b)	Jumlah isi padu $= \pi r^2 S_n$ $= 16\pi \left[\frac{n}{2} (2(16) + (n-1)(2)) \right]$ $= 16\pi \left[\frac{n}{2} (30 + 2n) \right]$ $= 16\pi(15n + n^2)$ Jumlah isi padu = 4000π $16\pi(15n + n^2) = 4000\pi$ $n^2 + 15n - 250 = 0$	K1	
			N1	
			K1	4

No	JAWAPAN	MARKAH	
	$(n - 10)(n + 25) = 0$ $n = 10$ atau $n = -25$	N1	
		7M	
4	$2x + y + 2 = 24 \dots\dots\dots(1)$ $(x + 2)^2 + x^2 = y^2$ $2x^2 + 4x + 4 = y^2 \dots\dots\dots(2)$ Daripada (1), $y = 22 - 2x \dots\dots\dots(3)$ Gantikan (3) dalam (2) $2x^2 + 4x + 4 = (22 - 2x)^2$ $2x^2 + 4x + 4 - 484 + 88x - 4x^2 = 0$ $2x^2 - 92x + 480 = 0$ $(x - 6)(x - 40) = 0$ $x = 6$ atau $x = 40$ Gantikan nilai x dalam (3) $y = 10$, $y = -58$ (<i>abaikan</i>) Panjang sisi-sisi segi tiga ialah 6 cm, 10 cm dan 8 cm	P1 P1 K1 K1 N1 N1	
		6	

5	(a)	$\frac{3^{3h+9}}{3^{4p-12}} = 3$ $3h - 4p + 21 = 1$ $p = \frac{3h}{4} + 5$	K1 N1	2
	(b)	$\frac{26}{4+\sqrt{3}} = \frac{26}{4+\sqrt{3}} \times \frac{4-\sqrt{3}}{4-\sqrt{3}}$ $\frac{104}{13} - 2\sqrt{3}$	K1 N1	2
	(c)	$p^4 m^2 = p^4 + m^2$ $\frac{p^4}{\sqrt{m}} + \frac{m^2}{\sqrt{m}}$ $8x + 4$	K1 K1 N1	3

No		JAWAPAN	MARKAH	
			7	
6	(a)	Titik maksimum = $(-1, 3k)$ $h = -1$ dan $3k = 9$ $k = 3$	K1 N1 N1	3
	(b)	Pada pintasan-y, $x = 0$ $y = -(0 + 1)^2 + 9$ $y = 8$	K1 N1	3
	(c)	(a) $x = 2$ Nilai maksimum baharu bagi lengkung itu masih sama	N1 N1	2
			8	
7	(a)	$\overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB}$ atau $\overrightarrow{BC} = \overrightarrow{BO} + \overrightarrow{OC}$ $\overrightarrow{OA} = \underline{i} + \underline{2j}$ atau $\overrightarrow{OC} = 2\underline{i} + \underline{j}$ $C(2, 1)$ $A(1, 2)$	K1 N1 N1 N1	4
	(b)	$\overrightarrow{AC} = \overrightarrow{AO} + \overrightarrow{OC}$ $\overrightarrow{AC} = \underline{i} - \underline{j}$	K1 N1	2
	(c)	$\sqrt{1^2 + (-1)^2}$ $\frac{1}{\sqrt{2}}(\underline{i} - \underline{j})$	K1 N1	2
			8 M	
8	(a)(i)	${}^{10}C_0(0.4)^0(0.6)^{10}$ atau ${}^{10}C_1(0.4)^1(0.6)^9$ $1 - {}^{10}C_0(0.4)^0(0.6)^{10} - {}^{10}C_1(0.4)^1(0.6)^9$	K1 K1	

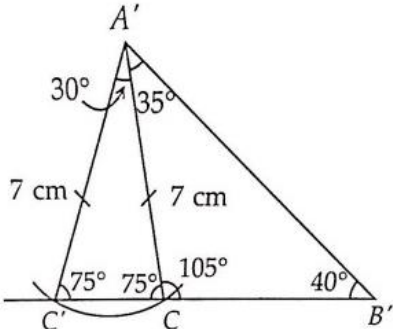
No		JAWAPAN	MARKAH	
		0.9536	N1	3
	(ii)	$n(0.4)(0.6) = 192$ $n = 800$	K1 N1	2
	(b)	$\left(\frac{58 - 65}{6} < Z < \frac{70 - 65}{6}\right)$ $1 - 0.1216 - 0.2025$ 0.6759 $\frac{148}{n} = 0.6759$ $n = 219$	K1 K1 N1 K1 N1	5
			10 M	
9	(a)	$y = x^2 - 9$ $\frac{dy}{dx} = 2x$ Kecerunan garis lurus $PQ = 2$ $2x = 2$ $x = 1$ Apabila $x = 1$, $y = 12 - 9 = -8$ Koordinat titik K ialah $(1, -8)$	K1 K1 N1	3
	(b)	Pada paksi-x, $y = 0$ $x^2 - 9 = 0$ $x^2 = 9$ $x = \pm 3$ Lengkung itu memotong paksi-x di titik $(-3,0)$ dan titik $(3,0)$. Luas rantau berlorek = Luas Δ - Luas rantau yang dibatasi oleh lengkung		

No		JAWAPAN	MARKAH		
		$= \frac{1}{2} (5 - 1)(8) - \int_1^3 y \, dx$ $= 16 - \int_1^3 (x^2 - 9) \, dx$ $= 16 - \left[\frac{x^3}{3} - 9x \right]_1^3$ $= 16 - \left \left(\frac{3^3}{3} - 9(3) \right) - \left(\frac{1^3}{3} - 9(1) \right) \right $ $= 16 - \left -\frac{28}{3} \right $ $= 16 - \frac{28}{3}$ $= 6\frac{2}{3}unit^2$	K1 K1 K1 N1	4	
(c)		Isipadu kisaran = 40π $\pi \int_h^0 x^2 \, dy = 40\pi$ $\pi \int_h^0 (y + 9) \, dy = 40\pi$ $\left[\frac{y^2}{2} + 9y \right]_h^0 = 40$ $0 - \left(\frac{h^2}{2} + 9h \right) = 40$ $h^2 + 18h + 80 = 0$ $(h + 10)(h + 8) = 0$ $h = -10 \text{ atau } h = -8 \text{ (ditolak)}$ $Maka, h = -10$	K1 K1 N1		3
			10		

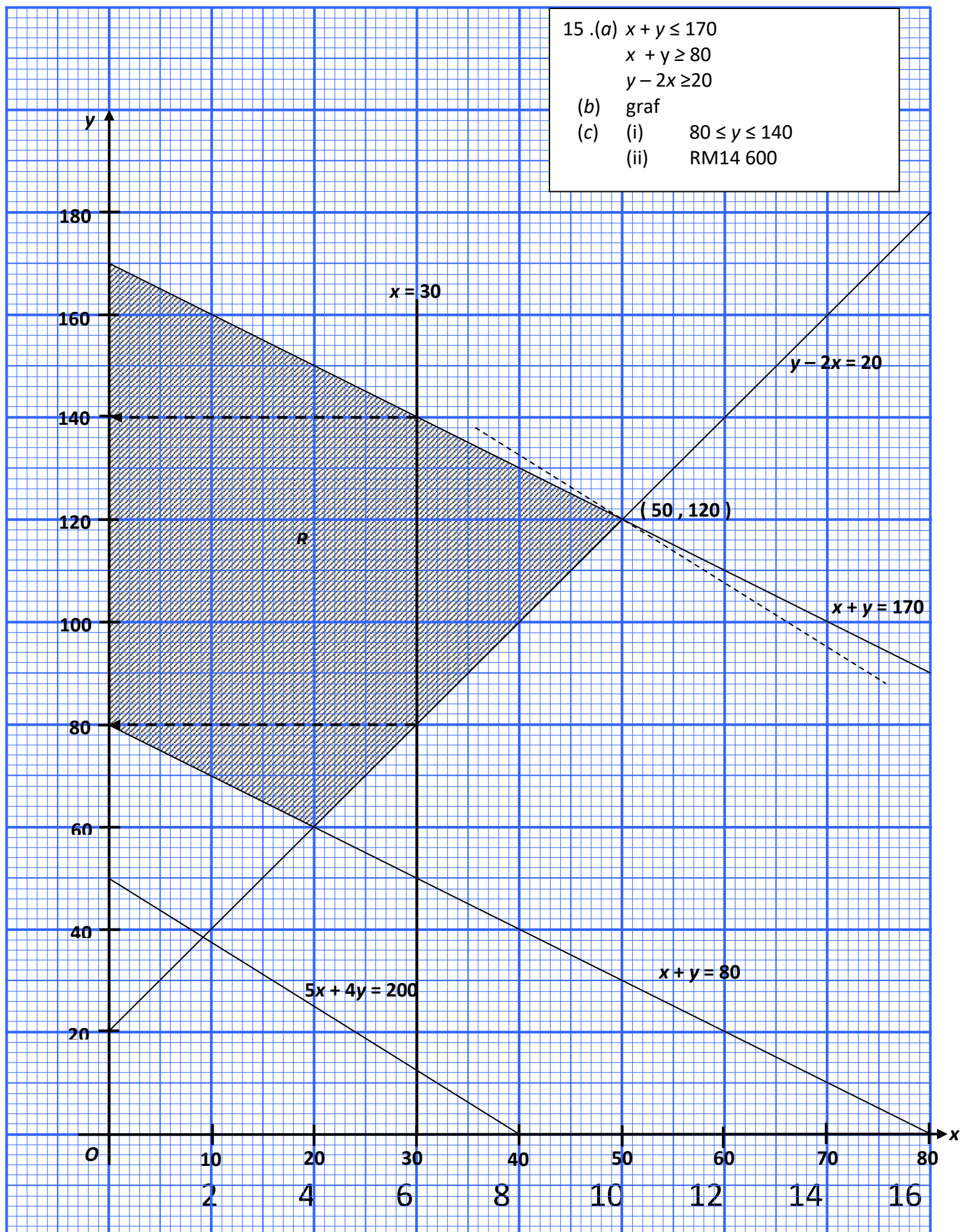
NO			JAWAPAN	MARKAH														
10	(a)	R	Rujuk Graf pada Lampiran	NI N1 K1 N1 N1	5													
		(i)	<table><tr><td>$\frac{1}{x}$</td><td>1</td><td>0.67</td><td>0.5</td><td>0.4</td><td>0.33</td><td>0.29</td></tr><tr><td>xy</td><td>3.80</td><td>7.80</td><td>9.90</td><td>11.20</td><td>12</td><td>12.50</td></tr></table>			$\frac{1}{x}$	1	0.67	0.5	0.4	0.33	0.29	xy	3.80	7.80	9.90	11.20	12
	$\frac{1}{x}$	1	0.67			0.5	0.4	0.33	0.29									
	xy	3.80	7.80			9.90	11.20	12	12.50									
(ii)	P	Seragam mengikut skala plot sekurang-kurangnya 5 titik dengan betul Graf Garis Lurus Penyuaian terbaik																
	(b)	(i)	$xy = q \left(\frac{1}{x} \right) + p$ $p = 16$	K1 N1	4													
	(ii)	$q = \frac{13.6 - 6.2}{0.2 - 0.8}$ $q = -12.33$	K1 N1															
	(c)	$\frac{1}{x} = 0.56$ $x = 1.786$	N1	1														
				10														

NO		JAWAPAN	MARKAH	
11	(a)	$\tan \angle ADE = \frac{10}{12}$ $\angle ADE = 0.6948$	K1 N1	2
	(b)	(i) 1.3898 $6(1.3898) = 8.338$ (ii) $ED = 15.62$ or $BD = 9.22$ $(15.62 - 9.22) + 8.338 + 10$ 24.74	K1 N1 K1 K1 N1	5
	(c)	$\frac{1}{2} \times 6^2 \times 1.7522$ or $\frac{1}{2} \times 6^2 \times \sin 100.38^\circ$ $\left(\frac{1}{2} \times 6^2 \times 1.7522 \right) - \left(\frac{1}{2} \times 6^2 \times \sin 100.38^\circ \right)$ 13.83	N1 K1 N1	3
			10	
NO		JAWAPAN	MARKAH	
12	(a)	$\frac{24 \times 100}{110}$ $x =$ $= \text{RM}21.82$ $\frac{18}{12} \times 100$ $= 150$ $\frac{130 \times 9.50}{100}$ $z =$ $= \text{RM}12.35$	K1 N1 N1 N1	4
	(b)(i)	$\frac{110(230) + 116(520) + 150(380) + 130(670) + 125(200)}{230 + 520 + 380 + 670 + 200}$ $= 127.36$	K1 N1	2
	(ii)	$\frac{Q}{50000}^{2018} \times 100$ $= 127.36$	K1 N1	

		$Q_{2018} = \text{RM}63680$ $I_{2020/2016} = \frac{110 \times 127.36}{100}$ 140.10	K1 N1	4
			10 M	
NO		JAWAPAN	MARKAH	
13	(a)	$v = -4 \text{ ms}^{-1}$	P1	1
	(b)	$\frac{dv}{dt} = 8t - p$ $p = 15$ $a = 8t - 15$	K1 N1 N1	3
	(c)	$4t^2 - 15t - 4 < 0$ $(4t + 1)(t - 4) < 0$ $0 < t < 4$	K1 K1 N1	3
	(d)	$\int_0^4 4t^2 - 15t - 4 \, dt$ $\left \frac{4}{3} (4)^3 - \frac{15}{2} (4)^2 - 4(4) - 0 \right $ $50 \frac{2}{3} \text{ metres}$	K1 K1 N1	
			10	
NO		JAWAPAN	MARKAH	
14	(a)(i)	$\frac{BC}{\sin \sin 35^\circ} = \frac{7}{\sin \sin 40^\circ}$ $BC = 6.246$ $\angle ECD = \angle ACB$	K1 N1 K1	5
	(ii)	$= 105^\circ$		

		$DE^2 = 11^2 + 4^2 - 2(11)(4) \cos 105^\circ$ $DE = 12.64 \text{ cm}$ (a) (i) (ii) $\angle A'C'B' = 75^\circ$ (iii)	K1 N1	
	(b) (i) (ii) (iii)	 $\angle A'C'B' = 75^\circ$ $\frac{C'B'}{\sin \sin 65^\circ} = \frac{7}{\sin \sin 40^\circ}$ $C'B' = 9.8698 \text{ cm}$ $\text{Luas} = \frac{1}{2} \times 7 \times 9.8698 \times \sin \sin 75^\circ$ $= 33.37 \text{ cm}^2$	N1 N1 K1 K1 N1	5
			10 M	
15	(a)	$x + y \leq 170$ $x + y \geq 80$ $y - 2x \geq 20$	N1 N1 N1	3
	(b)	(Rujuk graf) Betul sekurang-kurangnya 1 garis lurus Betul ke semua garis lurus Betul kawasan berlorek	K1 N1 N1	3

	(c)			
	(i)	$80 \leq y \leq 140$	N1	
	(ii)	(50,120) Peruntukan maksimum =100(50)+80(120) = RM14 600	N1 K1 N1	4



3472/1
Matematik
Tambahan
Kertas 1
2 Jam

PERAK SET 1



KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI PERAK

SEKTOR PEMBELAJARAN NEGERI PERAK
JABATAN PENDIDIKAN NEGERI PERAK

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SKEMA JAWAPAN MODUL GEMPUR SPM
TAHUN 2022

MATEMATIK TAMBAHAN
Kertas 1
Set 1
Dua Jam

SOALAN	BUTIRAN	MARKAH	JUMLAH
1	$\delta x = -10$ atau $\frac{dV}{dx} = 7500$	1	3
	$7500 \times (-10)$	1	
	-75000	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
2(a)	$9.24 = 7.34 \times \theta$ $\theta = 1.2589$ radian $\theta = 1.2589 \times \frac{180}{3.142}$ $\theta = 72.12^0$	1	4
		1	
(b)	Perentas PQ/Chord PQ $PQ^2 = (7.34)^2 + (7.34)^2 - 2 (7.34)(7.34) \cos 72.12^0$ Perimeter = $8.6411 + 9.24$ $= 17.88$ cm	1	
		1	

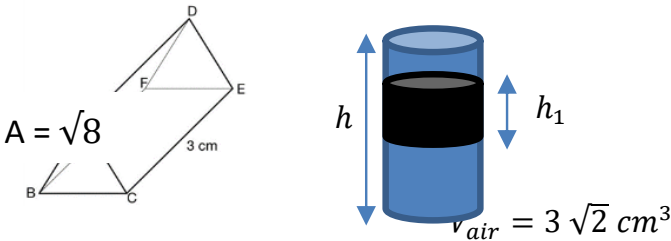
SOALAN	BUTIRAN	MARKAH	JUMLAH
3(a)	Katakan $P(x, y)$ ialah titik pada rel yang baru. C : Chow Kit A : Ampang Park $PC = PA$ $\sqrt{[x - (-1.5)]^2 + (y - 2.5)^2} = \sqrt{(x - 2)^2 + (y - 4)^2}$ $x^2 + 3x + 2.25 + y^2 - 5y + 6.25 = x^2 - 4x + 4 + y^2 - 8y + 16$ $7x + 3y - 11.5 = 0$	1,1	6
		1	
		1	
(b)	Batu Cave $(-4, 12)$ $7(-4) + 3y - 15 = 0$ $y = \frac{43}{3} \neq 12$ Dang Wangi $(2.5, -2)$ $7(2.5) + 3y - 11.5 = 0$ $y = -2$ Dang Wangi kerana koordinat berada di atas lokus.	Ganti kedua-dua koordinat 1 1	

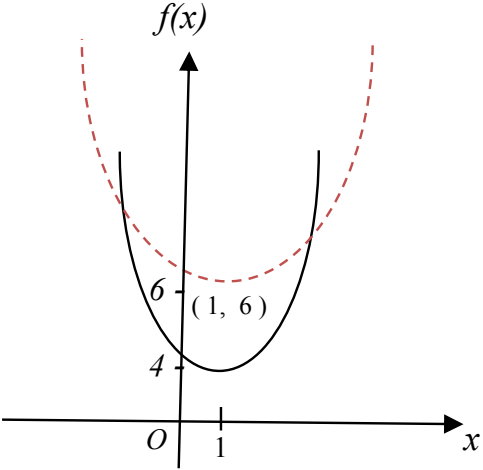
SOALAN	BUTIRAN	MARKAH	JUMLAH
4(a)	$T_{10} = 7 + (10 - 1)(4)$	1	5
	$T_{10} = 43$	1	
(b)	$S_{10} = \frac{10}{2} [(2)(7) + (10 - 1)(4)]$	1	
	$S_{10} = 250$	1	
	Tidak dapat	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
5(a)	$\int 24(4x - 3)^5 \, dx = (4x - 3)^6 \times \frac{1}{8}$	1	5
	$\int 3(4x - 3)^5 \, dx = \frac{1}{8} (4x - 3)^6 + c$	1	
(b)	$\left[\frac{x^2}{2(x + 3)} \right]_1^2$	1	
	$\frac{2^2}{2(2 + 3)} - \frac{1^2}{2(1 + 3)}$	1	
	$\frac{11}{40}$	1	

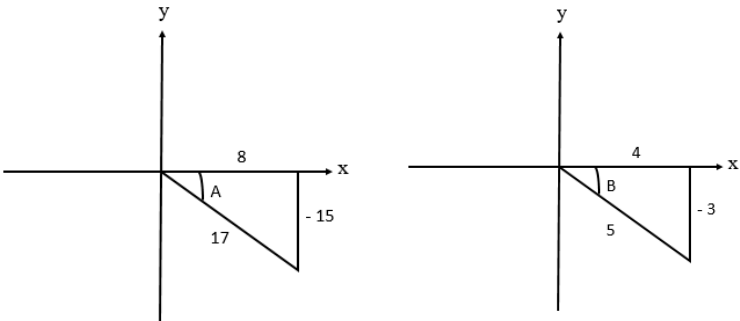
SOALAN	BUTIRAN	MARKAH	JUMLAH
6(a)	$m = 3(3) - 5 = 4$	1	5
(b)	$gf(x) = 6 - 9x$ $g(3x - 5) = 6 - 9x$ <i>let</i> $y = 3x - 5$ $x = \frac{y + 5}{3}$ $g(x) = 6 - 9\left(\frac{y + 5}{3}\right)$ $g(x) = -9 - 3x$ <i>bandingkan dengan</i> $g(x) = p - qx$ $p = -9$ $q = 3$	1 <	

SOALAN	BUTIRAN	MARKAH	JUMLAH
7(a)		1	6
(b)	$\log_{10} y = \frac{h}{6}(6x) + 5k$ $5k = 15$ $k = 3$ $\frac{15 - 2}{0 - 6} = \frac{h}{6}$ $h = -13$	1 1 1 1 1	

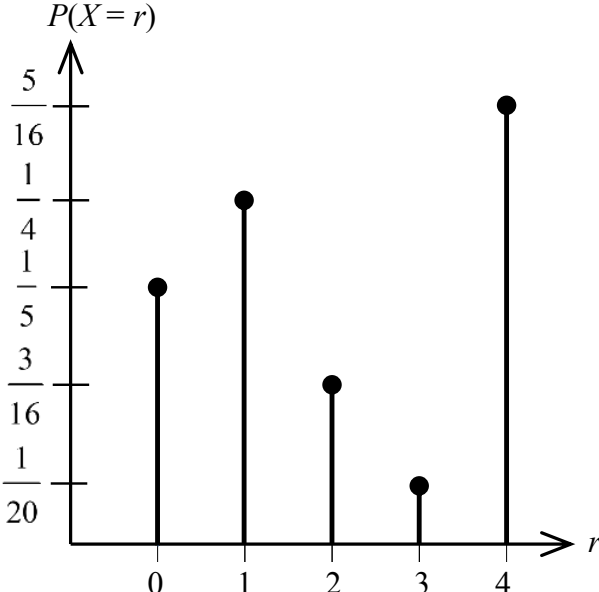
SOALAN	BUTIRAN	MARKAH	JUMLAH
8(a)	 $A = \sqrt{8}$ 3 cm h h_1 $v_{air} = 3\sqrt{2} \text{ cm}^3$ $V_{Prisma} = 3\sqrt{8} \text{ cm}^3$ $V_{Prisma} = V_{silinder} - V_{asal \text{ air}}$ $V_{prisma} = \pi r^2 h - 3\sqrt{2}\pi r^2$ $3\sqrt{8} = \pi r^2 h - 3\sqrt{2}\pi r^2$ $3\sqrt{8} = \pi r^2 (h - 3\sqrt{2})$ $h - 3\sqrt{2} = \frac{3\sqrt{8}}{\pi r^2}$	1 1 1 1	4
(b)	$V_{kubus} = V_{silinder} - V_{air \text{ (baru)}}$ $(\sqrt{2} x)^3 = \pi r^2 h - \pi r^2 h_1$ $\sqrt{8} x^3 = \pi r^2 (h - h_1)$ $h - h_1 = \frac{\sqrt{8} x^3}{\pi r^2}$ $\frac{\sqrt{8} x^3}{\pi r^2} = 1.08 \left(\frac{3\sqrt{8}}{\pi r^2} \right)$ $\frac{x^3}{3} = 1.08$ $x = 1.5 \text{ cm}$ $h - 3\sqrt{2} = \frac{3\sqrt{8}}{\pi (3)^2}$ $h = 4.4 \text{ cm}$	1 1 1	3

SOALAN	BUTIRAN	MARKAH	JUMLAH
9(a)	Titik minimum (1, 4) Persamaan paksi simetri, $x = 1$	1 1	6
(b)	 Lakaran graf yang betul	1	
	(i) Apabila nilai a berubah dari 4 ke 2, kelebaran graf bertambah (ii) Apabila nilai k berubah dari 4 ke 6, graf bergerak menegak 2 unit ke atas, nilai minimumnya menjadi 6 dan persamaan paksi simetrinya masih sama iaitu, $x = 1$	1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
10(a)	Halaju paduan kapal Ahmad, $A = \underline{v} + \underline{a}$ $V_A = 2\underline{i} + \frac{1}{2}\underline{j} + 5\underline{i} + 3\underline{j}$ $V_A = 7\underline{i} + \frac{7}{2}\underline{j}$ $V_A = 7\left(\underline{i} + \frac{1}{2}\underline{j}\right) \dots\dots\dots (i)$ Halaju paduan kapal Ben, $B = \underline{v} + \underline{b}$ $V_B = 2\underline{i} + \frac{1}{2}\underline{j} + 3\underline{i} + 2\underline{j}$ $V_B = 5\underline{i} + \frac{5}{2}\underline{j}$ $V_B = 5\left(\underline{i} + \frac{1}{2}\underline{j}\right) \dots\dots\dots (ii)$ $\frac{1}{7}V_A = \frac{1}{7}V_A = \underline{i} + \frac{1}{2}\underline{j} \quad \text{dan} \quad \frac{1}{5}V_B = \underline{i} + \frac{1}{2}\underline{j}$	1 1 1 1	6

SOALAN	BUTIRAN	MARKAH	JUMLAH
11(a)	Dalam sukuan iv  $\sin A = -\frac{15}{17}, \tan A = -\frac{15}{8}$ $\sin B = -\frac{3}{5}, \cos B = \frac{4}{5}$ $\tan (A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$ $= \frac{-\frac{15}{8} - (-\frac{3}{4})}{1 + (-\frac{15}{8})(-\frac{3}{4})}$ $= \frac{(-\frac{9}{8})}{(\frac{77}{32})}$ $= -\frac{36}{77}$	1 1 1	5
(b)	$\sin (\frac{1}{2} A) = \sqrt{\frac{1 - \cos A}{2}}$ $= \sqrt{\frac{1 - \frac{8}{17}}{2}}$ $= \frac{3}{\sqrt{34}}$ $\cos (\frac{1}{2} A) = \frac{1}{(\sin \frac{1}{2} A)}$ $= \frac{\sqrt{34}}{3}$	1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH														
12(a)	$6!$ atau $6 \times 5 \times 4 \times 3 \times 2 \times 1$	1	6														
	720	1															
(b)	Bilangan cara menempatkan Aliff dan Balqis: <table><tr><th>Stesen kerja Aliff</th><th>Stesen kerja Balqis</th></tr><tr><td>P</td><td>R, T, U</td></tr><tr><td>Q</td><td>U, S</td></tr><tr><td>R</td><td>P, S, T</td></tr><tr><td>U</td><td>P, Q, S</td></tr><tr><td>T</td><td>P, R</td></tr><tr><td>S</td><td>Q, R, U</td></tr></table>	Stesen kerja Aliff		Stesen kerja Balqis	P	R, T, U	Q	U, S	R	P, S, T	U	P, Q, S	T	P, R	S	Q, R, U	1
	Stesen kerja Aliff	Stesen kerja Balqis															
	P	R, T, U															
	Q	U, S															
	R	P, S, T															
U	P, Q, S																
T	P, R																
S	Q, R, U																
$3 + 2 + 3 + 3 + 2 + 3$																	
16																	
$16 \times 4 \times 3 \times 2 \times 1$																	
384																	

SOALAN	BUTIRAN				MARKAH	JUMLAH
13(a)		Pemboleh ubah rawak diskret	Pemboleh ubah rawak selanjar		1 , 1	8
		II, III	I, IV			
(b)(i)	$\frac{p-3}{5} + \frac{p-2}{8} + \frac{3}{16} + \frac{2p-7}{20} + \frac{p+1}{16} = 1$				1	
	4				1	
(ii)	$\frac{1}{5} + \frac{1}{20} + \frac{5}{16}$				1	
	$\frac{9}{16}$				1	
(iii)					1 , 1	

SOALAN	BUTIRAN	MARKA H	JUMLAH	
14 (a)		Semua sebutan ke-n betul- 1 semua r × sebutan ke-n betul -1 1,1	8	

SOALAN	BUTIRAN	MARKAH	JUMLAH
15(a)	$\frac{dy}{dx} = 12x^2 - 24x + 9$ $\frac{d^2y}{dx^2} = 24x - 24$	1 1	8
(b)	$\frac{dy}{dx} = 0$ $(6x - 3)(2x - 3) = 0$ $x = \frac{1}{2}, x = \frac{3}{2}$ $y = -2, y = -4$ $\left(\frac{1}{2}, -2\right), \left(\frac{3}{2}, -4\right)$ $\left(\frac{1}{2}, -2\right), \frac{d^2y}{dx^2} = 24\left(\frac{1}{2}\right) - 24 = -12 < 0$ Titik maksimum $\left(\frac{3}{2}, -4\right), \frac{d^2y}{dx^2} = 24\left(\frac{3}{2}\right) - 24 = 12 > 0$ Titik minimum	1 1 1 1 1	

3472/2
Matematik
Tambahan
Kertas 2
2 ½ Jam

PERAK SET 1



KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI PERAK

SEKTOR PEMBELAJARAN NEGERI PERAK
JABATAN PENDIDIKAN NEGERI PERAK

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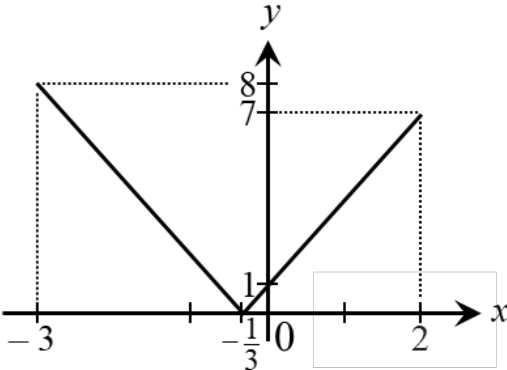
SKEMA JAWAPAN MODUL GEMPUR SPM
TAHUN 2022

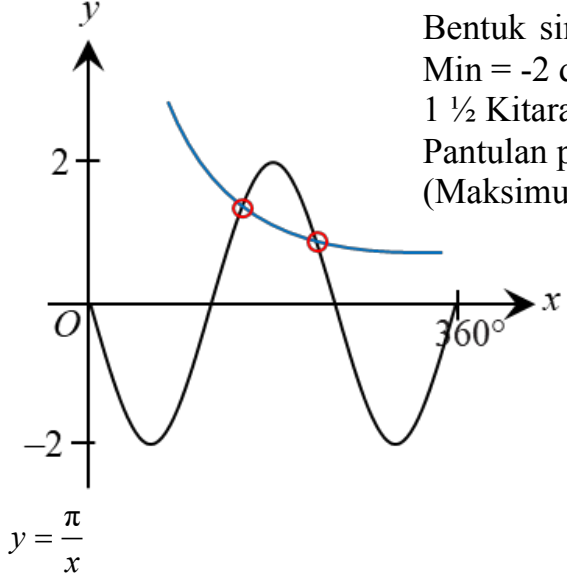
MATEMATIK TAMBAHAN
Kertas 2
Set 1
Dua Jam Tiga Puluh Minit

Bahagian A

SOALAN	BUTIRAN	MARKAH	JUMLAH
1(a)	$\overrightarrow{CB} + \overrightarrow{BA}$ atau $\overrightarrow{AB} + \overrightarrow{BC}$	1	3
	$\frac{n-3}{n}(-12\tilde{x} + 20\tilde{y}) = -3\tilde{x} + 5\tilde{y}$ <u>dan</u> perbandingan salah	1	
	komponen dilakukan 4 (atau $n = 4$)	1	
(b)	$-12(3\tilde{i}) + 20\left(\tilde{i} - \frac{3}{5}\tilde{j}\right)$	1	3
	$\frac{-16\tilde{i} - 12\tilde{j}}{\sqrt{(-16)^2 + (-12)^2}}$	1	
	$-\frac{4}{5}\tilde{i} - \frac{3}{5}\tilde{j}$	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
2(a)	$2! \times {}^nC_2$ ATAU $\frac{n!}{(n-2)!2!} = 45$	1	2
	90	1	
(b)(i)	${}^5C_3 \times \frac{5!}{2!}$ atau 6P_5	1	4
	1320	1	
	(ii) $4 \times 3!$ atau $4 \times {}^4P_3$ atau $4 \times 3 \times {}^3P_2$ atau $4 \times 3 \times {}^4P_2$ atau $4 \times 3 \times \frac{3!}{2!}$	1	
	372	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
2(a)(i)	Domain = $\{-2, 1, 2, 4\}$	1	4
	Julat = $\{2, 4, 6, 7\}$	1	
(ii)	Domain ialah $0 \leq x \leq 7$	1	
	Julat ialah $-4 \leq y \leq 2$	1	
(b)			2
		- Bentuk V	
		- Domain : $-3 \leq x \leq 2$; Julat : $0 \leq y \leq 8$; pintasan- $y = 1$; pintasan- $x = -\frac{1}{3}$	

SOALAN	BUTIRAN	MARKAH	JUMLAH
4(a)	$\tan A = \frac{4}{3}$ $\frac{2\left(\frac{4}{3}\right)}{1-\left(\frac{4}{3}\right)^2}$ $-3\frac{3}{7}$	1 1 1	3
4(b)	 Bentuk sinus Min = -2 dan Maks. = 2 1 ½ Kitaran untuk 2π Pantulan pada paksi-x (Maksimum 3 markah) $y = \frac{\pi}{x}$ Lakar graf $y = \frac{\pi}{x}$ Bilangan penyelesaian = 2	1 1 1 1 1 1 1	6

SOALAN	BUTIRAN	MARKAH	JUMLAH
5(a)	$x + y + z = 10$(1) $2x + 6y + 3z = 34$(2) $z = 3y$(3)	1 1 1	3
5(b)	Hapus anu pertama dengan kaedah gantian atau penghapusan Hapus anu kedua dengan kaedah gantian atau penghapusan $x = 2 / y = 2 / z = 6$ $y = 2 / z = 6 / x = 2$ $z = 6 / y = 2 / x = 2$	1 1 1 1 1	5

SOALAN	BUTIRAN	MARKAH	JUMLAH
6 (a)	$3^{2x} \times 3^y = 3^{2x} + 16$	1	4
	$(\sqrt{p})^2 \times \left(q^{\frac{1}{y}}\right)^y = (\sqrt{p})^2 + 16$	1	
	$p(q-1) = 16$	1	
	$p = \frac{16}{q-1}$	1	
(b)	$\log_m a - \log_m 3 = 5 - \log_m (5-m)$	1	3
	$\log_m \left(\frac{a}{3} \times (5-m)\right) = 5$	1	
	$a = \frac{3m^5}{5-m}$	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
7(a)	$4jp = j\theta$	1	2
	$\theta = 4p$	1	
(b)	$s = \left(\frac{3}{2}j\right)(8p)$	1	2
	$s = 12jp$	1	
(c)	$p = \frac{\pi}{6}$	1	4
	$\frac{1}{2}(j^2)(4p)$ atau $\frac{1}{2}\left(\frac{3}{2}j\right)^2(8p)$	1	
	$\frac{1}{2}(j^2)(4p) + \frac{1}{2}\left(\frac{3}{2}j\right)^2(8p)$	1	
	$\frac{11\pi}{6}j^2$	1	

Bahagian B

SOALAN	BUTIRAN	MARKAH	JUMLAH
8(a)	$2y = 6 - (y^2 + 3)$ $y = 1, y = -2$ (<i>abaikan</i>) (4,1)	1 1 1	3
(b)	$\frac{y^3}{3} + 3y$ $\frac{1}{2} \times 2 \times 4$ atau Guna $\int_0^1$ dalam $\frac{y^3}{3} + 3y$ $\frac{1}{2} \times 2 \times 4 + \int_0^1 y^2 + 3 dy$ $\frac{22}{3} // 7\frac{1}{3}$	1 1 1 1	4
(c)	$\pi \int_3^4 (x-3) dx$ $\pi \left[\frac{(4)^2}{2} - 3(4) \right] - \left[\frac{(3)^2}{2} - 3(3) \right]$ $\frac{1}{2} \pi$	1 1 1	3

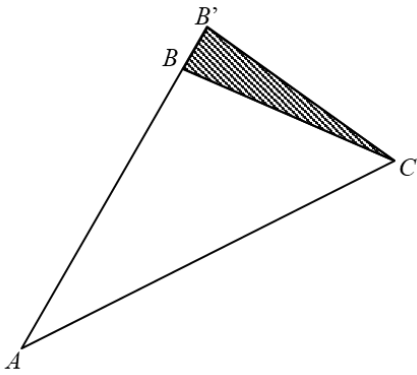
SOALAN	BUTIRAN	MARKAH	JUMLAH
9 (a)(i)	${}^8C_0 \left(\frac{3}{7} \right)^0 \left(\frac{4}{7} \right)^8$ atau ${}^8C_1 \left(\frac{3}{7} \right)^1 \left(\frac{4}{7} \right)^7$ $1 - {}^8C_0 \left(\frac{3}{7} \right)^0 \left(\frac{4}{7} \right)^8 - {}^8C_1 \left(\frac{3}{7} \right)^1 \left(\frac{4}{7} \right)^7$ 0.9204	1 1 1	3
(a)(ii)	$\sqrt{n \left(\frac{3}{7} \right) \left(\frac{4}{7} \right)} = 11.5$ $n = 540$	1 1	2
(b)(i)	$\frac{40-40}{12}$ atau $\frac{60-40}{12}$ 0.4522	1 1	2
(b)(ii)	0.202 $\frac{m-40}{12} = -0.202$ $m = 37.58$	1 1 1	3

SOALAN	BUTIRAN	MARKAH	JUMLAH														
10 (a)																	
	<table><tr><td>$\frac{1}{x^2}$</td><td>0.62</td><td>0.50</td><td>0.32</td><td>0.12</td><td>0.06</td><td>0.02</td></tr><tr><td>$\frac{1}{y}$</td><td>1.82</td><td>1.49</td><td>0.98</td><td>0.40</td><td>0.21</td><td>0.12</td></tr></table>	$\frac{1}{x^2}$	0.62	0.50	0.32	0.12	0.06	0.02	$\frac{1}{y}$	1.82	1.49	0.98	0.40	0.21	0.12	1	2
	$\frac{1}{x^2}$	0.62	0.50	0.32	0.12	0.06	0.02										
	$\frac{1}{y}$	1.82	1.49	0.98	0.40	0.21	0.12										
	1																
Semua nilai betul																	
(b)	Rujuk graf																
	Paksi yang betul dan 1 titik diplot dengan betul	1	3														
	Semua titik diplot dengan betul	1															
	Graf garis lurus penyuaian terbaik	1															
(c)(i)	$\frac{1}{y} = \frac{n}{m} \left(\frac{1}{x^2} \right) + \frac{1}{m}$	1	5														
	$\frac{1}{m} = 0.06$ atau $\frac{n}{m} = \frac{1.82 - 0.12}{0.62 - 0.02}$	1															
	$m = 16.67$	1															
	$n = 47.23$	1															
(ii)	$y = 0.84$	1															

SOALAN	BUTIRAN	MARKAH	JUMLAH
11 (a)(i)	$B (0, -5)$	1	3
(ii)	$\frac{2(x) + 7(-3)}{9} = 0 \quad \text{atau} \quad \frac{2k + 7(-7)}{9} = -5$ $C \left(\frac{21}{2}, 2 \right)$	1 1	
(b)	$\frac{2}{3} \times m_N = -1$ $y - (-7) = -\frac{3}{2}(x - (-3))$ $2y = -3x - 23 \quad \text{atau setara}$	1 1 1	3
(c)	Luas segitiga $AOB =$ $\frac{1}{2} \left[((-3 \times 0) + (0 \times -5) + (0 \times -7)) - ((-7 \times 0) + (0 \times 0) + (-5 \times -3)) \right]$ atau Luas segitiga $AOC =$ $\frac{1}{2} \left[((-3 \times 0) + (0 \times 2) + \left(\frac{21}{2} \times -7 \right)) - \left((-7 \times 0) + \left(0 \times \frac{21}{2} \right) + (2 \times -3) \right) \right]$ Luas $\triangle AOB = \frac{15}{2}$ dan Luas $\triangle AOC = \frac{135}{4}$ $\frac{15}{2} : \frac{135}{4}$ $2 : 9$	1 1 1 1	4

Bahagian C

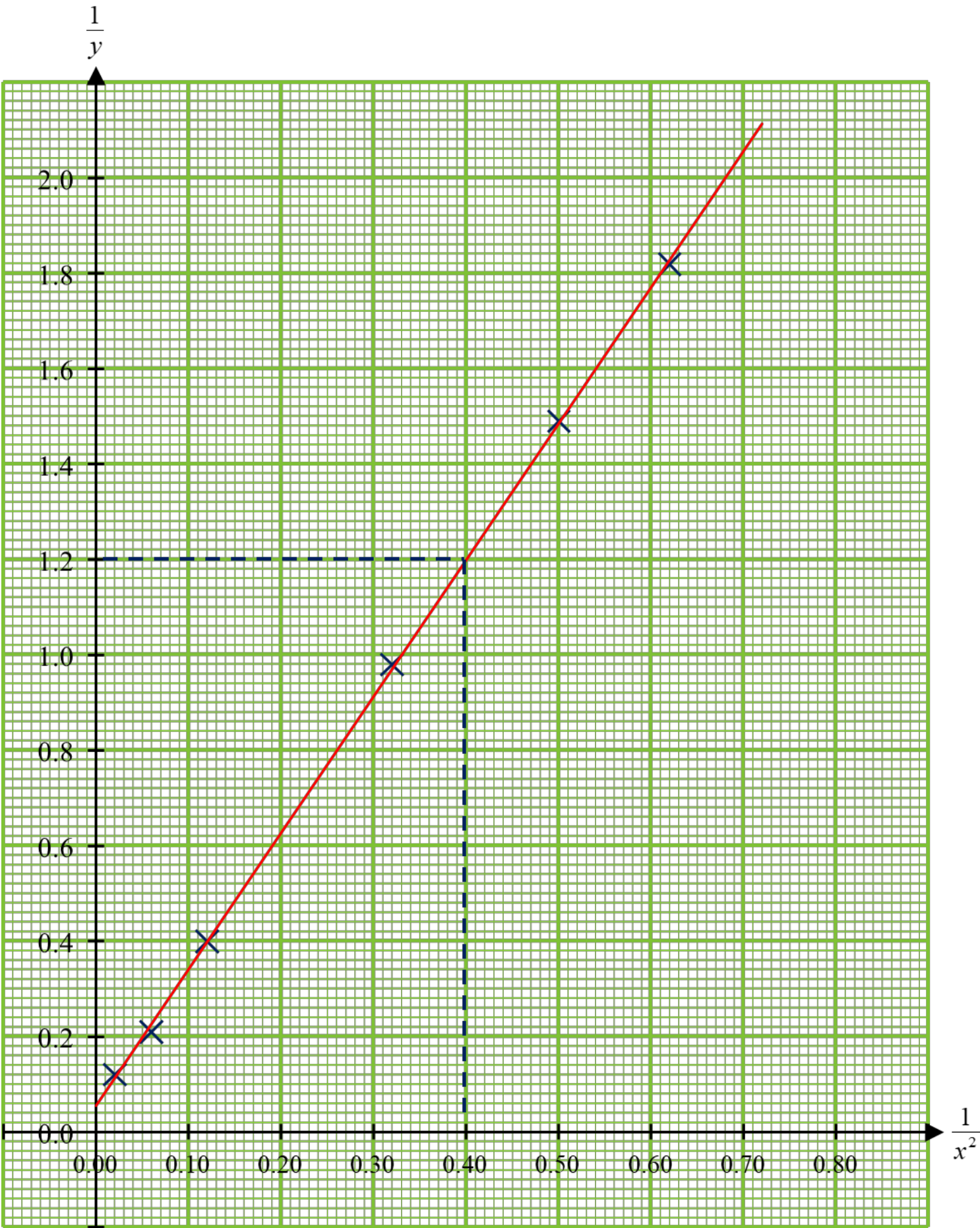
SOALAN	BUTIRAN	MARKAH	JUMLAH
12 (a)	I: $x + y \leq 450$ II: $x \leq 4y$ III: $18x + 16y \geq 3600$	1 1 1	3
(b)	Rujuk graf pada lampiran Mana-mana satu garisan dilukis dengan betul Kesemua 3 garisan dilukis dengan betul (garis padu atau garis putus-putus) Rantau R dilorek dengan betul	1 1 1	3
(c)(i) (ii)	340 (360,90) $18(360) + 16(90)$ RM 7920	1 1 1 1	4

SOALAN	BUTIRAN	MARKAH	JUMLAH
13 (a) (i)	$\frac{\sin E}{7} = \frac{\sin 50.5^\circ}{6.5}$ $\angle CED = 56.20^\circ$	1 1	2
(ii)	$AB^2 = 5^2 + 9^2 - 2(5)(9) \cos 50.5^\circ$ $AB = 6.98\text{cm}$	1 1	2
(iii)	$\frac{CE}{\sin 73.30^\circ} = \frac{6.5}{\sin 50.5^\circ}$ atau $7^2 + 6.5^2 - 2(7)(6.5)\cos 73.30^\circ$ $CE = 8.068 \text{ cm}$ $\frac{1}{2} (8.068 + 9) (6.5) \sin 56.20^\circ$ 46.10 cm^2	1 1 1 1	4
13 (b)	 $C. \angle AB'C > \angle ACB'$	1 1	2

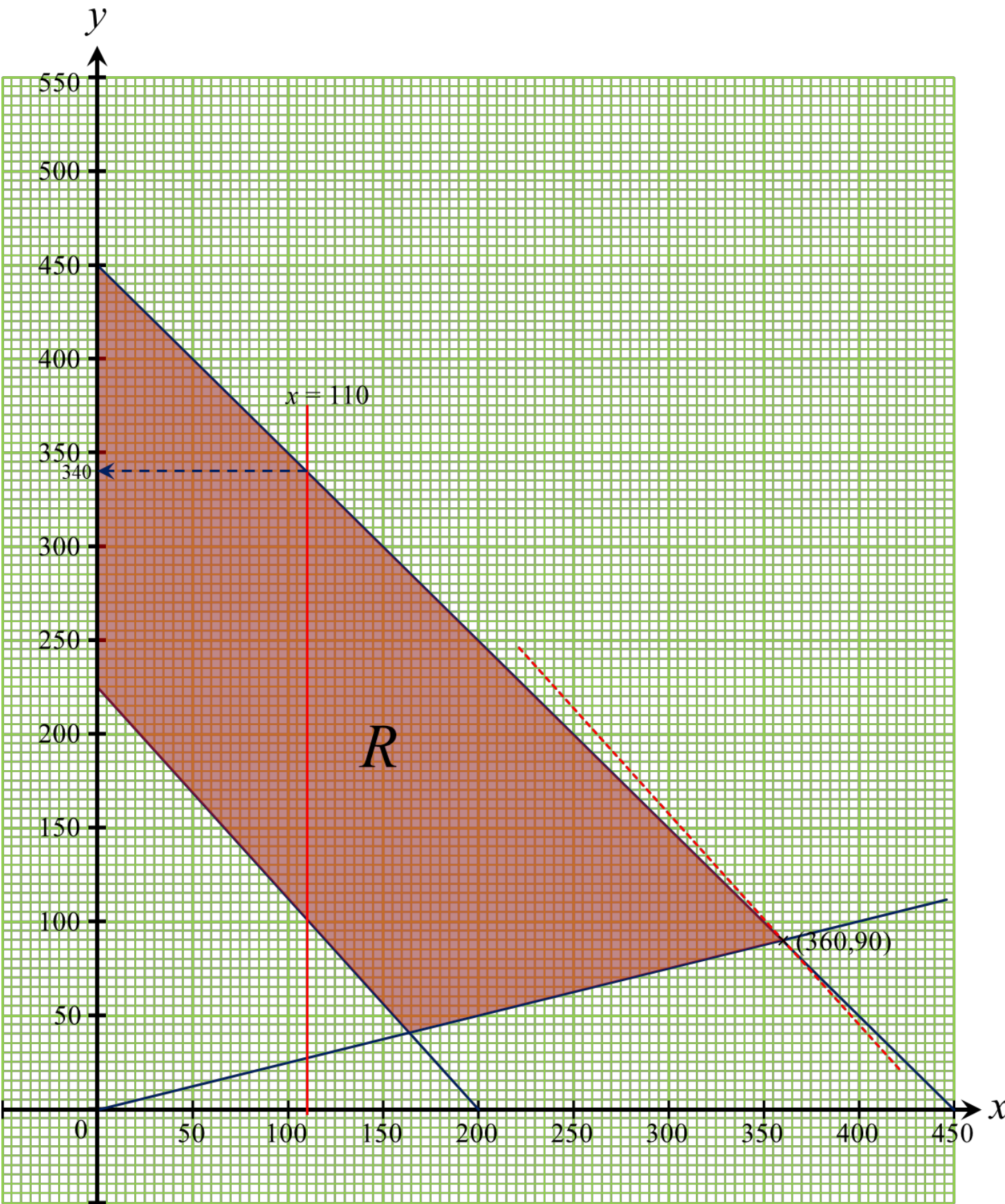
SOALAN	BUTIRAN	MARKAH	JUMLAH
14 (a)	$2(0)^2 - 8$ -8 m s^{-2}	1 1	2
14 (b)	$t^2 - 8t + 12 > 0$ $(t - 6)(t - 2) > 0$ $0 \leq t < 2 // t < 2, t > 6$	1 1	2
14 (c)	$2t - 8 < 0$ $0 < t < 4 // t < 4$	1 1	2
14 (d)	$s = \frac{t^3}{3} - \frac{8t^2}{2} + 12t + c$ $\frac{(1)^3}{3} - \frac{8(1)^2}{2} + 12(1) / \frac{(2)^3}{3} - \frac{8(2)^2}{2} + 12(2)$ $\left \frac{32}{3} - \frac{25}{3} \right $ $\frac{7}{3} \text{ m}$	1 1 1 1	4

SOALAN	BUTIRAN	MARKAH	JUMLAH
15(a)	$150 = \frac{9}{3p - q} \times 100$ atau $125 = \frac{11}{p + q} \times 100$ Kaedah penyelesaian $3p - q = 6$ dan $p + q = 8.8$ (Hapuskan satu anu) $p = 3.7$ $q = 5.1$	1 1 1 1	4
(b)	$\frac{(120 \times 4) + (150 \times 2) + (125 \times 4)}{4 + 2 + 4}$ $\bar{I} = 128$ 28%	1 1 1	3
(d)	$128 \times \frac{115}{100}$ $128 \times \frac{115}{100} = \frac{P_{23}}{25} \times 100$ RM 36.80	1 1 1	3

Soalan 10 (b)



Soalan 12 (b)



3472/1
Matematik
Tambahan
Kertas 1
2 Jam

PERAK SET 2



SEKTOR PEMBELAJARAN NEGERI PERAK
JABATAN PENDIDIKAN NEGERI PERAK

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SKEMA JAWAPAN MODUL GEMPUR SPM
TAHUN 2022

MATEMATIK TAMBAHAN
Kertas 1
Set 2
Dua Jam

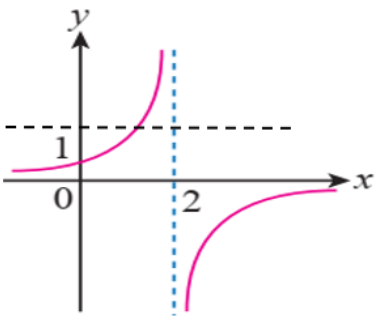
SOALAN	BUTIRAN	MARKAH	JUMLAH
1	$x^2 + 8x + 32 = 16 - px$ $x^2 + (8 + p)x + 16 = 0$ $(8 + p)^2 - 4(1)(16) \geq 0$ $p^2 + 16p \geq 0$ $p(p + 16) \geq 0$ $p \leq -16 @ p \geq 0$ Lakaran graf atau nombor garis atau jadual	 1 1 1 1	4

SOALAN	BUTIRAN	MARKAH	JUMLAH
2	$y = \frac{(3x+1)^2}{(1-2x)}$ $u = (3x + 1)^2 \quad \text{dan} \quad v = 1 - 2x$ Maka, $\frac{du}{dx} = 2(3x + 1)(3)$, $\frac{dv}{dx} = -2$ $= 6(3x + 1)$ $\frac{du}{dx} = v \frac{du}{dx} - u \frac{dv}{dx}$ $= \frac{(1 - 2x)[6(3x + 1)] - (3x + 1)^2(-2)}{(1 - 2x)^2}$ $= \frac{2(3x + 1)(4 - 3x)}{(1 - 2x)^2}$	1 1 1	3

SOALAN	BUTIRAN	MARKAH	JUMLAH
3	$\frac{75 - \mu}{\sigma} = 1.281 \text{ atau } \frac{40 - \mu}{\sigma} = 0.385$ $75 - \mu = 1.281\sigma \text{ --(1)}$ $40 - \mu = 0.385\sigma \text{ --(2)}$ $75 - (40 - 0.385\sigma) = 1.281\sigma$ $\sigma = 39.06$ Ganti $\sigma=39.06$ into eq (1) or (2) and solve $\mu = 24.96$	1 1 1 1 1 1	5

SOALAN	BUTIRAN	MARKAH	JUMLAH
4(a)	$r_1 = \frac{192p^2}{768p} = \frac{1}{4}p$ $r_2 = \frac{48p^3}{192p^2} = \frac{1}{4}p$ $r_3 = \frac{12p^4}{48p^3} = \frac{1}{4}p$ Jujukan ini ialah jangjang geomerti kerana nisbah sepunya, r adalah sama.	1 1	7
(b)	Ben: $36000 = 18000 + (n - 1)(1800)$ $n = 11$ Jumlah gaji = $\frac{11}{2}[2(18000) + (11 - 1)(1800)] + 4(36000)$ Jumlah gaji = 441000 Kent: $36000 = a + (15 - 1)(1000)$ $a = 22000$ Jumlah gaji = $\frac{15}{2}[2(22000) + (15 - 1)(1000)]$ Jumlah gaji = 435000 Ben menerima jumlah gaji yang lebih	1 1 1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
5 (a)	$(8 - 2k)(5k)$ Berjaya Buktikan, Luas Q = $-10k^2 + 40k$ $k = 2$	1 1 1	
(b)	$(8)^3 - (4)^3$ 408	1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
6 (a)	 Apabila ujian garis mengufuk dilakukan, garis mengufuk memotong graf f hanya pada satu titik. Ini bermaksud jenis fungsi f ini ialah fungsi satu dengan satu. Maka, fungsi f mempunyai fungsi songsang.	1	5
(b)(i)	$y = \frac{2}{2-x}$ $2y - xy = 2$ $x = \frac{2y-2}{y}$ $f^{-1}(x) = \frac{2x-2}{x}, x \neq 0$	1 1	
(ii)	$f^{-1}(-6) = \frac{2(-6)-2}{(-6)}$ $= \frac{7}{3}$	1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
7(a)	- Paksi dilukis dengan betul $\log_{10} y$ melawan x dan garis lurus dilukiskan. - Apabila $x = 6$, $\log_{10} 10 = 1$. (6, 1) Apabila $x = 16$, $\log_{10} 100 = 2$. (16, 2) Titik (6, 1) dan (16, 2) diplotkan	1 1	5
(b)	$y = pq^x$ $\log_{10} y = \log_{10} pq^x$ $\log_{10} y = \log_{10} p + (\log_{10} q)x$ $\log_{10} q = \frac{2-1}{16-6} = 0.1$ $q = 1.259$ $1 = \log_{10} p + 0.1(6)$ $\log_{10} p = 0.4$ $p = 2.512$	1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
9	$\angle AOB = \frac{60^0}{180^0} \times \pi$ $= \frac{\pi}{3} rad$ Luas /Area of shaded region $= 3 \times \frac{1}{2} \left(\frac{r}{3} \right)^2 \left(\frac{\pi}{3} - \sin 60^0 \right)$ $= \frac{r^2}{6} \left(\frac{\pi}{3} - \frac{\sqrt{3}}{2} \right)$ $= \left(\frac{\pi}{18} - \frac{\sqrt{3}}{12} \right) r^2 cm^2$ When r=30cm, $Area = \left(\frac{\pi}{18} - \frac{\sqrt{3}}{12} \right) (30)^2 cm^2$ $= 27.196/ 27.20 cm^2$	1 1 1 1 1 1	6

SOALAN	BUTIRAN	MARKAH	JUMLAH
10(a)(i)	$\overrightarrow{KR} = \underline{x} - \underline{y}$	1	7
(ii)	$\overrightarrow{SM} = 4\underline{y} + \frac{3}{4} (-4\underline{y} + \underline{x})$	1	
	$= \underline{y} + \frac{3}{4} \underline{x}$	1	
(b)	$\overrightarrow{SM} = q(\overrightarrow{SP} + \overrightarrow{PQ})$		
	$\underline{y} + \frac{3}{4} \underline{x} = q (4\underline{y} + p\underline{x} - 2\underline{y})$	1	
	$\underline{y} + \frac{3}{4} \underline{x} = 2q\underline{y} + pq\underline{x}$		
	$2q = 1$	1	
	$q = \frac{1}{2}$	1	
	$pq = \frac{3}{4}$		
	$p = \frac{3}{2}$	1	

SOALAN		BUTIRAN	MARKAH	JUMLAH
11	(a)	$\cos (A+B)=\cos A \cos B-\sin A \sin B$ Jika gantikan B dengan A $\cos (A+A)=\cos A \cos A-\sin A \sin A$ $\cos 2 A=\cos ^2 A-\sin ^2 A$	1 1	6
	(b)	$3 \cos ^2 x-3 \sin ^2 x=8 \sin x \cos x$ $3\left(\cos ^2 x-\sin ^2 x\right)=4(2 \sin x \cos x)$ $3(\cos 2 x)=4(\sin 2 x)$ $\frac{\sin 2 A}{\cos 2 A}=\frac{3}{4}$ $\tan 2 x=0.75$ $x=18.44^{\circ}, 108.44^{\circ}, 198.44^{\circ}, 288.44^{\circ}$	1 1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
12(a)	6x4 24	1 1	5
(b)	$\frac{{}^8P_6}{2(6)}$ or $\frac{{}^8P_7}{2(7)}$ or $\frac{{}^8P_8}{2(8)}$ $\frac{{}^8P_6}{2(6)}+\frac{{}^8P_7}{2(7)}+\frac{{}^8P_8}{2(8)}$ 7080	1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
13 (a)	$m=1$ dan $n=1$	1	8
(b)	$\left(\frac{2k+7k}{2}, \frac{4k+k}{2}\right)$ atau $\left(\frac{(2k)(1)+(7k)(1)}{1+1}, \frac{(4k)(1)+(k)(1)}{1+1}\right)$ $h+k=\frac{4k+k}{2}$ $h=\frac{3}{2}k$	1 1 1	
(c)	$h=3$ atau $k=2$ $\frac{1}{2}\left [(4)(2)+(14)(L-2)+(8)(2)+(0)(8)]\right. \\ \left.-[(4)(2)+(0)(L-2)+(8)(2)+(14)(8)]\right =105$ $14L-140=\pm 210$ $L=25, L=-5$ $S(8,-7)$	1 1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
14(a)	Isi pada = 32π $\pi r^2 h = 32\pi$ $h = \frac{32}{x^2}$ Jumlah luas permukaan $\pi r s + \pi r^2 + 2 \pi r h$ $\pi(x) (3x) + \pi (x)^2 + 2 \pi (x) \left(\frac{32}{x^2}\right)$ $4\pi x^2 + \frac{64\pi}{x}$ $4 \pi \left(x^2 + \frac{16}{x}\right)$	1 1 1	8
(b)	$\frac{dL}{dx} = 0$ $\frac{dL}{dx} = 8 \pi x - \frac{64\pi}{x^2}$ $8 \pi x - \frac{64\pi}{x^2} = 0$ $x = 2$	1 1	
(c)	Petua rantai $\frac{dL}{dt} = \frac{dL}{dx} \times \frac{dx}{dt}$ atau setara $42 \pi = \left(8 \pi x - \frac{64\pi}{x^2}\right) \times \frac{dx}{dt}$ Gantikan $x = 4$ $42 \pi = \left[8 \pi (4) - \frac{64\pi}{(4)^2}\right] \times \frac{dx}{dt}$ $\frac{dx}{dt} = 1.5 \text{ cms}^{-1}$	1 1 1	

3472/2
Matematik Tambahan
Kertas 2
2 ½ Jam

PERAK SET 2



KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI PERAK

SEKTOR PEMBELAJARAN NEGERI PERAK
JABATAN PENDIDIKAN NEGERI PERAK

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SKEMA JAWAPAN MODUL GEMPUR SPM
TAHUN 2022

MATEMATIK TAMBAHAN
Kertas 2
Set 2
Dua Jam Tiga Puluh Minit

Bahagian A

SOALAN	BUTIRAN	MARKAH	JUMLAH
1	$x = \frac{5+3y}{2}$ atau $y = \frac{5+2x}{3}$ $2\left(\frac{5+3y}{2}\right)^2 + y^2 = 8$ $y = \frac{-30 \pm \sqrt{(30)^2 - 4(11)(9)}}{2(11)}$ $y_1 = -0.343$ atau $y_2 = -2.38$ $x_1 = 1.99$ atau $x_2 = -1.07$	1 1 1 1 1	5

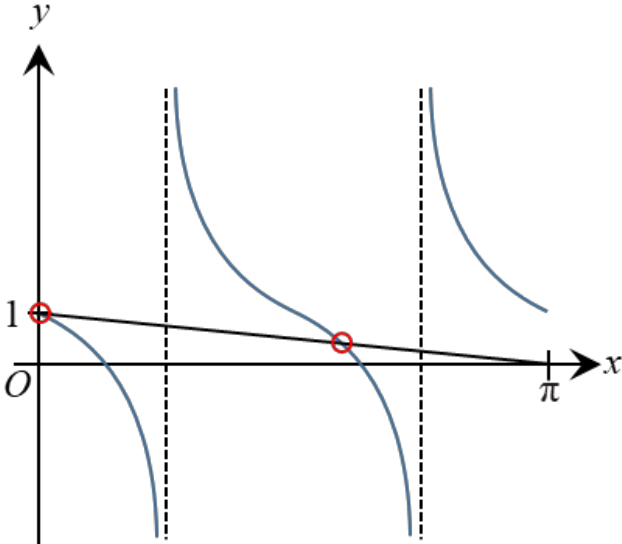
SOALAN	BUTIRAN	MARKAH	JUMLAH
2 (a)	$\frac{(n-2)!}{n(n-1)(n-2)!}$ $\frac{1}{n(n-1)} = \frac{1}{n^2 - n}$	1 1	2
2 (b)	${}^4C_0 \times {}^7C_6$ atau ${}^4C_1 \times {}^7C_5$ atau ${}^4C_2 \times {}^7C_4$ ${}^4C_0 \times {}^7C_6 + {}^4C_1 \times {}^7C_5 + {}^4C_2 \times {}^7C_4$ 301	1 1 1	3

SOALAN	BUTIRAN	MARKAH	JUMLAH
3(a)	$ax^2 + bx + c = 0$ $x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$ $\left(x - \frac{b}{2a}\right)^2 = \frac{b^2 - 4ac}{4a^2}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	1 1 1	3
3(b)	$\frac{1}{2}(x-1)(2x-1) \times 4$ $\frac{1}{2}(x-1)(2x-1) \times 4 = 17$ $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(4)(-15)}}{2(4)}$ $x = 2.8267 \text{ cm}$	1 1 1 1	4

SOALAN	BUTIRAN	MARKAH	JUMLAH
4(a)	ar^{5-1} atau $4ar^{3-1}$	1	3
	$ar^{5-1} = 4ar^{3-1}$	1	
	$r = 2$ (-2 tidak diterima)	1	
(b)(i)	$\frac{4(2^n - 1)}{2 - 1}$	1	4
	$1020 = \frac{4(2^n - 1)}{2 - 1}$	1	
	$2^8 = 2^n$	1	
	$n = 8$	1	
(ii)	$4(2)^{8-1}$	1	2
	512	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
5(a)(i)	$\overrightarrow{AE} = \overrightarrow{AO} + \overrightarrow{OE}$	@ 1	3
	$\overrightarrow{AE} = -5\underset{\sim}{x} + 10\underset{\sim}{y}$	1	
(a)(ii)	$\overrightarrow{BC} = \overrightarrow{BA} + \overrightarrow{AC}$	@ 1	
	$\overrightarrow{BC} = -6\underset{\sim}{x} + 4\underset{\sim}{y}$	1	
(b)	$\overrightarrow{BC} = \lambda \overrightarrow{BD}$		4
	$-6\underset{\sim}{x} + 4\underset{\sim}{y} = -9\lambda\underset{\sim}{x} + 4\lambda\underset{\sim}{y}$	1	
	$-6 = -9\lambda$ atau $4 = 4\lambda$	1	
	$\lambda = \frac{2}{3}$ dan $\lambda = 1$	1	
	Menara pemerhatian B, C dan D bukan segaris. Ranger itu dapat melihat menara pemerhatian B tanpa dihalang oleh menara pemerhatian C. <i>Wildlife observatory B, C and D are not collinear. The ranger can see the wildlife observatory B without being block by wildlife observatory C</i>	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
6	$2x + 3y + 4z = 29.5$	1	8
	$6x + 4y + 2z = 31$	1	
	$2x + 5y + 3z = 21$	1	
	Hapus anu pertama dengan kaedah gantian atau penghapusan	1	
	Hapus anu kedua dengan kaedah gantian atau penghapusan	1	
	$y = 5.5, x = 0.5, z = 3$	1	
	$x = 0.5, y = 5.5, z = 3$	1	
	$z = 3, x = 0.5, y = 5.5$	1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
7(a)	$\frac{\tan A + \tan A}{1 - \tan A \tan A}$ $\tan 2A$	1 1	2
(b)	Bentuk graf tangen 1 kitaran untuk π Pantulan pada paksi-x Anjakan 1 unit ke atas 	1 1 1 1	4
(c)	$y = 1 - \frac{x}{\pi}$ Garisan dengan pintasan $y = 1$ atau dengan kecerunan negatif Bilangan penyelesaian = 2	1 1 1	3

Bahagian B

SOALAN	BUTIRAN	MARKAH	JUMLAH
8(a)	$2(2 + x^2) + x = 7$ $(2x + 3)(x - 1) = 0$ $(1, 3)$	1 1 1	3
(b)	$\frac{x^3}{3} + 2x$ Guna $\int_0^1$ dalam $\frac{x^3}{3} + 2x$ atau 1×3 $3 - \left[\frac{(1)^3}{3} + 2(1) \right] - \left[\frac{(0)^3}{3} + 2(0) \right]$ $\frac{2}{3}$	1 1 1 1	4
8(c)	$\frac{y^2}{2} - 2y$ $\pi \left[\frac{(3)^2}{2} - 2(3) \right] - \pi \left[\frac{(3)^2}{2} - 2(3) \right]$ $\frac{1}{2} \pi$	1 1 1	3

SOALAN	BUTIRAN						MARKAH	JUMLAH
9 (a)(i)	$\sqrt{x}$	5.00	2.50	1.25	1.00	0.50	1	2
	y^2	52.6	29.1	16.0	14.0	9.0	1	
(a)(ii)	Rujuk graf Paksi yang betul dan 1 titik diplot dengan betul Semua titik diplot dengan betul Graf garis lurus penyuaian terbaik						1 1 1	3
(b)(i)	$y = 4.85$						1	1
(b)(ii)	$y^2 = pq\sqrt{x} + p$ $p = *4.5$ $(4.5)q = *9.5$ $q = 2.11$						1 1 1 1	4

SOALAN	BUTIRAN						MARKAH	JUMLAH
10 (a)(i)	$0.4052 - P(z \geq k) = 0.104$						1	2
	$k = 0.52$						1	
(a)(ii)	$\frac{500 - 510}{48} / \frac{515 - 510}{48}$						1	3
	$1 - P(Z \leq -0.2083) - P(Z \geq 0.1042)$						1	
	0.1240						1	
(b)(i)	$p = 0.52$, $q = 0.48$						1	3
	${}^{50}C_{15} (0.48)^{15} (0.52)^{35}$						1	
	0.004276						1	
(b)(ii)	$\sqrt{(1500)(0.52)(0.48)}$						1	2
	19.35						1	

SOALAN	BUTIRAN						MARKAH	JUMLAH
11 (a)	$\angle HOK = \frac{15}{12}$						1	2
	0.625 rad						1	
11 (b)	1.892 rad						1	4
	$12(1.892)$ atau $2(12) \sin 1.892$						1	
	$12(1.892) + 2(12) \sin 1.892$						1	
	42.17 m						1	
	$\frac{1}{2}(12)^2 (1.25)$						1	4
	$\frac{1}{2}(24) (17.32)$ atau $\frac{1}{2}(12)^2 \sin 108.39^\circ$						1	
	$\frac{1}{2}(24) (17.32) - \frac{1}{2}(12)^2 (1.25) - \frac{1}{2}(12)^2 \sin 108.39^\circ$						1	
	49.52 m ²						1	

Bahagian C

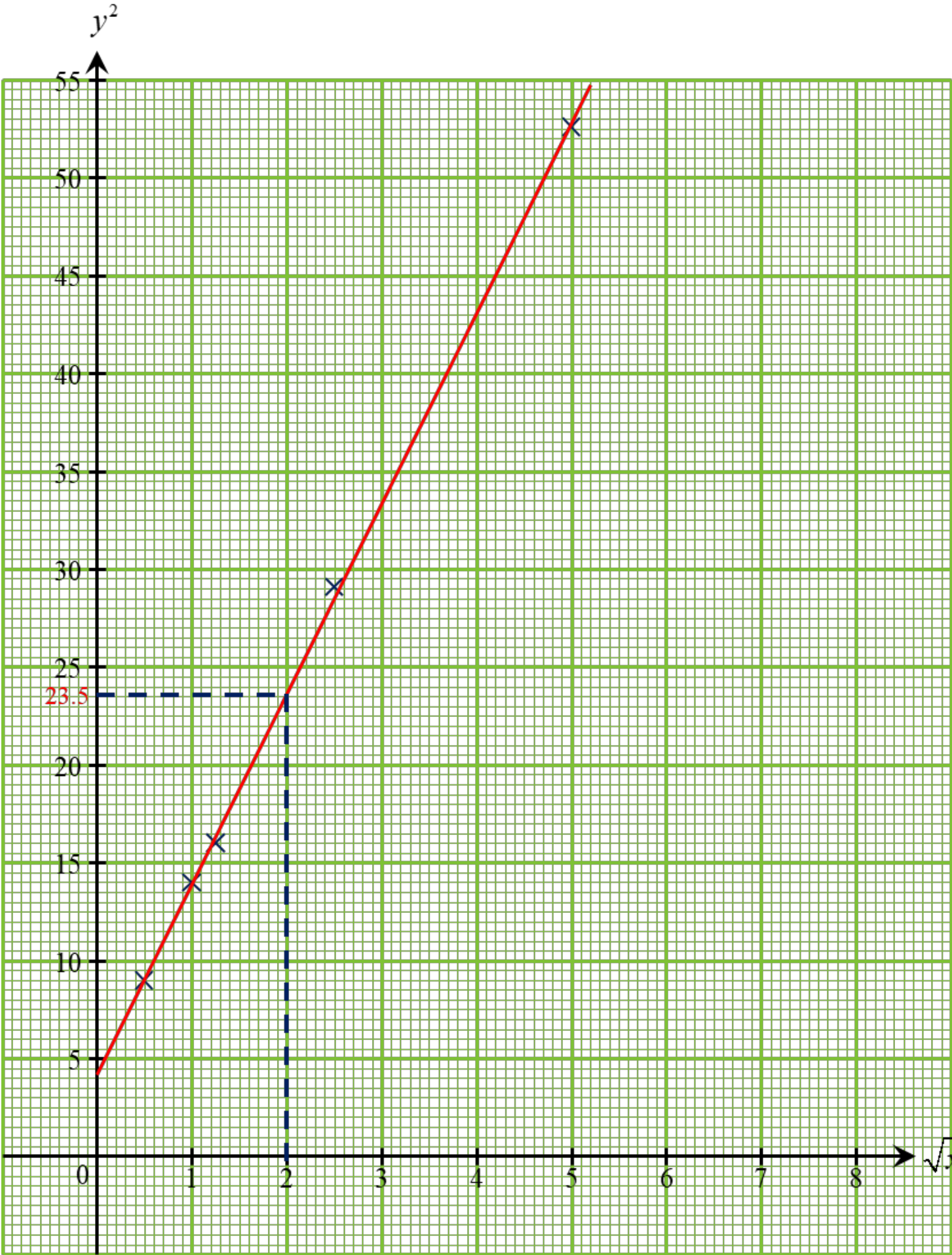
SOALAN	BUTIRAN	MARKAH	JUMLAH
12(a)	$1 - 2t = 0$ $t = \frac{1}{2}s$ $v_p\left(\frac{1}{2}\right) = 6 + \left(\frac{1}{2}\right) - \left(\frac{1}{2}\right)^2$ $v_p = \frac{25}{4}ms^{-1}$	1 1 1 1	4
12(b)	$s = 6t + \frac{t^2}{2} - \frac{t^3}{3}$ $s(3) = 6(3) + \frac{(3)^2}{2} - \frac{(3)^3}{3}$ $s = \frac{27}{2}m$	1 1 1	3
12(c)	$jarak = 9$ $15 - \frac{9}{2} - 9 - 3$ $\frac{3}{2}m$	1 1 1	3

SOALAN	BUTIRAN	MARKAH	JUMLAH
13 (a)	$AC = \sqrt{5^2 + 10^2}$ $AG = \sqrt{8^2 + (125)^2}$ $AG = 13.75cm$	1 1 1	10
(b)	$\sin \angle FAG = \frac{5}{13.75}$ $\angle FAG = 21^{\circ}19'$	1 , 1 1	
(c)	$HA = \sqrt{5^2 + 8^2}$ $\cos H = \frac{(\sqrt{89})^2 + 10^2 - (\sqrt{189})^2}{(9.434)(10)}$ $Area \Delta HAG = \frac{1}{2}(9.434)(10)(\sin 90^{\circ})$ $= 47.17 \text{ cm}^2$	1 1 1 1	

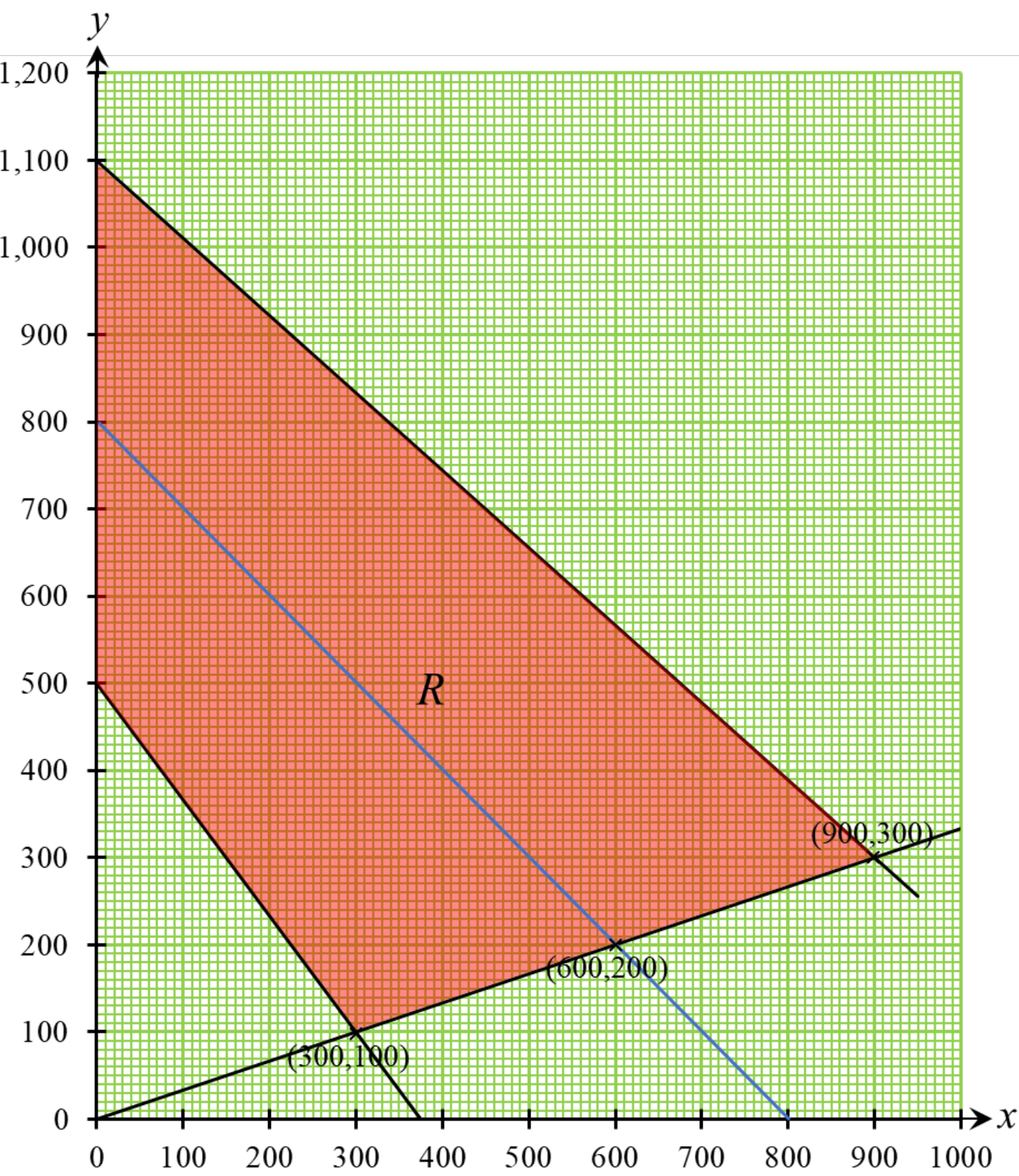
SOALAN	BUTIRAN	MARKAH	JUMLAH
14(a)	$x \leq 2y$ $16x + 18y \leq 19800$ $4x + 3y \geq 1500$	1 1 1	3
14(b)	Rujuk graf Lukis dengan betul sekurang-kurangnya 1 garis lurus daripada ketaksamaan x dan y . Lukis dengan betul SEMUA garis lurus daripada ketaksamaan x dan y Rantau R dilorek dengan betul	1 1 1	3
14(c)(i)	Nilai maksimum baju sekolah = 900 helai	1	4
14(c)(ii)	$(600, 200)$ $4(600) + 3(200)$ RM 3000	1 1 1	

SOALAN	BUTIRAN	MARKAH	JUMLAH
15(a)	$\frac{1330}{950} \times 100$ 140	1 1	2
15(b)	$w_B = 30$ $\frac{(121 \times 22) + (y \times 28) + (114 \times 20) + (161 \times 30)}{100} = 134.12$ $y = 130$ Harga bahan B meningkat 30% pada tahun 2020 berbanding tahun 2016.	1 1 1 1	4
15(c)	$\frac{121 \times 100}{110}$ atau $\frac{130 \times 100}{125}$ atau $\frac{114 \times 100}{120}$ atau $\frac{161 \times 100}{140}$ $\frac{(110 \times 18) + (104 \times 30) + (95 \times 22) + (115 \times 30)}{100}$ $\frac{P_{2020}}{40500} \times 100 = 106.40$ RM 43 092	1 1 1 1	4

Soalan 9(b)



Soalan 14(b)



SKEMA PEMARKAHAN

No.	Skema Pemarkahan	Submarks	Total Marks
1(a)	$3k^{\frac{1}{2}+(-\frac{1}{3})}$	1	4
	$3k^{\frac{1}{6}}$	1	
1(b)	$(5^x)(5) - (5^x)(5)^{-1} + (5^x)$	1	
	29(5 ^{x-1}) boleh dibahagi tepat dengan 29 bagi semua integer positif <i>x</i> atau 5 ^{x-1}	1	
2	$\cos \angle AOL = \frac{16}{20}$ atau $\sin \angle AOL = \frac{12}{20}$ atau $\tan \angle AOL = \frac{12}{16}$	1	4
	$\angle AOB = 73.74^\circ$ atau 1.287 rad	1	
	20×1.287 atau $\frac{73.74}{360} \times 2\pi(20)$	1	
	25.74	1	
3	$xy = 7 - x$	1	4
	$a = 7$	1	
	$3 = 7 - b$ ATAU $-1 = \frac{7-3}{0-b}$	1	
	$b = 4$ $b = 4$	1	
4(a)	$\text{Kos } x = \frac{90}{L}$	1	
	$L = \frac{90}{\cos x}$		
	$= \frac{90}{(1-2\sin^2 \frac{x}{2})}$	1	
	$= \frac{90}{1-2(2t)^2}$ $= \frac{90}{1-8t^2}$	1	

4(b)	$\cos \frac{x}{2} = \sqrt{1 - 4t^2}$ $\frac{2t}{\sqrt{1-4t^2}}$	1	5
5(a)	$99N = 54$ $N = \frac{6}{11}$	1	
5(b)	$\frac{1}{2}(\sqrt{5} + \sqrt{2})(2\sqrt{5} - \sqrt{2})$ $= \frac{1}{2}[(2 \times 5) - \sqrt{2}\sqrt{5} + 2\sqrt{2}\sqrt{5} - 2] \text{ atau setara}$ $= 4 + \frac{1}{2}\sqrt{10}$	1	5
6(a)	$2\overrightarrow{AB} = \overrightarrow{DC}$ $2\overrightarrow{AB} = -\overrightarrow{CD}$ $2[(h+2)\underline{i} - 3\underline{j}] = -(2\underline{i} + 3k\underline{j})$ $2(h+2)\underline{i} - 6\underline{j} = -2\underline{i} - 3k\underline{j}$ <i>Bandingkan</i> $2(h+2) = -2$ $2h+4 = -2$ $h = -3$ <i>Bandingkan</i> $-3k = -6$ $k = 2$	1	
6(b)	$ \overrightarrow{AB} = \sqrt{(-1)^2 + (-3)^2}$ $= \sqrt{10}$ vektor unit dalam arah $\overrightarrow{AB} = \frac{-\underline{i}-3\underline{j}}{\sqrt{10}}$	1	5
7(a)	$f(x) = \frac{4}{(1-2x)^3}$ $f'(x) = (4)(-3)(1-2x)^{-4}(-2)$ $= 24(1-2x)^{-4}$ m + n = 20	1	

7(b)	$\frac{1}{p} \int f'(x) dx = -\frac{1}{81}$ $\frac{1}{p} \left(\frac{4}{(1-2x)^3} \right) = -\frac{1}{81}$ $\frac{1}{p} \left\{ \frac{4}{[1-2(2)]^3} \right\} = -\frac{1}{81}$ p = 12	1	1	5
8(a) (i)	$C(x, y) = \left(\frac{2(-12)+1(3)}{1+2}, \frac{2(1)+1(7)}{1+2} \right)$ $= (-7, 3)$	1	1	6
(a) (ii)	$y - 1 = \frac{2}{5}(x - (-12))$ $y = \frac{2}{5}x + \frac{29}{5} \text{ or equivalent}$	1	1	
8(b)	$\sqrt{(x-3)^2 + (y-7)^2} = 6$ $x^2 - 6x + 9 + y^2 - 14y + 49 = 36$ $x^2 + y^2 - 6x - 14y + 22 = 0$	1	1	
9(a)	$\sqrt{25p(1-p)} = \sqrt{\frac{50}{9}} \quad \text{or} \quad 25p(1-p) = \frac{50}{9}$ $9p^2 - 9p + 2 = 0$ $p = \frac{1}{3}$ $25 \times \frac{1}{3}$ $\frac{25}{3}$	1	1	6
9(b)(i)	0.7881	1		
(ii)	Skor-z = -0.8 $\frac{X - 84}{5} = -0.8$ X = 80	1	1	

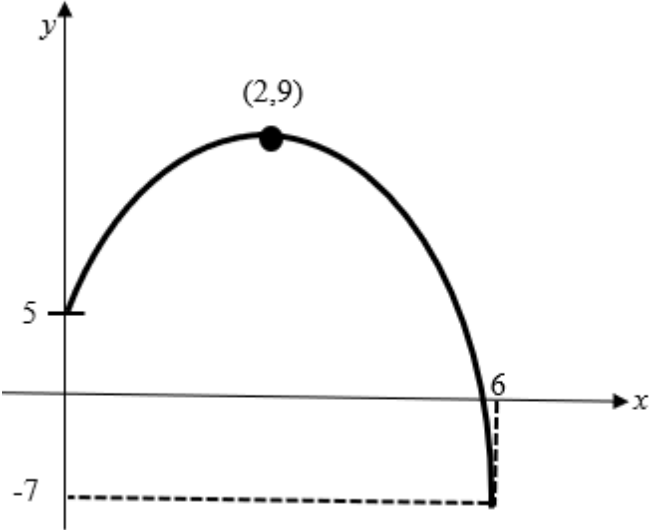
10(a)	a b c b a digit pertama : hanya 9 pilihan sahaja (kecuali 0) digit ke-5: 1 pilihan sahaja, iaitu ikut pilihan digit pertama. digit ke-2: 10 pilihan digit ke-4: 1 pilihan sahaja, iaitu ikut pilihan digit ke-2 digit ke-3: 10 pilihan. Skema: Digit pertama, 9 Digit kedua atau ketiga, 10 atau Digit ke-empat atau ke-lima, 1 $9 \times 10 \times 10 \times 1 \times 1$ $= 900$	1 1 1 1	
10(b)	${}^8C_6 \times {}^6C_3$ 560	1 1	6
11(a)	$3x + 2y + z = 90$ $4x + 3y + z = 122$ $6x + y + 4z = 148$	1 (mana2 satu betul) 1 (semua betul)	
11(b)	Hapuskan salah satu pemboleh ubah $x + y = 32$ $10x + 11y = 340$ or other valid method Hapuskan satu lagi pemboleh ubah sehingga tinggal satu pemboleh ubah $x = 12, y = 20, z = 14$	1 1 1,1,1	7
12(a)(i)	Selanjut	1	
12(a)(ii)	Domain = $0 \leq x \leq 2\sqrt{2} + 2$ atau setara Kodomain = $0 \leq f(x) \leq 8$ Julat = $0 \leq f(x) \leq 8$	1 1 1	

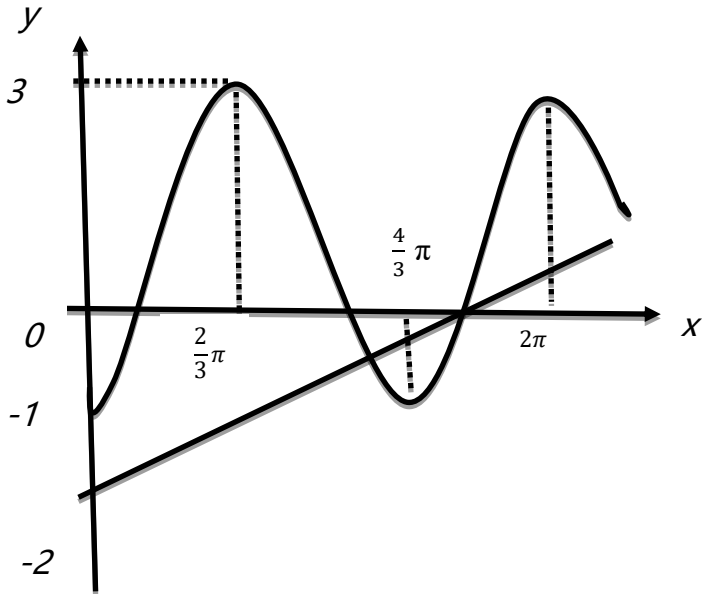
12(b)(i)	$\frac{px-q}{rx} = y$ $x(p-ry) = q$ $x = \frac{q}{p-ry} \quad @ \quad y = \frac{q}{p-rx}$ $g^{-1}(x) = \frac{q}{p-rx}, x \neq \frac{p}{r}$	1	7
12(b)ii)	$g^{-1}(x) = \frac{-1}{2-3x}$ atau setara	1 OF	
13(a)	$h(x) = -x^2 + 10x$ $= -[x^2 - 10x + (\frac{-10}{2})^2 - (\frac{-10}{2})^2]$ $= -[(x-5)^2 - 25]$ $h(x) = -(x-5)^2 + 25$	1 1 1	8
13(b)	Ketinggian maksimum = 25 m	1	
13(c)	AD = 12 m bila h(x) adalah maksimum. $x = \frac{12}{2} = 6$, $6 + p = 0$ $p = -6$ Pada titik E(4,32) $32 = a(4-6)^2 + q$ $32 = 4a + q$ $q = 32 - 4a$ or Pada titik A(0,0) $0 = a(0-6)^2 + q$ $0 = 36a + q$ maka $36a + (32 - 4a) = 0$ $32a + 32 = 0$ $a = -1$ $q = 32 - 4(-1)$ $= 32 + 4$ $= 36$ Ketinggian adalah maksimum = 36 m. Maka bola golf tidak boleh sampai ke bumbung dewan kerana $36 < 50$	1 1 1 1	

14(a)(i)	$S_n = a + (a+d) + (a+2d) + \dots + [a+(n-2)d] + [a+(n-1)d]$ atau (hasil tambah n sebutan pertama ditulis dengan terbalikkan susunan) $S_n = [a+(n-1)d] + [a+(n-2)d] + \dots + (a+2d) + (a+d) + a$ $2S_n = [2a+(n-1)d] + [2a+(n-1)d] + \dots + [2a+(n-1)d]$ $2S_n = n[2a+(n-1)d]$ dan lihat $S_n = n/2 [2a+(n-1)d]$	1 1 1	8
14(a)(ii)	$S_n = \frac{n}{2} [2(3) + (n-1)(4)]$ $2n^2 + n$	1 1	
14(b)	$2n^2 + n = 1275$ $3 + (25-1)(4)$ atau $1275 - [2(24)2 + 24]$ atau $\frac{25}{2} [3 + x] = 1275$ $x = 99$	1 1 1	
15(a)	Biarkan panjang = y $2x + 2y + \pi x = 120$ $y = 60 - x - \frac{1}{2} \pi x$ $L = 2xy - \frac{1}{2} \pi x^2$ $L = 2x \left(60 - x - \frac{1}{2} \pi x \right) - \frac{1}{2} \pi x^2$ $L = 120x - 2x^2 - \frac{3}{2} \pi x^2$	1 1 1	8
15(b)	$\frac{dL}{dx} = 120 - 4x - 3\pi x$ Bila L maksimum, $\frac{dL}{dx} = 0$ $120 - 4x - 3\pi x = 0$ $x = \frac{120}{(4+3\pi)}$	1 1 1	
15(c)	$\frac{dL}{dt} = -0.02$ $\frac{dA}{dr} = 8\pi$, Biar A = luas semi bulatan $\frac{dr}{dt} = \frac{\frac{dA}{dt}}{\frac{dA}{dr}}$ $\frac{dr}{dt} = -\frac{0.02}{8\pi}$ $= -\frac{1}{400\pi}$	1 1	

Peraturan Pemarkahan Ujian Diagnostik 3 Tingkatan 5 Matematik Tambahan (Kertas 2 / 2022)

No	Solutions and marking Scheme	Sub marks	Total Marks
1	$y = 3x - 2$ $2x^2 + 3y^2 - 5xy - 16 = 0$ $2x^2 + 3(3x - 2)^2 - 5x(3x - 2) - 16 = 0$ $7x^2 - 13x - 2 = 0$ $(x - 2)(7x + 1) = 0$ $x = 2 \quad x = -\frac{1}{7}$ $y = 3(2) - 2$ $= 4$ $y = 3(-\frac{1}{7}) - 2$ $= -2\frac{3}{7}$	1 1 1 1 1	5
2(a)	$b > 0$ atau $b \neq 1$	1	6
2(b)	$\log_p(\frac{p}{\sqrt{q}} \times \sqrt{p}\sqrt{q})$ $1 + \frac{1}{2} \log_n n$ atau setara $\frac{3}{2}$	1 1 1	
2(c)	$\log_{14} 6 = \frac{\log_2 6}{\log_2 14}$ atau $\frac{\log_2 3 + \log_2 2}{\log_2 7 + \log_2 2}$ $\frac{x + 1 - y}{y}$	1 1	

3(a) i)	$\frac{x^{10}}{x^5}$ atau $\frac{x^{15}}{x^{10}}$ atau $\frac{x^{20}}{x^{15}}$	1	7
	x^5	1	
	(a) ii) $\frac{1}{31} = \frac{x^5}{1-x^5}$	1	
	$\frac{1}{2}$	1	
(b)	$2ar - a = ar^2 - 2ar$	1	7
	$\frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(1)}}{2(1)}$	1	
	$2 + \sqrt{3}$ or equivalent	1	
4 (a)	$2 - p = 0$ or $3q = 9$	1	8
	$p = 2, q = 3$	1, 1	
(b)	At $x = 0, f(x) = 5$ or $x = 6, f(x) = -7$	1	
	Maximum point	1	
	Correct shape	1	
(c)			
	(i) $f(x) = (x - 2)^2 - 9$	1	
	(ii) $f(x) = -(x + 2)^2 + 9$	1	

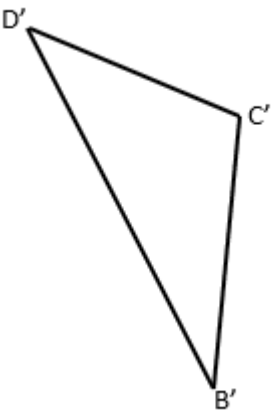
5(a)	$\frac{\sqrt{3^2 + 4^2}}{5}$ atau $\frac{9 - 4}{5}$	1 1	8
	(b) $\tan \angle OAB = \frac{3}{4}$ atau $\sin \angle OAB = \frac{3}{5}$ atau $\cos \angle OAB = \frac{4}{5}$ 2.4985 / 2.4984	1 1	
	(c) $\frac{1}{2}(5)^2(2.4985)$ $\frac{1}{2}(5)(5)(\sin 2.4985)$ atau $\frac{1}{2}(5)(5)(\sin 143.13)$ $\frac{1}{2}(5)^2(2.4985) - \frac{1}{2}(5)(5)(\sin 2.4985)$ atau $\frac{1}{2}(5)^2(2.4985) - \frac{1}{2}(5)(5)(\sin 143.13)$ 23.73 / 23.74	1 1 1 1	
6 (a)	Gunakan $\frac{a}{c} = \sin x$ dan $\frac{b}{c} = \cos x$ dalam teorem Pythagoras $a^2 + b^2 = c^2$ $\sin^2 x + \cos^2 x = 1$	1 1	8
	(b) i)  $y = \frac{x}{3} - \frac{3}{2}$ (b) ii) Sketch *straight line correctly Number of solutions = 2	1 (negative cos graph) 1 (shifted vertically +1) 1 ($\frac{3}{2}$ cycle in 360°) 1 1 1	

7	(a) i. $\overrightarrow{TS} = \overrightarrow{TR} + \overrightarrow{RS}$ or $\overrightarrow{TK} = \overrightarrow{TR} + \overrightarrow{RK}$ $\overrightarrow{TS} = -8\hat{x} + 10\hat{y}$ ii. $\overrightarrow{TK} = -8\hat{x} + 6\hat{y}$ (b) i. $\overrightarrow{TQ} = \overrightarrow{TR} + \overrightarrow{RQ}$ $= -8\hat{x} + n(\overrightarrow{RL})$ $= -8\hat{x} + n(\overrightarrow{RT} + \overrightarrow{TL})$ $= -8\hat{x} + n(8\hat{x} + \frac{1}{3}(-8\hat{x} + 10\hat{y}))$ $= -8\hat{x} + \frac{16}{3}n\hat{x} + \frac{10}{3}n\hat{y}$ $\overrightarrow{TQ} = \left[\frac{16}{3}n - 8\right]\hat{x} + \frac{10}{3}n\hat{y}$ ii. $\left[\frac{16n}{3} - 8\right]\hat{x} + \frac{10}{3}n\hat{y} = \lambda[-8\hat{x} + 6\hat{y}]$ or equivalent $-8\lambda = \frac{16n}{3} - 8$ or $\frac{10n}{3} = 6\lambda$ $n = \frac{9}{11}$	1 1 1 1 1 1 1 1	8														
8	(a) <table border="1"><tr><td>R</td><td>1</td><td>3</td><td>4</td><td>6</td><td>8</td><td>10</td></tr><tr><td>$\frac{P - 200}{R}$</td><td>1.00</td><td>-0.10</td><td>-0.50</td><td>-2.00</td><td>-2.88</td><td>-4.00</td></tr></table> Graf (Rujuk Lampiran) 1 titik diplot dengan betul dan skala yang seragam 6 titik diplot dengan betul Garis lurus penyuaian terbaik (b) i) $P - 200 = aR - bR^2$ $\frac{P - 200}{R} = -bR + a$ pintasan-Y , $a = 1.45 \leftrightarrow 1.55$ (b) ii) kecerunan , $-b = m$ and use any two points on LBF to m $b = 0.55 \leftrightarrow 0.56$	R		1	3	4	6	8	10	$\frac{P - 200}{R}$	1.00	-0.10	-0.50	-2.00	-2.88	-4.00	1 1 1 1 1 1 1 1
R	1	3	4	6	8	10											
$\frac{P - 200}{R}$	1.00	-0.10	-0.50	-2.00	-2.88	-4.00											

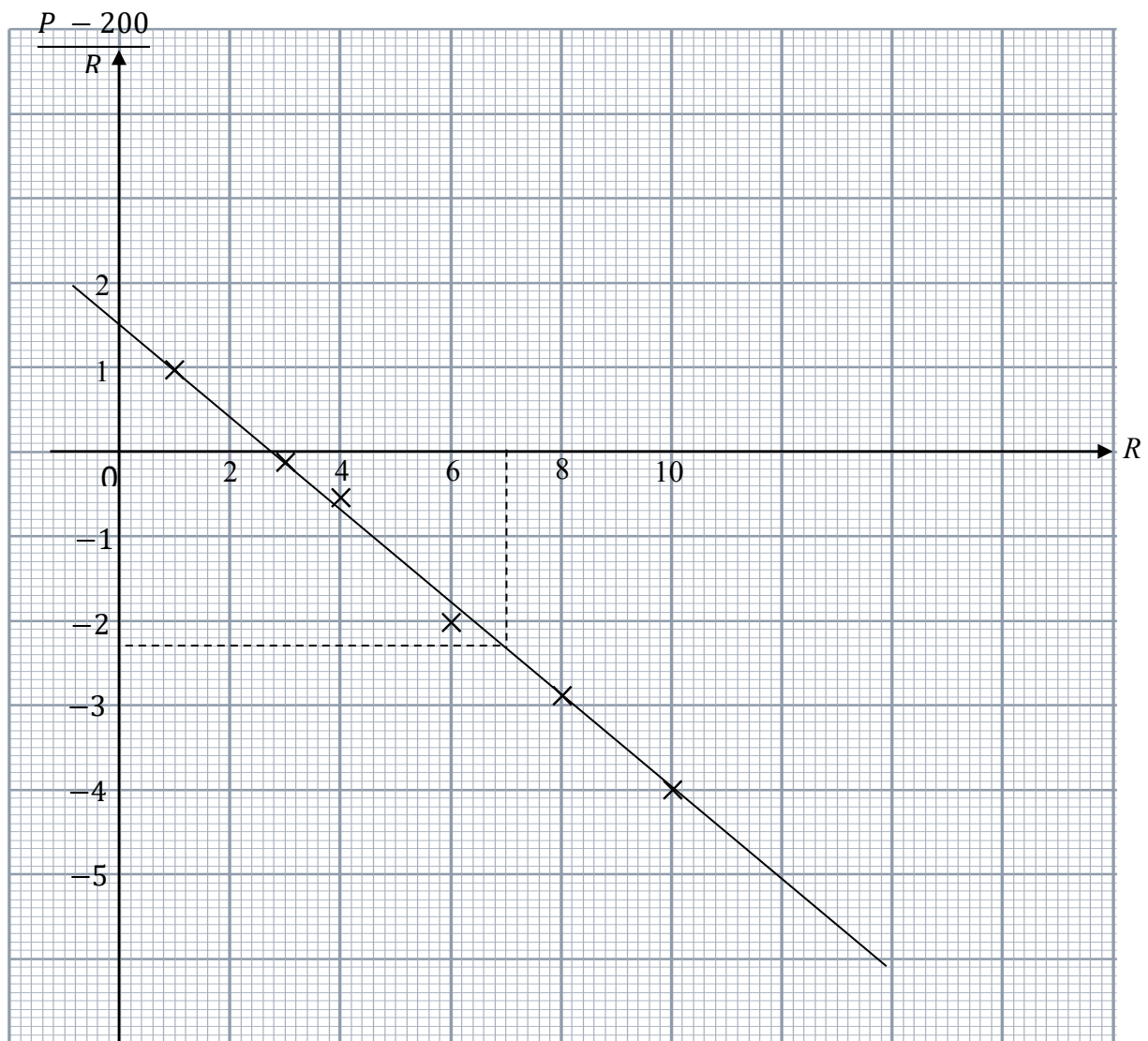
(c)	Bila $R = 7$ $\frac{P-200}{R} = -2.3$ $P = 183.9$	1 1	
9	$m_{HG} = m_{EF} = 2$ $y - 13 = 2(x - 8)$ $y - 13 = 2x - 16$ $y = 2x - 3$	1 1	10
	$m_{EH} = -\frac{1}{2}$ $y - 3 = -\frac{1}{2}(x - (-2))$ $y - 3 = -\frac{1}{2}x - 1$ $y = -\frac{1}{2}x + 2$	1 1 1	
	$2x - 3 = -\frac{1}{2}x + 2$ $\frac{5}{2}x = 5$ $x = 2$ <i>or</i> $y = 2(2) - 3$ $= 1$ $H(2, 1)$	1 1	
	$\text{Luas segi empat tepat } EFGH = 2 \times \Delta EGH$ $= 2 \times \frac{1}{2} \begin{vmatrix} -2 & 8 & 2 & -2 \\ 3 & 13 & 1 & 3 \end{vmatrix}$ $= (-2)(13) + (8)(1) + (2)(3) - ((3)(8) + (13)(2) + (1)(-2)) $ $= -12 - 48 $ $= 60 \text{ unit}^2$	1 1 1	

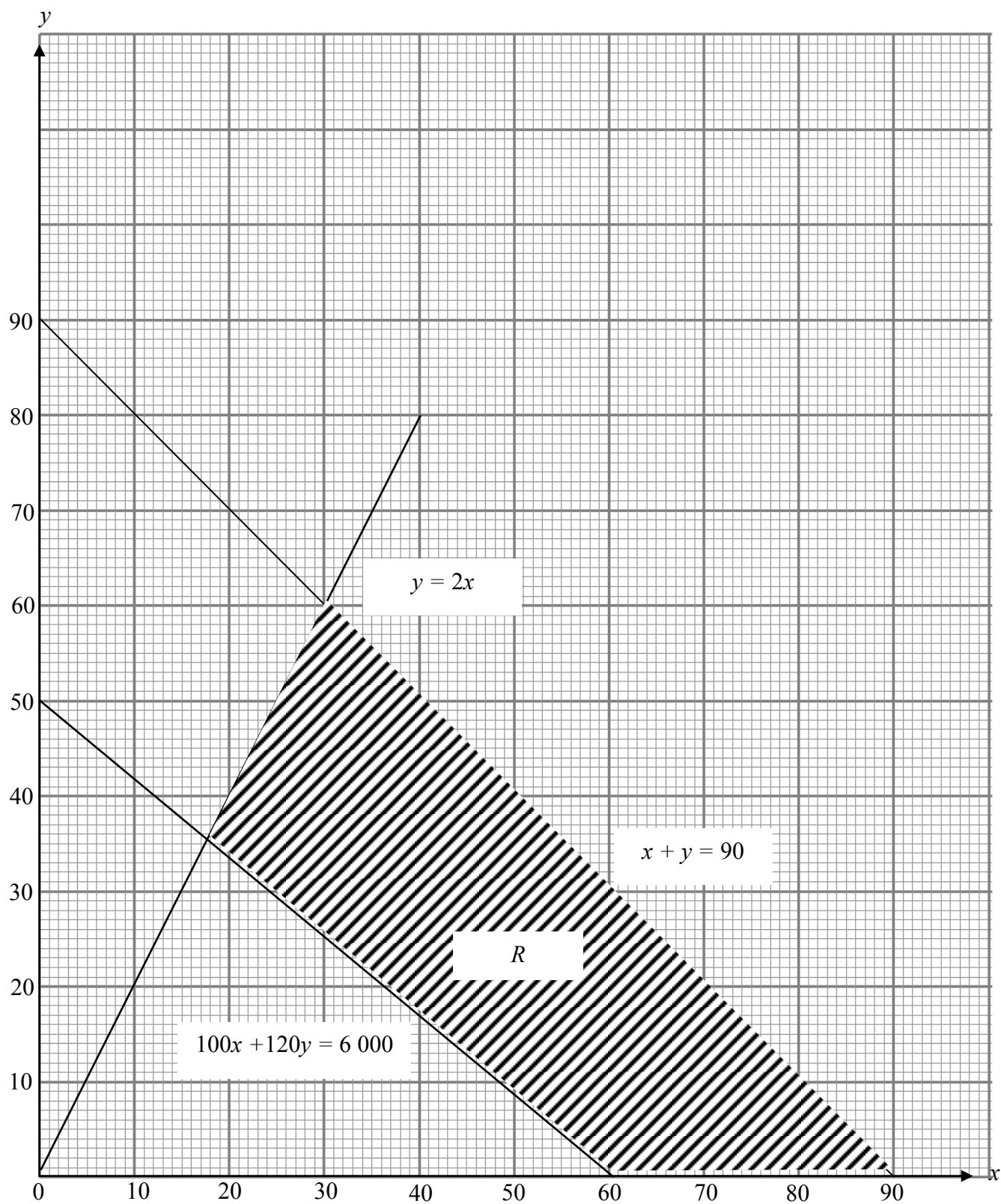
10	$\frac{dy}{dx} = 2x - \frac{2}{x^2}$ Pada titik pegun , $\frac{dy}{dx} = 0$, $x = k$, maka $2k - \frac{2}{k^2} = 0$ $k = 1$	1 1	10																
	<table><tr><td>x</td><td>0.5</td><td>1</td><td>1.5</td></tr><tr><td>$\frac{dy}{dx}$</td><td>-7</td><td>0</td><td>$2\frac{1}{9}$</td></tr><tr><td>tangen tangent</td><td></td><td></td><td></td></tr><tr><td colspan="4">(1, 8) merupakan titik minimum.</td></tr></table>	x		0.5	1	1.5	$\frac{dy}{dx}$	-7	0	$2\frac{1}{9}$	tangen tangent				(1, 8) merupakan titik minimum.				1 1 1
x	0.5	1		1.5															
$\frac{dy}{dx}$	-7	0	$2\frac{1}{9}$																
tangen tangent																			
(1, 8) merupakan titik minimum.																			
	$\int_0^3 (y^2 + 10) dy \text{ or } \frac{1}{2} (1 + k)(3)$ $\int_0^3 (y^2 + 10) dy - \frac{1}{2} (1 + k)(3) = 9$ $\left[\frac{y^3}{3} + 10y \right]_0^3 - \frac{3}{2} - \frac{3}{2}k = 9$ $\left[\left(\frac{3^3}{3} + 10 \times 3 \right) - 0 \right] - \frac{3}{2} - \frac{3}{2}k = 9$ $k = 19$	1 1 1 1 1																	

11	(a) i)	$\frac{16.5-12}{\sigma} = 2.25$ $\sigma = 2$	1	10
			1	
	(a) ii)	Skor -z = 0.566 / 0.567	1	
		$\frac{m-12}{2} = 0.566$ atau $\frac{m-12}{2} = 0.567$	1	
		m = 13.13	1	
	(b) i)	${}^6C_0 \left(\frac{3}{7}\right)^0 \left(\frac{4}{7}\right)^6$ =0.03482	1	
			1	
	(b) ii)	1- P(X=0)+P(X=1) +P(X=2) @ P(X=3) + P(X = 4) + P(X =5) +P(X=6) $1 - {}^6C_0 \left(\frac{3}{7}\right)^0 \left(\frac{4}{7}\right)^6 - {}^6C_1 \left(\frac{3}{7}\right)^1 \left(\frac{4}{7}\right)^5 - {}^6C_2 \left(\frac{3}{7}\right)^2 \left(\frac{4}{7}\right)^4$ or ${}^6C_3 \left(\frac{3}{7}\right)^3 \left(\frac{4}{7}\right)^3 + {}^6C_4 \left(\frac{3}{7}\right)^4 \left(\frac{4}{7}\right)^2 + {}^6C_5 \left(\frac{3}{7}\right)^5 \left(\frac{4}{7}\right)^1 + {}^6C_6 \left(\frac{3}{7}\right)^6 \left(\frac{4}{7}\right)^0$ =0.5147@ 0.5148	1	
			1	
12 (a)		56°35'	1	
		$\frac{BD}{\sin 76^\circ 25'} = \frac{10.2}{\sin 56^\circ 35'}$	1	
		11.88	1	
		$8.4^2 = 10^2 + 11.88^2 - 2(10)(11.88)\cos \angle ADB$	1	
	(b)	44.12	1	

(c)		1	10
	$\angle B'C'D' = 103^\circ 35'$ or equivalent	1	
(d)	$A_1 = \frac{1}{2}(10)(11.88)\sin 44.12^\circ$ or $A_2 = \frac{1}{2}(11.88)(10.2)\sin 47^\circ$ $A_1 + A_2 = 41.35 + 44.31$ 85.66	1	
		1	
		1	
13 (a)	$x = \frac{12}{8} \times 100$ or $\frac{4}{y} \times 100 = 80$ $x = 150$ $y = 5$	1	10
		1,1	
(b)	$\frac{z+1}{z} \times 100 = 140$ OR $\frac{z}{z-1} \times 100 = 140$ Harga pada tahun 2012 = 3.50	1	
		1	
(c) i)	$\frac{150(3.85) + 140(3.25) + 125(0.7) + 80(2.2)}{3.85 + 3.25 + 0.7 + 2.2}$ 129.6 Menaik/ increase 29.6%	1	
		1	
		1	
(c) ii)	$\frac{P_{2012}}{4072} \times 100 = 129.6$ dan $*P_{2012} \times 115\%$ 6068.91 OR	1	
		1	

	$I_{2013/2011} = \frac{129.6 \times 115}{100}$ 6068.91	1 1	
14 (a)	22 $-8t^2 + 8t + 10 = 0$ atau $6t^2 - 9t - 12 = 0$ $t = 1.7247$ atau $t = -0.7247$ (diabaikan kerana $t > 0$) or $t = 2.3508$ atau $t = -0.8508$ (diabaikan kerana $t > 0$) Zarah Q	1 1 1 1	10
(b)	$6t^2 - 9t - 12 = * (-8t^2 + 8t + 10)$ $r = 2$ atau -0.7857 (diabaikan kerana $t > 0$)	1 1	
(c)	$(8t - 8t^2 + 10) - (6t^2 - 9t - 12)$ atau $17t - 14t^2 + 22$ $17 - 28t = 0$ $17(0.6071) - 14(0.6071)^2 + 22$ or equivalent 27.16m	1 1 1 1	
15 (a)	$x + y \leq 90$ $y \leq 2x$ $100x + 120y \geq 6\,000$ or equivalent	1 1 1	10
(b)	Graf (Rujuk Lampiran) 1 garis dilukis betul Semua garis dilukis betul Kawasan R betul	1 1 1	
(c) i)	36	1	
ii)	(30, 60) $100(30) + 120(60)$ RM 2 040	1 1 1	





TERENGGANU SET 2



KEMENTERIAN PENDIDIKAN
Jabatan Pendidikan Negeri Terengganu

MPP 3

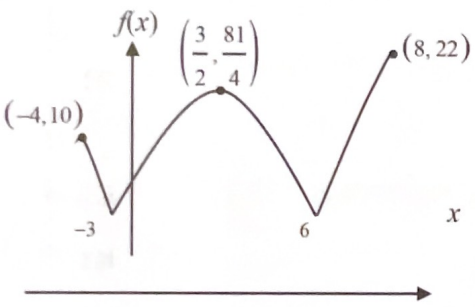
SPM 2022

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

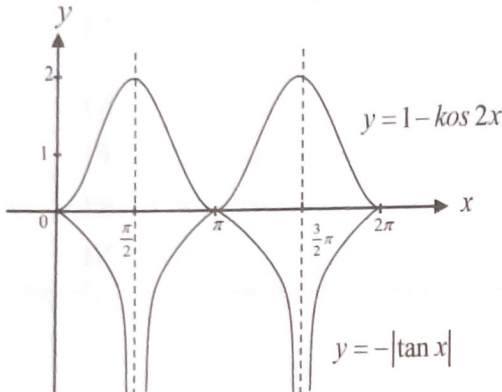
SKEMA PEMARKAHAN MATEMATIK TAMBAHAN KERTAS 1
MPP3 TINGKATAN 5 2022

No	Skema Pemarkahan	Σ Markah
1	(a) { Suhana, Danial, Rohani, Hamimah} N1 (b) Fungsi kerana setiap objek mempunyai hanya satu imej N1N1	3
2	(a) $p = 0.8, q = 0.2$ dan $P(X = n) = 0.1342$ ${}^nC_n (0.8)^n (0.2)^0 = 0.1342$ K1 $n \log_{10} (0.8) = \log_{10} 0.1342$ K1 $n = 9$ N1 (b) $P(X < 3) = P(X = 0) + P(X = 1) + P(X = 2)$ P1 ${}^9C_0 (0.8)^0 (0.2)^9 + {}^9C_1 (0.8)^1 (0.2)^8 + {}^9C_2 (0.8)^2 (0.2)^7$ K1 0.0003139 N1	6
3	(a) $\lim_{\delta x \rightarrow 0} \frac{\delta y}{\delta x} = \frac{(x + \delta x)^2 - x^2}{\delta x}$ atau $\lim_{\delta x \rightarrow 0} \frac{(x + \delta x)^2 - x^2}{\delta x}$ K1 $\frac{dy}{dx} = 2x$ N1 (b) Selesaikan persamaan $2a(4) - \frac{b}{(4)^2} = 7$ dan $a(4)^2 + \frac{b}{4} = 5$ K1 $a = \frac{11}{16}$ N1 $b = -24$ N1	5

4	(a) (i) $x = \frac{3}{2}$ N1 (ii) $f(x) = (\frac{3}{2} + 3)(6 - \frac{3}{2})$ atau kaedah lain K1 $f(x) \leq \frac{81}{4}$ N1 (b)  Bentuk P1 Modulus P1 Semua betul P1	6
5	$0.3p + 0.6q + 0.1r = 50$ @ $0.1p + 0.3q + 0.7r = 40$ @ $0.6p + 0.1q + 0.2r = 45$ P1 Hapus anu pertama dengan kaedah penggantian @ penghapusan K1 Hapus anu kedua dengan kaedah penggantian @ penghapusan K1 $r = 27.5$ @ $q = 50$ @ $p = 57.5$ N1 $q = 50$ @ $p = 57.5$ @ $r = 27.5$ N1 $r = 27.5, q = 50, p = 57.5$ N1	6
6	$y = \frac{x}{py} - \frac{q}{p^2}$ P1 $\frac{1}{p} = 2$ atau $-\frac{q}{p^2} = -5$ K1 $p = \frac{1}{2}, q = \frac{5}{4}$ N1N1	4

7	(a) 1 (b) $\log_m a = 2 \log_m \left(\frac{b}{2} \right)$ $a = \frac{b^2}{4}$ $b = 2\sqrt{a}$	N1 K1 K1 N1	4
8	(a) $\overline{TQ} = \overline{TP} + \overline{PQ}$ dan $6\underline{b} + 3\underline{a}$ $\overline{TQ} = \sqrt{12^2 + 3^2}$ dan $\sqrt{153}$ (b) $\overline{TR} = 6\underline{a} + 4\underline{b}$ dan $\overline{SQ} = -3\underline{a} + 6\underline{b}$ $\frac{9}{2}\underline{a} + 3\underline{b} = \lambda(6\underline{a} + 4\underline{b})$ $\overline{TU} = \frac{3}{4}\overline{TR}$ dan segaris	K1 N1 K1 K1 N1	5
9	(a) (i) -10 (ii) $\frac{1}{2}(-10)$ -5 (b) $g(x) = \frac{3x^3}{3} - \frac{24x^2}{2} + 17x + c$ dan $96 = \frac{3(1)^3}{3} - \frac{24(1)^2}{2} + 17(1) + c$ $g(x) = x^3 - 12x^2 + 17x + 90$	N1 K1 N1 K1 N1	5

10	(a) BAKU = $4! = 24$ K1 BAKA = $\frac{4!}{2!} = 12$ K1 Tidak sama kerana perkataan BAKA mempunyai objek secaman atau setara N1 (b) (i) ${}^7P_5 = 2520$ N1 (ii) 2P_1 atau 5P_1 atau 5P_3 P1 ${}^2P_1 \times {}^5P_1 \times {}^5P_3$ K1 600 N1	7
11	$\tan \alpha = \frac{5}{6.5}$ atau K1 $10^2 = (8.2006)^2 + (8.2006)^2 - 2(8.2006)(8.2006)\cos \theta$ K1 $75.14^\circ @ 1.312^*$ $L_{\text{sektor}} = \frac{1}{2}(8.2006)^2(1.312^*)$ atau $L_{\text{segitiga}} = \frac{1}{2}(8.2006)^2 \sin 75.14^\circ$ K1 $\frac{1}{2}(8.2006)^2(1.312^*) - \frac{1}{2}(8.2006)^2 \sin 75.14^\circ$ K1 $130 + 2(11.62)$ K1 153.24 N1 Kos pembinaan = 13025.40 N1 Tidak, kerana kos pembinaan melebihi peruntukan. N1	7

12	(a) bentuk graf kos amplitud 2 kala untuk $0 \leq x \leq 2\pi$  (b) bentuk graf tan modulus 3 penyelesaian	P1 P1 P1 6 P1 P1 N1
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13	(a) (i) $T_1 = 2\pi r$, $T_2 = 2\pi(r+1)$, $T_3 = 2\pi(r+2), \dots$ $2\pi r, 2\pi r + 2\pi, 2\pi r + 4\pi, \dots$ $T_2 - T_1 = 2\pi$ and $T_3 - T_2 = 2\pi$ Maka, lilitan bulatan ini membentuk suatu Jajang Aritmetik. (ii) $\frac{10}{2}[2(2\pi r) + (10-1)(2\pi)] = m\pi$ $m = 20r + 90$ (b) $r = \frac{1}{2}$ $32\left(\frac{1}{2}\right)^{n-1} = \frac{1}{2^8}$ $n = 14$	P1 K1 N1 K1 N1 P1 K1 N1 8
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14	(a) $5a-1=2$ or $\frac{3}{2(2)+b}=1$	K1
	$a=\frac{2}{5}, b=-1$	N1N1
	(b) (i) Let $y=\frac{3}{2z-1}$	
	$g^{-1}(y)=\frac{y+3}{2y}, y \neq 0$	N1
	(ii) $g^{-1}\left(\frac{2}{5}x-1\right)$	
	$\frac{\frac{2}{5}x-1+3}{2\left(\frac{2}{5}x-1\right)}$	K1
	$\frac{x+5}{2x-5}, x \neq \frac{5}{2}$	N1
	(iii) $\frac{x+5}{2x-5}=-1$	K1
	0	N1

8

15	(a) $(-1, 1)$ dan $m = -2$	P1	8
	$y - 1 = -2(x - (-1))$ atau $1 = -2(-1) + c$	K1	
	$y = -2x - 1$	N1	
	(b) $Q(0, -1)$	K1	
	$(-1, 1) = \left(\frac{0+x}{2}, \frac{-1+y}{2}\right)$		
	$-1 = \frac{0+x}{2}$ atau $1 = \frac{-1+y}{2}$	K1	
	$S(-2, 3)$	N1	
	(c)		
	$A = \frac{1}{2} ((3 \times 3) + (-2 \times -1) + (-5 \times -1) + (0 \times 3)) - ((-2 \times 3) + (-5 \times 3) + (0 \times -1) + (3 \times -1)) $	K1	
	20 unit^2	N1	

TERENGGANU SET 2 K2

2

3472/2 (PP)

PEPERIKSAAN PERCUBAAN SPM TAHUN 2022

Bil	Peraturan Pemarkahan	Jumlah
1	(a) (i) $y = 60 - x$ dan $A = x(60 - x)$ K1 $A = 60x - x^2$ N1 (ii) $60 - 2x = 0$ K1 $A = 60(30) - (30)^2$ K1 $A = 900$ N1 (b) $\frac{dy}{dt} = (1 + 6(4)) \times \left(\frac{1}{5}\right)$ K1 5 N1	7
2	(a) $f(x) = (0 - 4)^2 + p = 7$ K1 $p = -9$ N1 $f(x) = (x - 4)^2 - 9$ $x^2 - 8x + 7 = 0$ dan cari hasil tambah punca K1 $8 = \frac{-(q+10)}{-3}$ atau setara K1 $q = 14$ N1 (b) $g(x) = -3 \left[x^2 - 8x + \left(\frac{-8}{2}\right)^2 - \left(\frac{-8}{2}\right)^2 + 7 \right]$ K1 $g(x) = -3(x - 4)^2 + 27$ N1 $(4, 27)$ N1	8

Bil	Peraturan Pemarkahan	Jumlah
3	(a) $9 - 2x = \frac{x-2}{2}$ or $\frac{9-y}{2} = 2y+2$ K1 $(4,1)$ N1 (b) $-2 \times \frac{1}{2} = -1$ K1 berserenjang. N1 (c) $\frac{12}{5} = \frac{0+4m}{m+n}$ atau $\frac{1}{5} = \frac{-n+m}{m+n}$ K1 $m:n = 3:2$ N1 (d) Pagar (x,y) dan Menara Telekomunikasi (h,k) K1 $\sqrt{(x-h)^2 + (y-k)^2} = 1$ K1 $x^2 + y^2 - 2hx - 2ky + h^2 + k^2 - 1 = 0$ K1 $2h = 4$ dan $2k = 4$ N1 Koordinat Menara Telekomunikasi $(2,2)$	9
4	$\angle LOK = \frac{\pi}{2} - \alpha$ P1 $\angle LOJ_{\text{major}} = 2\pi - 2(\frac{\pi}{2} - \alpha)$ K1 $14(\pi + 2\alpha) + 14 + 14$ K1 $14\pi + 28\alpha + 28$ N1	4

Bil	Peraturan Pemarkahan	Jumlah
5	(a) $a + ar + ar^2 = 8(ar^3 + ar^4 + ar^5)$	K1
	$1 + r + r^2 = 8r^3(1 + r + r^2)$ dan selesaikan	K1
	$r = \frac{1}{2}$	N1
	(b) (i) $a + ar + ar^2 - (ar^3 + ar^4 + ar^5) = 98$	
	$a + a\left(\frac{1}{2}\right) + a\left(\frac{1}{2}\right)^2 - \left(a\left(\frac{1}{2}\right)^3 + a\left(\frac{1}{2}\right)^4 + a\left(\frac{1}{2}\right)^5\right) = 98$	K1
	$a = 64$	N1
	(ii) $S_{\infty} = \frac{64}{1 - \frac{1}{2}}$	K1
	$= 128$	N1
		7

Bil	Peraturan Pemarkahan	Jumlah
6	(a) $(\sin x)\left(\frac{\sqrt{3}}{2}\right) + (\cos x)\left(\frac{1}{2}\right) = 2\cos x$	K1
	$\tan x = 1.732$	K1
	$x = 60^\circ, 240^\circ$	N1
	(b) (i) $\frac{1}{1 - 2\left(\frac{15}{17}\right)^2}$	K1
	$-\frac{289}{161}$	N1
	(ii) $\pm \sqrt{\frac{1 - \left(-\frac{7}{25}\right)}{2}}$	K1
	$\frac{4}{5}$	N1
		7

Bil	Peraturan Pemarkahan	Jumlah
7	(a) $\frac{3}{\sqrt{3}-3} \times \frac{\sqrt{3}+3}{\sqrt{3}+3}$ dan kembangkan	K1
	$-\frac{\sqrt{3}+3}{2}$	N1
	(b) (i) $\frac{\log_a hk}{\log_a a^2}$	K1
	$\frac{\log_a h + \log_a k}{2}$	K1
	$\frac{1}{2} \log_a h + \frac{1}{2} \log_a k$	N1
	(ii) $\log_{a^2} 5q = 1$	K1
	$5q = a^2$	K1
	$a = \sqrt{5q}$	N1
		8

Bil	Peraturan Pemarkahan		Jumlah
8	(a)	(i) $k(4) - 12 = 0$	K1
		$k = 3$	N1
		(ii) $m_1 \left(\frac{1}{3} \right) = -1$ atau $3x - 12 = -3$	K1
		$(3, -6)$	N1
	(b)	$y = \frac{3}{2}x^2 - 12x + c$	
		$-6 = \frac{3}{2}(3)^2 - 12(3) + c$	K1
		$y = \frac{3}{2}x^2 - 12x + \frac{33}{2}$	N1
	(c)	$y = \frac{3}{2}x^2 - \frac{15}{2}$	P1
		$V = \pi \int_{-7.5}^{-6} \left(\frac{2}{3}y + 5 \right) dy$	
		$\pi \left[\frac{2y^2}{2(3)} + 5y \right]_{-7.5}^{-6}$	K1
		$\pi \left[\left(\frac{2(-6)^2}{2(3)} + 5(-6) \right) - \left(\frac{2(-7.5)^2}{2(3)} + 5(-7.5) \right) \right]$	K1
		0.75π	N1

Bil	Peraturan Pemarkahan	Jumlah
9	(a) $\overrightarrow{BC} = \overrightarrow{BO} + \overrightarrow{OC}$ atau $\overrightarrow{OD} = \overrightarrow{OA} + \overrightarrow{AD}$ dan $\overrightarrow{BC} = -9\underline{y} + \frac{3}{4}(20\underline{x})$ atau $\overrightarrow{OD} = 20\underline{x} + \frac{1}{2}(-20\underline{x} + 9\underline{y})$	K1
	(i) $15\underline{x} - 9\underline{y}$	N1
	(ii) $10\underline{x} + \frac{9}{2}\underline{y}$	N1
	(b) $\overrightarrow{BE} = -9\underline{y} + n\left(10\underline{x} + \frac{9}{2}\underline{y}\right)$	K1
	$m(15\underline{x} - 9\underline{y}) = -9\underline{y} + n\left(10\underline{x} + \frac{9}{2}\underline{y}\right)$	K1
	$15m = 10n$, $-9m = \frac{9}{2}n - 9$ dan selesaikan	K1
	$m = \frac{4}{7}, n = \frac{6}{7}$	N1 N1
	(c) $\frac{1}{2}(20 \times 2)h = 140$	K1
	$h = 7$	N1
		10

Bil	Peraturan Pemarkahan	Jumlah
10	(a) (i) $P(X=1) = {}^nC_1 \left(\frac{1}{8}\right)^1 \left(\frac{7}{8}\right)^{n-1}$ atau $P(X=0) = {}^nC_0 \left(\frac{1}{8}\right)^0 \left(\frac{7}{8}\right)^n$ K1 $n \left(\frac{1}{8}\right) \left(\frac{7}{8}\right)^{n-1} = 15 \left(\frac{7}{8}\right)^n$ selesaikan K1 $n \left(\frac{1}{8}\right) = 15 \left(\frac{7}{8}\right)$ $n = 105$ N1 (ii) sisihan piawai = $\sqrt{105 \left(\frac{1}{8}\right) \left(\frac{7}{8}\right)}$ K1 $= 3.389$ N1 (b) (i) 0.58 dilihat P1 $\frac{V - 990}{15} = 0.58$ K1 $V = 998.7$ N1 (ii) $P(970 < X < 1015) = P\left(\frac{970 - 990}{15} < Z < \frac{1015 - 990}{15}\right)$ K1 $= 0.8609 // 0.8610$ N1	10

T	-10	-5	5	10	15	20	
$\log_{10} P$	0.21	0.33	0.55	0.72	0.79	0.90	N1

 $\log_{10} P$

Melukis garis lurus, paksi seragam dan 1 titik
diplot dengan betul

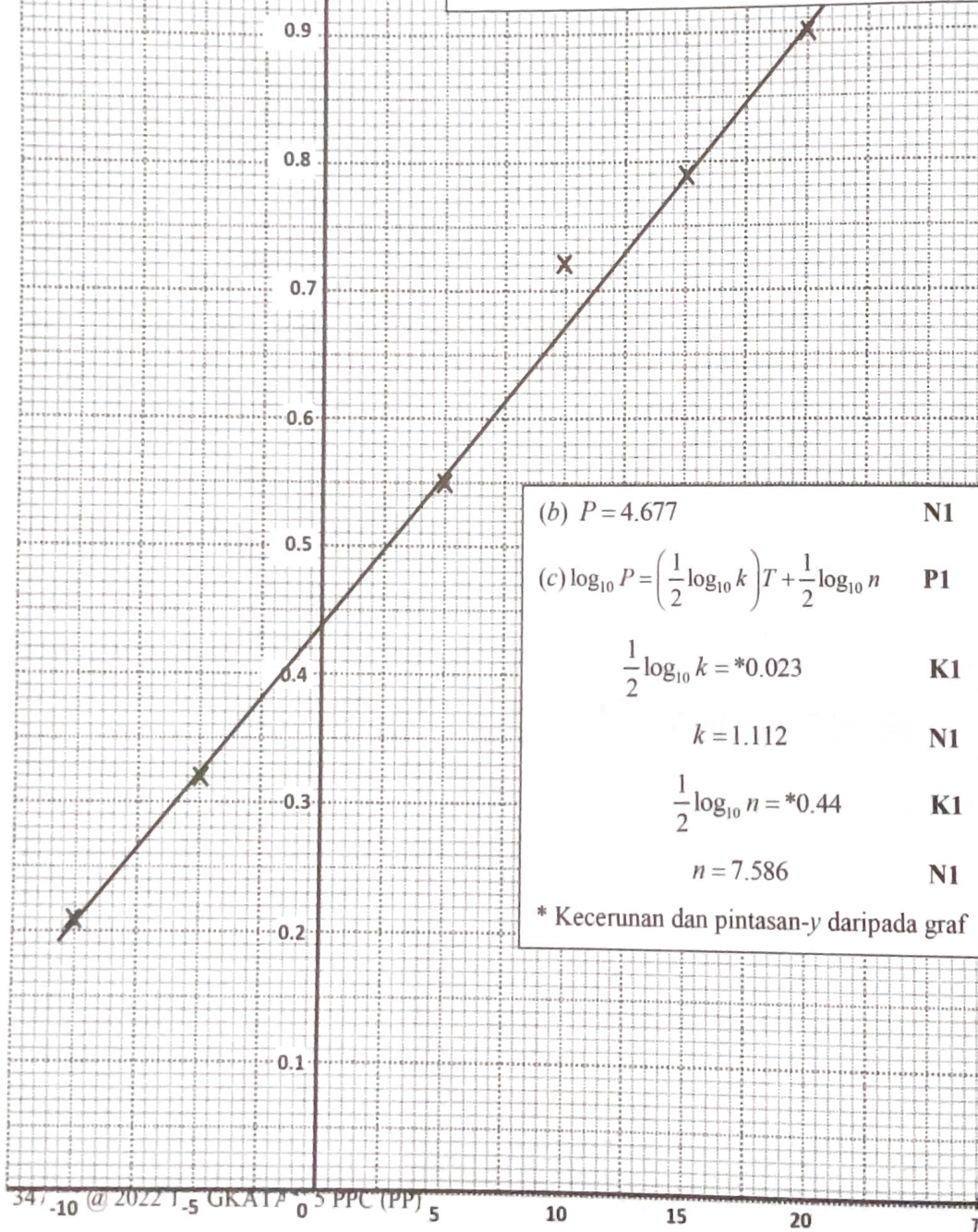
K1

Semua titik diplot betul

N1

Garis lurus penyuaian terbaik

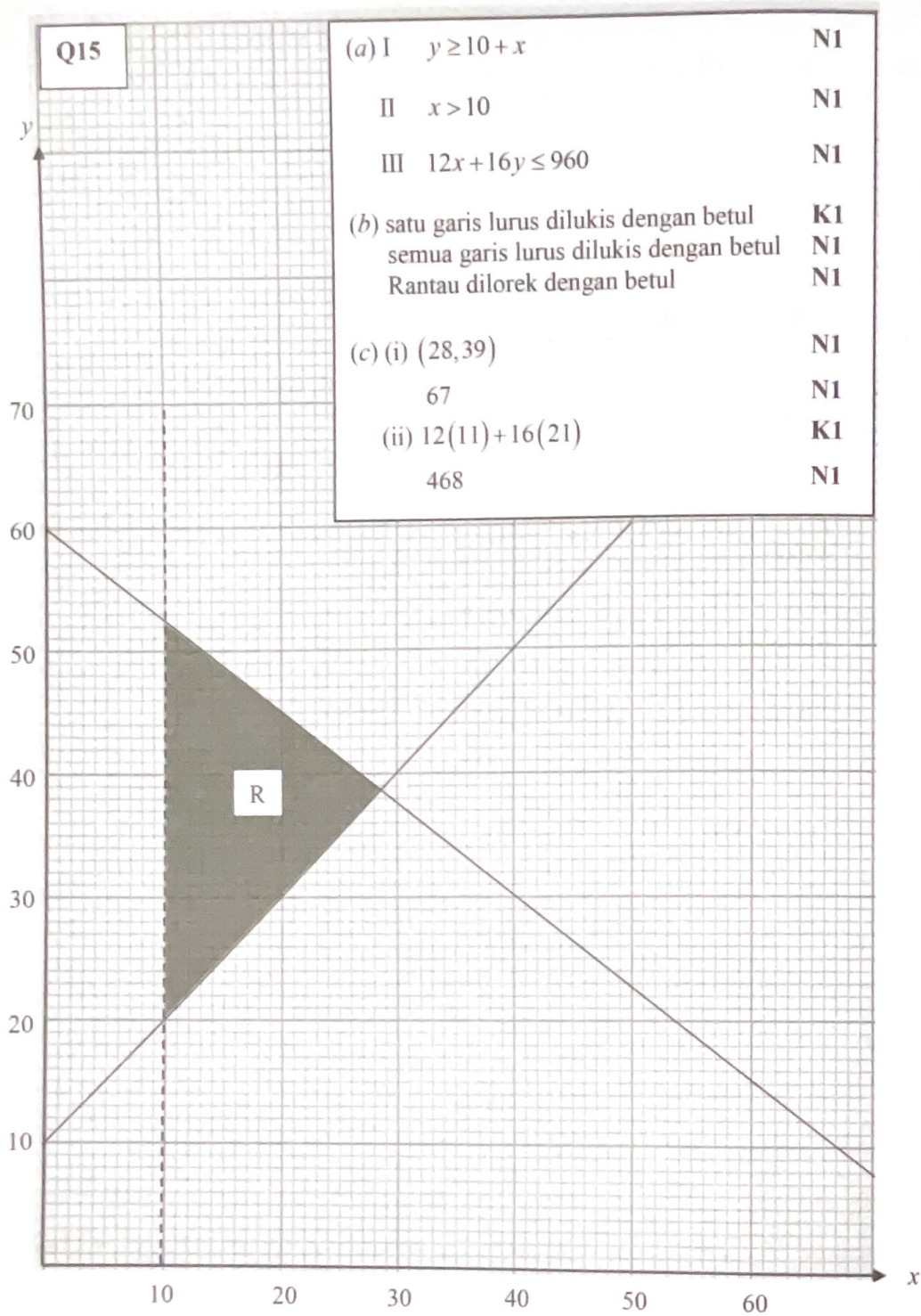
N1



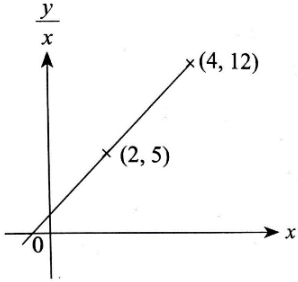
Bil	Peraturan Pemarkahan	Jumlah
12	(a) $v = 8$ N1 (b) $2 - 2t = 0$ K1 $t = 1$ $v = 8 + 2(1) - (1)^2$ K1 $= 9$ N1 (c) $8 + 2t - t^2 = 0$ dan selesaikan pers. kuadratik K1 $t = 4$ N1 (d) $s = \int (8 + 2t - t^2) dt$ $s = 8t + t^2 - \frac{t^3}{3} + c$ K1 $s = 8(4) + (4)^2 - \frac{(4)^3}{3}$ atau $s = 8(6) + (6)^2 - \frac{(6)^3}{3}$ K1 Jumlah jarak = $\frac{80}{3} + [8(4) + (4)^2 - \frac{(4)^3}{3} - [8(6) + (6)^2 - \frac{(6)^3}{3}]]$ K1 $= \frac{124}{3}$ N1	10

Bil	Peraturan Pemarkahan		Jumlah
13	(a)	$\frac{125}{\sin \angle BAC} = \frac{96}{0.7}$	K1
		$\angle BAC = 65.71^\circ$	N1
		$\angle ABC = 69.86^\circ$	P1
		$\frac{AC}{\sin 69.86^\circ} = \frac{96}{\sin 44.43^\circ}$ atau setara	
		$AC = 128.75$	N1
	(b)	(i) $128.75^2 = 55^2 + 99^2 - 2(55)(99)\cos \angle ADC$	K1
		$\angle ADC = 110.15^\circ$	N1
		(ii) $\frac{1}{2}(55)(99)\sin 110.15^\circ$	K1
		2555.87	N1
	(c)	$\frac{1}{2} \times d \times 128.75 = 2555.87$	K1
		39.70	N1
			10

Bil	Peraturan Pemarkahan		Jumlah
14	(a)	$175 = \frac{7}{x} \times 100$ atau $y = \frac{55}{40} \times 100$	K1
		$x = 4.00$	N1
		$y = 137.50$	N1
	(b)	$\frac{175(15) + 125(30) + *137.50(24) + 150(33) + 120(12)}{15 + 30 + 24 + 33 + 12}$	K1
		140.92	N1
	(c)	$\frac{P_{2022}}{4560} \times 100 = 140.92$ dan 6425.95	K1
		917.99 // 918	N1
		Cukup kerana RM 1000 melebihi RM 917.99 // RM 918	N1
	(d)	$\frac{140.92 \times 120}{100}$	K1
		169.10	N1
			10



SKEMA PERMAKAHAN PEPERIKSAAN PERCUBAAN SPM TINGKATAN 5
MATEMATIK TAMBAHAN KERTAS 1

NO. SOALAN	PEMARKAHAN	MARKAH	JUMLAH
BAHAGIAN A (64 M)			
1	$10 + 10\lambda + 4 + 6\mu + 6 = 40$ $10\lambda + 6\mu = 20$ $5\lambda + 3\mu = 10$ $\mu = \frac{10 - 5\lambda}{3}$	1 1	2
2(a)		2	4
(b)	$m = \frac{12 - 5}{4 - 2} = \frac{7}{2}$ $k^2 = \frac{7}{2}$ $k = \sqrt{\frac{7}{2}}$ $12 = \frac{7}{2}(4) + \frac{5}{h}$ $h = -\frac{5}{2}$	1 1	
3(a)	$2(3^x) = 162$ $3^x = 81$ $3^x = 3^4$ $x = 4$	1 1 1	
(b)	$3^n(3^4) + 3^n(3^5) + (3^n)$ $(3^4 + 3^5 + 1)3^n$ $325 (3^n)$	1 1 1	5

4(a)	$\lim_{n \rightarrow 4} \left(\frac{(k-4)(k+4)}{k-4} \right)$	1	4
	$= \lim_{n \rightarrow 4} ((k+4))$	1	
	$= 8$		
(b)	$\frac{dv}{dy} = 6y - 2$	1	
	$\delta v = [6(2) - 2] \times 9 - 0.01)$		
	$= -0.1$	1	
5(a)	$x < m \text{ atau } x > n$	1,1	7
(b)	$(-8)^2 - 4ac > 0$	1	
	$a < \frac{16}{c}$	1	
	$m+n = \frac{8}{a}, mn = \frac{c}{a}$		
(c)	$\frac{m+n}{mn} = \frac{\frac{8}{a}}{\frac{c}{a}} \text{ or } \left(\frac{8}{a}\right)\left(\frac{a}{c}\right)$	1	
		1	
	$\frac{m+n}{mn} = \frac{8}{c}$	1	
6(a)	OC X CT = 40		6
	5 X CT = 40		
	CT = 8cm		
	$\tan \theta = \frac{8}{5}$		
	$\theta = 58^\circ \times \frac{\pi}{180^\circ} = 1.012 \text{ rad}$	1	
	(b) Luas sektor OAB = $\frac{1}{2} (5)^2 \left[\frac{\pi}{2} - 1.012 \right]$	1	
	$= 6.9875 \text{ cm}^2$	1	
(c)	Panjang lengkok AB = $5 \left[\frac{\pi}{2} - 1.012 \right] = 2.795 \text{ cm}$	1	
	Panjang BT = $\sqrt{8^2 + 5^2} - 5 = 4.434 \text{ cm}$	1	
	Perimeter = $2.795 + 4.434 + 3 + 5$		
	$= 15.229 \text{ cm}$	1	

10(a)	80, 78, 76, ... , 6 $80 + (n - 1)(-2) = 6$ $2n = 76$ $n = 38$	1	
(b)	Tinggi dinding = 38×7 $= 266 \text{ cm}$ $S_{28} = \frac{38}{2} [2(80) + (80 - 1)(-2)]$ $= 1634 \text{ cm}$ kos batu bata = $1634 \times \text{RM}0.50$ $= \text{RM } 817$	1 1 1 1	6
11(a)	$\frac{n!}{(n - 2)! 2!} = 36$ $\frac{n(n - 1)(n - 2)!}{(n - 2)! 2!} = 36$ $n^2 - n - 72 = 0$ $(n - 9)(n + 8) = 0$ $n = 9 \text{ (accept)}$	1 1 1	
(b) (i)	${}^2P_1 \times {}^4P_3$ 48	1 1	7
(ii)	${}^4P_3 \times {}^3P_1$ 72	1 1	
12 (a)	$a + b + a + b + b + a + 0.1 = 1$ $3a + 3(2a) = 0.9$ $a = 0.1$ $b = 2(0.1) = 0.2$	1 1 1	
(b)	$P(X > 1) = 1 - 0.1 - 0.2$ $= 0.7$	1	4

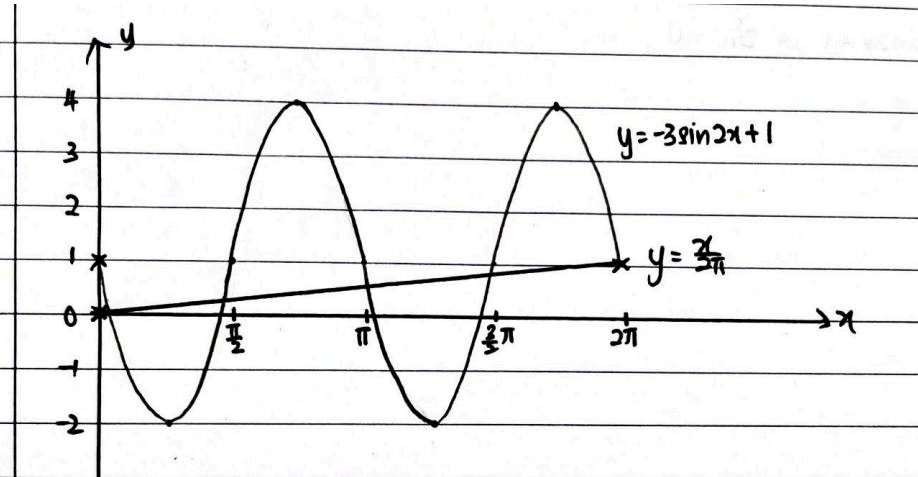
BAHAGIAN B (16 M)			
13(a)	$k = 8$	1	
(b)(i)	$f(10) = 10$		
	$\frac{10+m}{10-8} = 10$	1	
	$10+m = 10(2)$ $m = 10$	1	
(ii)	$f(x) = \frac{x+10}{x-8}$		
	$\frac{x+10}{x-8} = y$	1	
	$x+10 = xy - 8y$		
	$x - xy = -8y - 10$		
	$x = \frac{-8y-10}{1-y}$	1	
(iii)	$x = \frac{8y+10}{y-1}$		
	$f^{-1}(x) = \frac{8x+10}{x-1}$	1	
	$\frac{1}{2}f^{-1}(p) = 1$		
	$\frac{1}{2}\left(\frac{8p+10}{p-1}\right) = 1$	1	
	$4p+5 = p-1$ $3p = -6$ $p = -2$	1	
			8
14(a)	(i) $\frac{1}{\cos 2\theta} = \frac{1}{2\cos^2 \theta - 1}$	1	
	$= \frac{1}{2k^2-1}$	1	
	(ii) $\sin(90^\circ - \theta) = \sin 90^\circ \cos \theta - \cos 90^\circ \sin \theta$		
	$= (1)(k) - (0)\left(\frac{\sqrt{1-k^2}}{1}\right)$ $= k$	1 1	

(b)	$4 (2 \cos^2 \theta - 1) + 2 \cos 2\theta + 1 = 0$ $(4 \cos 2\theta + 3)(2 \cos 2\theta - 1) = 0$ $\cos 2\theta = -\frac{3}{4}, \quad \cos \theta = \frac{1}{2}$ $\theta = 30^\circ, 69^\circ 18', 110^\circ 43', 150^\circ, 210^\circ, 249^\circ 18', 290^\circ 43', 330^\circ$	1 1 1 1	8
15	$x = y + 1$ $4y^2 - 10x^2 = 3xy$ $4y^2 - 10(y + 1)^2 = 3y(y + 1)$ $(9y + 5)(y + 2) = 0$ $y = -\frac{5}{9}, \quad y = -2$ $x = \frac{4}{9}, \quad x = -1$ $\left(\frac{4}{9}, -\frac{5}{9}\right) = \left(\frac{m}{9}, \frac{n}{9}\right)$ $m = 4, n = -5$ $(-1, -2) = (3k, -2p)$ $3k = -1$ $k = -\frac{1}{3}$ $-2p = -2$ $p = 1$	1 1 1 1 1 1 1 1	8

MUAR K2

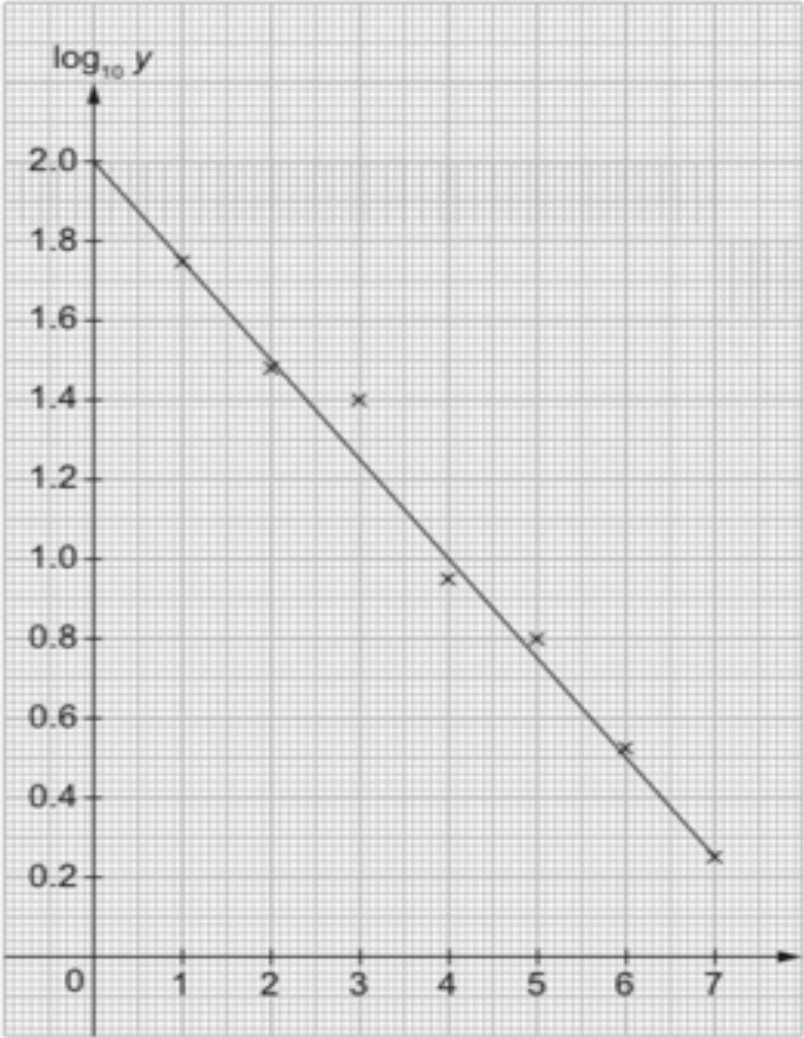
PERATURAN PERMAKAHAN MATEMATIK TAMBAHAN PEPERIKSAAN PERCUBAAN SPM 2022

NO. SOALAN	PEMARKAHAN	MARKAH
BAHAGIAN A		
1.	Nota: K1 diberi pada salah satu persamaan yang tepat. K1 kedua diberi apabila KETIGA-TIGA persamaan betul. $x + y + z = 245 \dots (1)$ $20x + 30y + 40z = 7\,750 \text{ atau } 2x + 3y + 4z = 775 \dots (2)$ $(25 - 20)x + (35 - 30)y + (50 - 40)z = 1725$ $x + y + 2z = 345 \dots (3)$ (3) - (1) $z = 100$ (chocolate cake) 2 x (3) $2x + 2y + 4z = 690$ (2) - (4) $y = 85$ (carrot cake) Dari (1), $x + 85 + 100 = 245$ $x = 60$ (banana cake)	K1 K1 N1 K1 N1 K1 N1
	JUMLAH	7m
2 (a)	$\frac{5 + \sqrt{7}}{5 - \sqrt{7}} \times \frac{5 + \sqrt{7}}{5 + \sqrt{7}}$ $\frac{32 + 10\sqrt{7}}{18}$ $\frac{16 + 5\sqrt{7}}{9}$	K1 K1 N1
2(b)	$(x - 4)\log 3 = (x - 3)\log 50$ $x(\log 3 - \log 50) = -3\log 50 + 4\log 3$ $x = 2.610$	K1 K1 N1
	JUMLAH	6m
3(a)	$a = \text{RM } 28\,000$, $r = 1.035$ $T_6 = ar^{n-1}$ $= \text{RM } 22\,800(1.035)^5$ $= \text{RM } 27\,079.25$	K1 N1
3(b)	$S_{12} = \frac{22\,800(1.035^6 - 1)}{1.035 - 1}$	K1

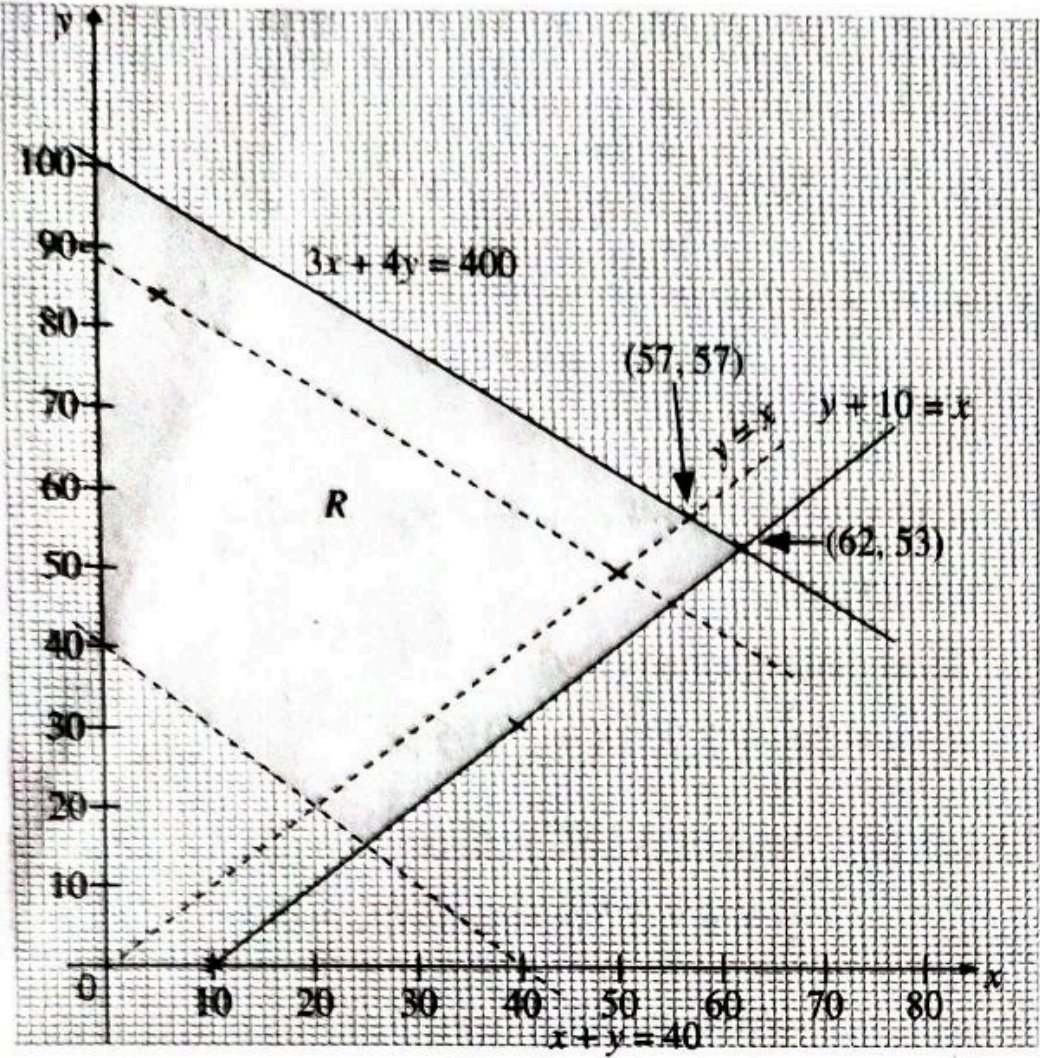
	$= RM\ 149\ 343.47$	N1
3(c)	$T_n > RM40\ 000$ $22\ 800 (1.035)^{n-1} > 40\ 000$ $n - 1 > \frac{\log 1.7544}{\log 1.035}$ $n = 18$	K1 K1 N1
	JUMLAH	7m
4(a)	$HTP = \frac{5}{3}$ $HDP = -\frac{2}{3}$	N1 N1
4(b)	$(3x + 1)(x - 2) = 0$ $\alpha = 2$ dan $\beta = \frac{1}{3}$ $HTP\ baru = (\alpha - 1) + (\beta + \frac{3}{4}) = \frac{17}{12} @$ $HDP\ baru = (\alpha - 1) \times (\beta + \frac{3}{4}) = \frac{5}{12}$ $Persamaan\ baru\ x^2 - \frac{17}{12}x + \frac{5}{12} = 0$ $12x^2 - 17x + 5 = 0$	K1 N1 K1 N1
	JUMLAH	6m
5	a) $1 - 2\sin^2\theta = 1 - 2[\cos^2\theta - 1]$ $1 - 2\sin^2\theta = 1 - 2\cos^2\theta - 2$1m $1 - 2\sin^2\theta = 2\cos^2\theta - 1$1m b) i) lakarkan graf $y = -3\sin 2x + 1$ - amplitud 31m - bentuk graf – sin 2x 1m - bentuk graf -sin2x +11m  ii) $y = \frac{x}{2\pi}$ dan graf $y = \frac{x}{2\pi}$2m bilangan penyelesaian = 51m	

6(a)	$\text{Kecerunan, } m_{AM} = -\frac{3}{2}$ $\therefore \text{kecerunan, } m_{BM} = \frac{2}{3}$ $\therefore y - 3 = \frac{2}{3}(x + 5)$ $y = \frac{2}{3}x + \frac{19}{3}$ $3y = 2x + 19$	K1 N1
6(b)	$\text{Koordinat } C(-1, -3)$ $3k = 2(-8) + 19$ $k = 1$ $\therefore B(-8, 1)$ $\text{Luas} = \frac{1}{2} \begin{vmatrix} -9 & 1 & -1 & -8 & -9 \\ 9 & 9 & -3 & 1 & 9 \end{vmatrix}$ $= \frac{1}{2} ((-81) + (-3) + (-1) + (-72)) - (9 + (-9) + 24 + (-9)) $ $= \frac{1}{2} -157 - 33 $ $= \frac{1}{2} -190 $ $= 95 \text{ unit}^2$	P1 @P1 K1 N1
6(c)	$\sqrt{(x - (-9))^2 + (y - 9)^2} = 10$ $(x - (-9))^2 + (y - 9)^2 = 10^2$ $x^2 + y^2 + 18x - 18y + 62 = 0$ $B(-8, 1)$ $(-8)^2 + (1)^2 + 18(-8) - 18(1) + 62 = -35$ $-35 \neq 0$ $\therefore \text{Titik } B \text{ tidak berada di atas Bulatan } Z$	K1 N1 N1
	JUMLAH	8m
7(a)	$\frac{dy}{dx} = x[3(x - 2)^2(1)] + (x - 2)^3(1)$ $= 2(2x - 1)(x - 2)^2$	K1 N1
7(b)	$\frac{dy}{dx} = 0$ $2(2x - 1)(x - 2)^2 = 0$ $(2x - 1) = 0 \text{ atau } (x - 2)^2 = 0$ $x = \frac{1}{2}, x = 2$ $\text{Apabila } x = \frac{1}{2}, \quad y = \frac{1}{2} \left(\frac{1}{2} - 2 \right)^3 = -\frac{27}{16}$ $\text{Apabila } x = 2, \quad y = 2(2 - 2)^3 = 0$	K1 N1 K1 @K1

	$\therefore P\left(\frac{1}{2}, -\frac{27}{16}\right), Q(2,0)$	N1,N1																
7(c)	Q ialah titik lengkok balas	N1																
	JUMLAH	8m																
BAHAGIAN B																		
8(a)	$batas\ rantau\ y = -1\ dan\ y = 3$ $\begin{aligned} luas &= \int_{-1}^3 -(y+1)(y-3)dy \\ &= \int_{-1}^3 (-y^2 + 2y + 3) dy \\ &= \left[-\frac{y^3}{3} + \frac{2y^2}{2} + 3y\right]_{-1}^3 \\ &= \left[-\frac{3^3}{3} + 3^2 + 3(3)\right] - \left[-\frac{(-1)^3}{3} + (-1)^2 + 3(-1)\right] \\ &= \frac{32}{3}unit^2 \end{aligned}$	K1 K1 K1 N1																
8(b)	i) $x = 5 - y, y = \frac{4}{5-y}$ $y^2 - 5y + 4 = 0$ $(y - 4)(y - 1) = 0$ $y = 4, y = 1$ A (1, 4) dan B (4, 1)	K1 N1																
	ii) Isipadu $\begin{aligned} &= \pi \int_1^4 (5 - x)^2 dx - \pi \int_1^4 \left(\frac{4}{x}\right)^2 dx \\ &= \pi \left[25x - 5x^2 + \frac{x^3}{3}\right]_1^4 - \pi \left[\frac{16x^{-1}}{-1}\right]_1^4 \\ &= \left\{\pi \left[25(4) - 5(4)^2 + \frac{(4)^3}{3}\right] - \left[25(1) - 5(1)^2 + \frac{(1)^3}{3}\right]\right\} - \pi \left[\frac{16}{(4)} - \left(-\frac{16}{(1)}\right)\right] \\ &= 9\pi unit^3 \end{aligned}$	K1 K1 K1 N1																
	JUMLAH		10m															
	9(a)	<table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>$\log_{10} y$</td><td>1.75</td><td>1.48</td><td>1.40</td><td>0.95</td><td>0.80</td><td>0.53</td><td>0.25</td></tr></table>	x	1	2	3	4	5	6	7	$\log_{10} y$	1.75	1.48	1.40	0.95	0.80	0.53	0.25
x	1	2	3	4	5	6	7											
$\log_{10} y$	1.75	1.48	1.40	0.95	0.80	0.53	0.25											

	Kesemua titik bagi $\log_{10} y$ betul <i>All points for $\log_{10} y$ are correct</i>  satu titik betul/<i>one point correct</i> semua titik betul/<i>all points correct</i> garis penyesuaian terbaik/<i>line of best fit</i>	K1 K1 K1
9(b)	(i) $y_{\text{salah/wrong}} = 25.1$; $y_{\text{betul/correct}} = 17.78$ Kedua-dua nilai/<i>Both values</i> (ii) $\log_{10} y = -(\log_{10} n)x + \log_{10} m$ $-\log n = \text{kecerunan/gradient}$ $n = 1.778$ $\log_{10} m = 2.0$ $m = 100$	N1 P1 K1 N1 K1 N1
	JUMLAH	10m
10(a)	(i) $n(0.2) = 50$ $n = 250$	K1 N1

	(ii) ${}^{10}C_4 (0.2)^4 (0.8)^6$ = 0.08808	K1 N1
10(b)	$\mu = 3.1 \quad \sigma^2 = 0.09 \rightarrow \sigma = 0.3$ (i) $P(2.9 < Z < 3.1) = P\left(\frac{2.9-3.1}{0.3} < Z < \frac{3.3-3.1}{0.3}\right)$ $= P\left(-\frac{2}{3} < Z < \frac{2}{3}\right)$ $= 0.4950$ (ii) $P(X < m) = 0.25$ $P\left(Z < \frac{m-3.1}{0.3}\right) = 0.25$ $\frac{m-3.1}{0.3} = -0.674$ $m = 3.1 - 0.674(0.3)$ $m = 2.898 \text{ kg}$	K1 K1 N1 K1 K1 N1
JUMLAH		10m
11.	a) i) $\vec{OR} = \frac{1}{3}\vec{OA} + m\vec{PB}$1m $\vec{OR} = (6 - 6m)\vec{x} + 16m\vec{y}$1m ii) $\vec{OR} = \frac{3}{4}\vec{OB} + n\vec{QA}$1m $\vec{OR} = 18n\vec{x} + (12 - 12n)\vec{y}$1m b) $6 - 6m = 18n \text{ or } 16m = 12 - 12n$1m $m = 1 - 3n \text{ masukkan dalam } 4(1 - 3n) = 3 - 3n$1m $m = \frac{2}{3}$1m $n = \frac{1}{9}$1m c) $\vec{PR} = -4\vec{x} - \frac{32}{3}\vec{y}$ $ \vec{PR} = \sqrt{[-4(2)]^2 + [\frac{32}{3}(1)]^2}$1m $ \vec{PR} = \frac{40}{3} \text{ units}$1m	
BAHAGIAN C		
12(a)	$x + y > 40$ $3x + 4y \leq 400$ $x - y \leq 10$	N1 N1 N1

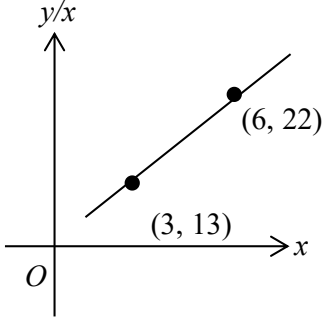
12(b)	Graf - Lukis 3 garis lurus - Lorekkan rantau R 	K1, K1 N1
12(c)	i) $y = x$ titik maksimum = (57, 57) kos maksimum = $3(57) + 4(57) = \text{RM}399$ peruntukan minimum = $\text{RM } 400 - \text{RM } 399 = \text{RM } 1$ ii) $3x + 4y = 350$ Titik maksimum = (62, 53) $x_{\text{maksimum}} = 62$	K1 N1 K1 N1
	JUMLAH	10m
13(a) i)	$AC^2 = 7^2 + 8^2 - 2(7)(8)\cos 80^\circ$ $AC = 9.6722 \text{ cm}$	K1 N1
13(a) ii)	$9.6722^2 = 3^2 + AD^2 - 2(3)(AD)\cos 100^\circ$	

	$AD = 8.68899 \text{ cm}$ $\frac{\sin \angle C}{8.68899} = \frac{\sin 100^\circ}{9.6722}$ <i>OR/ATAU</i> $8.68899^2 = 9.6722^2 + 3^2 - 2(9.6722)(3)\cos \angle C$ $\angle C = 62.2145^\circ$	P1 K1 @K1 N1
13(b) i)	$s = \frac{9.6722 + 7 + 8}{2} = 12.3361$ $luas = \sqrt{12.3361(12.3361 - 9.6722)(12.3361 - 7)(12.3361 - 8)}$ $luas = 27.5746 \text{ cm}^2$	K1 K1 N1
13(b) ii)	$\frac{1}{2}(9.6722)BX = 27.5746$ <i>Jarak terdekat BX = 5.7018 cm</i>	K1 N1
	JUMLAH	10m
14(a)	$\frac{P_{2019}}{8.50} \times 100 = 140$ $P_{2019} = RM11.90$	K1 N1
14(b)	$B = 30$ $\bar{I} = \frac{90(50)+160(30)+140(10)+120(10)}{50+30+10+10}$ $= 119$ $\frac{61\,750}{Q_{2016}} \times 100 = 119$ $Q_{2016} = RM51\,890.76$	P1 K1 N1 K1 N1
14(c)	$x = \frac{165 \times 119}{100}$ $= 196.35$ <i>Kenaikan sebanyak 96.35% dari tahun 2016 ke tahun 2021</i>	K1 N1 N1
15(a)	$= \int (8 - 2t)dt$ $= 8t - t^2 + c$ $t = 2, v = 16,$ $16 = 8(2) - (2)^2 + c$ $16 = 16 - 4 + c$ $c = 4$ $8(0) - (0)^2 + 4$ 4ms^{-1}	K1 K1 K1 N1
15(b)	$\frac{dv}{dt} = a = 0$	

	$8 - 2t = 0$ $t = 4$ $8(4) - (4)^2 + 4$ 20ms^{-1}	K1 K1 N1
15(c)	Jarak dilalui dalam saat ke-3, <i>Distance travelled in the 3rd second,</i> $s = \int_2^3 (8t - t^2 + 4) dt$ $= \left[4t^2 - \frac{1}{3}t^3 + 4t \right]_2^3$ $= \left[4(3)^2 - \frac{1}{3}(3)^3 + 4(3) \right]$ $- \left[4(2)^2 - \frac{1}{3}(2)^3 + 4(2) \right]$ $= 17\frac{2}{3} \text{ m}$	K1 K1 N1
	JUMLAH	10m

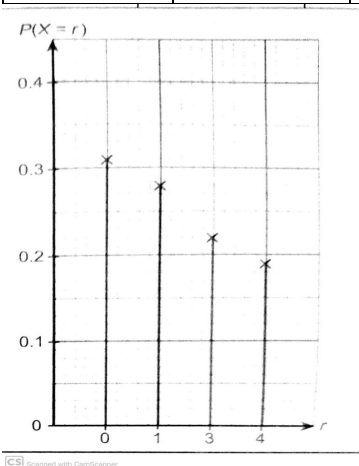
TANGKAK K1

SKEMA PEMARKAHAN
KERTAS PEPERIKSAAN PERCUBAAN SPM 2022
DAERAH TANGKAK

BIL			JALAN PENYELESAIAN	SUB	MARK
1			$2j + 55 = 95$ $j = 20 \text{ cm}$ $20\theta = 55$ $\theta = 2.75 \text{ rad}$	1 1	2
2	(a)			1	3
	(b)		$m = 3$ $a = 3, b = 4$	1 1	
3	(a)		2^2 or 3^4 $q^8 - p^4$	1 1	4
	(b)		Changing 6^{m+2} to $6^m(6^2)$ or 6^{m+1} to $6^m(6)$ $6^m[6^2 + 6 - 18]$ $6^m[24]$	1 1 1	
4			$V = \frac{1}{3}h^3 + 8h$ $\frac{dV}{dt} = 10 \text{ cm}^3 \text{ s}^{-1}$ cari $\frac{dV}{dt} = ?$ apabila $h = 2 \text{ cm}$ $\frac{dV}{dh} = h^2 + 8$ $\frac{dV}{dt} = \frac{dV}{dh} \times \frac{dh}{dt}$ $10 = (h^2 + 8) \times \frac{dh}{dt}$ $10 = ((2)^2 + 8) \times \frac{dh}{dt} \quad \therefore \frac{dh}{dt} = \frac{5}{6} \text{ cm}$	1 1 1, 1	

BIL			JALAN PENYELESAIAN	SUB	MARK
5	(a)		$f(x) = 4x^2 + 18x - 5.$ $= 4(x^2 + \frac{18}{4}x - \frac{5}{4})$ $= 4[x^2 + \frac{18}{4}x + (\frac{9}{4})^2 - (\frac{9}{4})^2 - \frac{5}{4}]$ $= 4[(x + \frac{9}{4})^2 - \frac{101}{16}]$ $= 4[(x + \frac{9}{4})^2 - \frac{101}{4}]$	1 1 1	7
	(b)		titik minimum, $(-\frac{9}{4}, -\frac{101}{4})$	1, 1	
	(c)		$f(x) = -4[(x + \frac{9}{4})^2 + \frac{101}{4}]$	2	
6	(a)		$OQ : QB = 20$ $3 : 2 = 20$ $12 : 8 = 20$ $j = 12 \text{ cm}$ $\frac{1}{2}(12)^2(\sin \theta) = 42.42$ $\theta = 0.6301 \text{ rad}$	1 1 1	6
	(b)		Luas berlorek $= \frac{1}{2}(20)^2(0.6301) - 42.42$ $= 83.6$	1,1 1	
7	(a)		$h(x) = \frac{x-2}{3}$	1	6
	(b)		$let y = \frac{x-2}{3}$ $h^{-1} = 3x + 2$	1 1	
	(c)		$gh(x) = x^2 - 4x - 1$ $gh(x)h^{-1}(x) = (x^2 - 4x - 1)h^{-1}(x)$ $g(x) = (3x + 2)^2 - 4(3x + 2) - 1$ $g(x) = 9x^2 - 5$	1 1 1	

BIL			JALAN PENYELESAIAN	SUB	MARK
8	(a)		$m_{AB} = \frac{5-1}{-9-3} \quad \text{dan} \quad m_{PQ} = \frac{5-(-4)}{1-a}$ $m_{AB} \times m_{PQ} = -1$ $\left(\frac{5-1}{-9-3}\right) \times \left(\frac{5-(-4)}{1-a}\right) = -1$ $\left(-\frac{4}{12}\right) \left(\frac{9}{1-a}\right) = -1$ $a = -2$	1 1 1	6
	(b)		$m_{AB} = \frac{5-1}{-9-3} = -\frac{4}{12}$ $m_{AB} = -\frac{1}{3}$ $y - (-4) = -\frac{1}{3}[x - (-2)] \quad \text{atau} \quad -4 = -\frac{1}{3}(-2) + c$ $y = -\frac{1}{3}x - \frac{14}{3}$	1 1 1	
9	(a)		$\int_0^k \pi x^2 dy = 6\pi$ $\pi \int_0^k 4 - y dy = 6\pi$ $\left[4y - \frac{y^2}{2}\right]_0^k = 6$ $-k^2 + 8k - 12 = 0$ $k^2 - 8k + 12 = 0$ $(k-6)(k-2) = 0$ $k = 2, \quad k = 6$ $\therefore k = 2$	1 1 1	5
	(b)		$\int_1^3 2f(x) dx - \int_1^3 5 dx$ $= 2 \int_1^3 f(x) dx - [5x]_1^3$ $= 2(6) - [5(3) - 5(1)]$ $= 2$	1 1	

BIL			JALAN PENYELESAIAN	SUB	MARK										
10	(a)		$T_{12} = 600 + 11(80)$ $= 1,480.00$	1	8										
				1											
	(b)		$S_{60} = \frac{60}{2} [2(600) + 59(80)]$ $= 177600.00$	1											
				1											
	(c)		$\frac{n}{2} [2(600) + (n - 1)(80)] \leq 500,000$ $n^2 + 14n - 12500 \leq 0$ $0 \leq n \leq 105.02$ $n = 105$ kedalaman = 105×2 $= 210\text{m.}$	1 1 1 1											
11	(a)	(i)	${}^7P_4 = 840$	1	6										
		(ii)	$= \underline{1} \times \underline{5} \times \underline{4} \times \underline{3}$ $= 60$	1											
	(b)	(i)	$\frac{3}{5} \times \frac{1}{3} = \frac{1}{5}$	2											
		(ii)	$\left(\frac{3}{5} \times \frac{2}{3}\right) + \left(\frac{2}{5} \times \frac{1}{3}\right)$ $= \frac{6}{15} + \frac{2}{15}$ $= \frac{8}{15}$	1 1											
12			<table><tr><td>$X = r$</td><td>0</td><td>1</td><td>3</td><td>4</td></tr><tr><td>$P(X = r)$</td><td>$\frac{11}{36} = 0.31$</td><td>$\frac{5}{18} = 0.28$</td><td>$\frac{2}{9} = 0.22$</td><td>$\frac{7}{36} = 0.19$</td></tr></table> 	$X = r$	0	1	3	4	$P(X = r)$	$\frac{11}{36} = 0.31$	$\frac{5}{18} = 0.28$	$\frac{2}{9} = 0.22$	$\frac{7}{36} = 0.19$	1 1	4
$X = r$	0	1	3	4											
$P(X = r)$	$\frac{11}{36} = 0.31$	$\frac{5}{18} = 0.28$	$\frac{2}{9} = 0.22$	$\frac{7}{36} = 0.19$											

BIL		JALAN PENYELESAIAN	SUB	MARK
14		$4y + 4x + 4(x + 5) = 154$ @ persamaan * di bawah $4y + 4x + 4x + 20 = 154$ $y = \frac{67-4x}{2}$ $2y(x + 5) + 2x(x + 5) + 2xy = 845$ $2x^2 + 4xy + 10y + 10x - 845 = 0$ $2x^2 + 4x\left(\frac{67-4x}{2}\right) + 10\left(\frac{67-4x}{2}\right) + 10x - 845 = 0$ $6x^2 - 124x + 510 = 0$ @ $3x^2 - 62x + 255 = 0$ $x = \frac{-(-124) \pm \sqrt{(-124)^2 - 4(6)(510)}}{2(6)}$ @ $(3x - 17)(x - 15) = 0$ $x = 5\frac{2}{3}$ @ $x = 15$ $y = \frac{67 - 4(5\frac{2}{3})}{2}$ @ $y = \frac{67 - 4(15)}{2}$ $y = 22\frac{1}{6}$ @ $y = 3.5$ Diberi $x > y$, maka $x = 15$ dan $y = 3.5$ Isipadu bekas = $15 \times 3.5 \times (15 + 5)$ = 1050 cm^3 Isipadu jus minuman = $1000 \text{ ml} = 1000 \text{ cm}^3$, Maka 1000 ml jus minuman boleh dimuatkan dalam bekas tersebut.	1 1 1 1 1 1 1	8

BIL			JALAN PENYELESAIAN	SUB	MARK
15	(a)		$y = a \tan bx$ $b = \frac{1}{2}$ $y = a \tan \frac{1}{2}x$ $\left(\frac{\pi}{2}, \frac{3}{2}\right)$ $\frac{3}{2} = a \tan \left(\frac{1}{2} \times \frac{\pi}{2}\right)$ $a = \frac{3}{2}$ $y = \left \frac{3}{2} \tan \frac{1}{2}x\right / y = \frac{3}{2} \left \tan \frac{1}{2}x\right / y = \left -\frac{3}{2} \tan \frac{1}{2}x\right $	1 1 1 1	8
	(b)		$3 \cos 2x = 8 \sin x - 5$ $3(1 - 2\sin^2 x) = 8 \sin x - 5$ $3 - 6\sin^2 x = 8 \sin x - 5$ $6 \sin^2 x + 8 \sin x - 8 = 0$ $3\sin^2 x + 4\sin x - 4 = 0$ $(3\sin x - 2)(\sin x + 2) = 0$ $\sin x = \frac{2}{3}, \sin x = -2(\text{rejected})$ $x = 41.81^\circ, 138.19^\circ$	1 1 1 1	

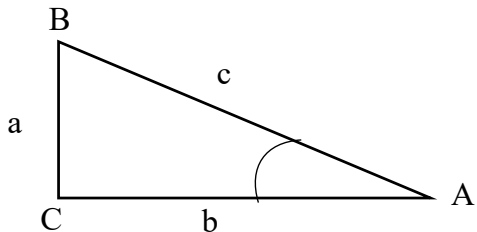
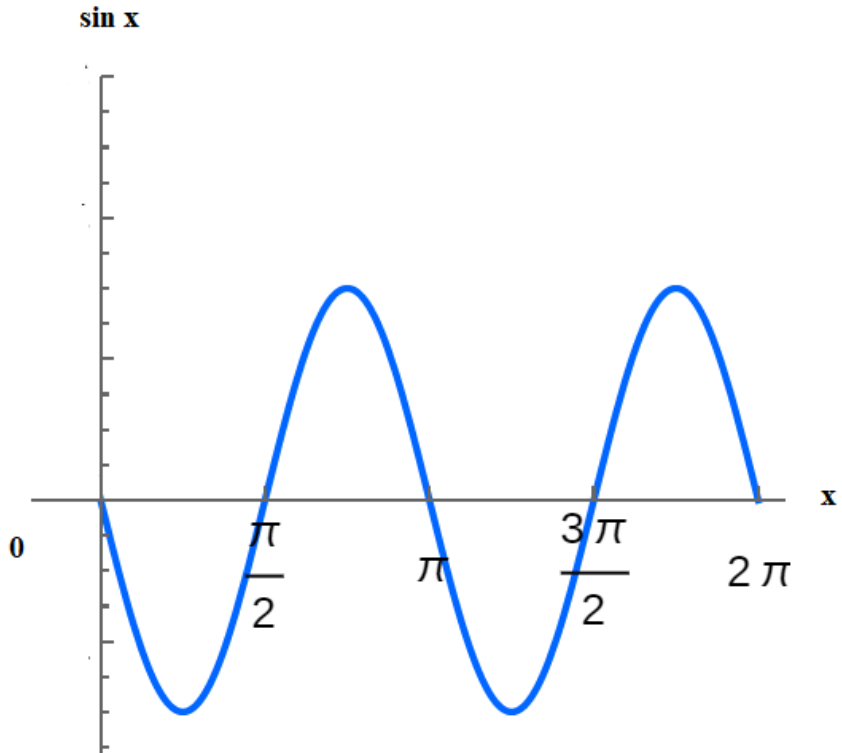
No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
15.	a) $\sin 2\theta = \sin \theta$ $2 \sin \theta \cos \theta = \sin \theta$ $2 \sin \theta \cos \theta - \sin \theta = 0$ $\sin \theta (2 \cos \theta - 1) = 0$ $\sin \theta = 0 \quad \text{or} \quad 2 \cos \theta - 1 = 0$ $\theta = 0^\circ, 60^\circ, 180^\circ, 300^\circ, 360^\circ$ b) (i) $\sin (90^\circ - x) = \cos x$ $\cos x = \frac{-d}{\sqrt{c^2 + d^2}}$ (ii) $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$ $\tan 2x = \frac{2 \left(\frac{c}{d}\right)}{1 - \left(\frac{c}{d}\right)^2}$ $\frac{2cd}{d^2 - c^2}$	K1 N1 N1 K1 N1 K1 N1	8

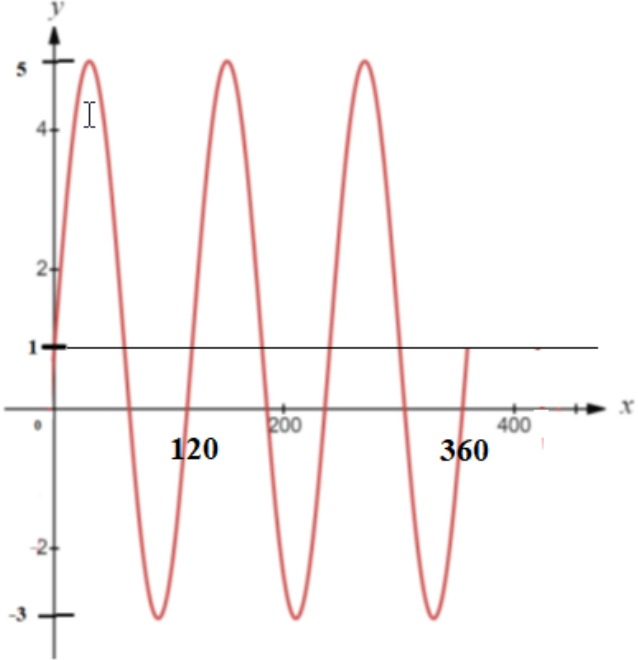
TANGKAK K2

No.	Penyelesaian	Sub Markah	Jumlah
1	$x + y + z = 250 \quad (1)$ $15x + 10y + 8z = 2\,825 \quad (2)$ $y = 2x \quad (3)$ Gantikan (3) ke dalam (1) $3x + z = 250 \quad (4)$ Gantikan (3) ke dalam (2) $35x + 8z = 2\,825 \quad (5)$ $(4) \times 8: \quad 24x + 8z = 2\,000 \quad (6)$ $(5) - (6): \quad 11x = 825$ $x = 75$ Gantikan $x = 75$ ke dalam (3) $y = 150$ Gantikan $x = 75$ ke dalam (4) $z = 25$ Dewasa: 75, Pelajar: 150, Kanak-kanak: 25 (semua betul)	1 1 1 1 1 1 1	7
2	(a) Katakan $l = \text{lebar}$, *terima sebarang algebra bagi lebar. $l \times (2 - \sqrt{2}) = 3 + \sqrt{2}$ $l = \frac{3 + \sqrt{2}}{2 - \sqrt{2}} \times \frac{2 + \sqrt{2}}{2 + \sqrt{2}}$ $= \frac{6 + 3\sqrt{2} + 2\sqrt{2} + 2}{4 - 2}$ $= 4 + \frac{5}{2}\sqrt{2}$ (b) $\log_7 (x - 1) - \log_7 (x - 7) = 1$ $\log_7 \frac{(x - 1)}{(x - 7)} = 1$ $x = 8$	1 1 1 1 1	4 2

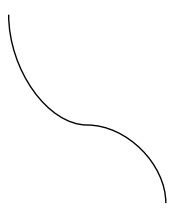
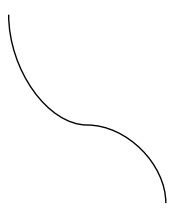
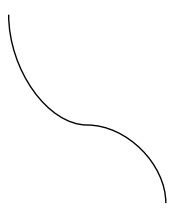
No.	Penyelesaian	Sub Markah	Jumlah																																																																																							
3	(a) Untuk Syarikat X: a = 45 500 dan d = 500 Untuk syarikat Y: a = 40300 dan r =1.07 Maka, skim penggajian syarikat Y yang mengikut suatu jangjang geometri.	1 1 1	3																																																																																							
	(b)Untuk syarikat X: $T_5 = 45\,500 + (5 - 1)(500)$ $= 47\,500$ Untuk syarikat Y: $T_5 = 40300(1.07)^{5-1}$ $= 52825.08$	1 1	2																																																																																							
	(c) Untuk syarikat Y: <table><tr><td>T</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td></td></tr><tr><td>gaji tahunan</td><td></td><td></td><td>46139.4</td><td>49369.2</td><td>52825.0</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>ke-n</td><td>40300</td><td>43121</td><td>7</td><td>3</td><td>8</td><td>56522.83</td><td>60479.43</td><td>64712.99</td><td>69242.9</td><td>740</td></tr><tr><td></td><td></td><td>5605.7</td><td>5998.13</td><td></td><td></td><td></td><td></td><td></td><td>9001.57</td><td></td></tr><tr><td>15%</td><td>5239</td><td>3</td><td>1</td><td>6418</td><td>6867.26</td><td>7347.969</td><td>7862.326</td><td>8412.689</td><td>7</td><td>963</td></tr></table> Jumlah untuk 10 tahun = <table><tr><td>5239</td><td>+ 5605.73</td><td>+ 5998.131</td><td>+ 6418</td><td>+ 6867.26</td><td>+ 7347.969</td><td>+ 7862.326</td><td>+ 8412.689</td><td>+ 9001.577</td><td>+ 9631.688</td><td></td></tr><tr><td colspan="10"></td><td></td></tr><tr><td colspan="10"></td><td>= 72384.37</td></tr></table> ATAU $a = 40300, r = 1.07, S_{10}$ $S_n = \frac{40300(1.07^{10-1})}{1.07 - 1}$ $S_n = 556802.8528$ 13% disimpan, Amaun $= 556802.8528 \times \frac{13}{100}$ $= 72384.37$	T	1	2	3	4	5	6	7	8	9		gaji tahunan			46139.4	49369.2	52825.0						ke-n	40300	43121	7	3	8	56522.83	60479.43	64712.99	69242.9	740			5605.7	5998.13						9001.57		15%	5239	3	1	6418	6867.26	7347.969	7862.326	8412.689	7	963	5239	+ 5605.73	+ 5998.131	+ 6418	+ 6867.26	+ 7347.969	+ 7862.326	+ 8412.689	+ 9001.577	+ 9631.688																							= 72384.37	1 1 <
T	1	2	3	4	5	6	7	8	9																																																																																	
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										= 72384.37																																																																																

No.	Penyelesaian	Sub Markah	Jumlah
4	(a) $x^2 + 3(4x + k) = 0$ $x^2 + 12x + 3k = 0$ HTP: $p + 2p = -12$ $p = -4$ HDP: $p(2p) = 3k$ $2(-4)^2 = 3k$ $k = \frac{32}{3}$ (b) HTP: $(p + 1) + (p - 5) = (-4 + 1) + (-4 - 5)$ $= (-3) + (-9)$ $= -12$ HDP: $(p + 1)(P - 5) = (-4 + 1)(-4 - 5)$ $= (-3)(-9)$ $= 27$ Both HTP and HDP correct, $x^2 + 12x + 27 = 0$	1 1 1 1 1 1 1	6

No.	Penyelesaian	Sub Markah	Jumlah
5	(a)  $\sin A = \frac{a}{c}$ and $\cos A = \frac{b}{c}$ and $\tan A = \frac{a}{b}$ Teorem Pythagoras, $a^2 + b^2 = c^2$..... ① ① $\div c^2$: $\frac{a^2}{c^2} + \frac{b^2}{c^2} = \frac{c^2}{c^2}$ $\left(\frac{a}{c}\right)^2 + \left(\frac{b}{c}\right)^2 = 1$ $\sin^2 A + \cos^2 A = 1$ Terbukti. (b)  Graf bentuk sin x diberi 1 markah Semua betul diberi 1 markah	1 1 1 1	

No.	Penyelesaian	Sub Markah	Jumlah
	(c) $a=4, b=3, c=1$ Betul semua diberi 1 markah. 	1	
	Bentuk graf	1	
	Amplitud	1	
	Kitaran	1	8

[illegible]

No.	Penyelesaian	Sub Markah	Jumlah																				
7	(a) $y = x(x + 2)^3$ $\frac{dy}{dx} = x \frac{d}{dx}(x + 2)^3 + (x + 2)^3 \frac{d}{dx}(x)$ $= x (3(x + 2)^{3-1}(1) + (x + 2)^3((1)x^{1-1})$ $= 2(x + 2)^2(2x + 1)$ (b) Apabila $\frac{dy}{dx} = 0$, $2(x + 2)^2(2x + 1) = 0$ $x = -2$ both $x = -\frac{1}{2}$ $y = 0$ $y = -\frac{27}{16} // -1.6875$ $P(-2,0)$ $Q(-\frac{1}{2}, -\frac{27}{16})$ (c) <table border="1"> <tr> <td>x</td><td>-2.1</td><td>-2</td><td>-1.9</td></tr> <tr> <td>$\frac{dy}{dx}$</td><td>-0.064</td><td>0</td><td>-0.056</td></tr> <tr> <td>Tanda bagi $\frac{dy}{dx}$</td><td>-</td><td>0</td><td>-</td></tr> <tr> <td>Lakaran tangen</td><td>\</td><td>-</td><td>\</td></tr> <tr> <td>Lakaran graf</td><td colspan="3">  </td></tr> </table> $P(-2,0)$ ialah titik lengkok balas.	x	-2.1	-2	-1.9	$\frac{dy}{dx}$	-0.064	0	-0.056	Tanda bagi $\frac{dy}{dx}$	-	0	-	Lakaran tangen	\	-	\	Lakaran graf				1 1 1 1 1 1 1 1	8
x	-2.1	-2	-1.9																				
$\frac{dy}{dx}$	-0.064	0	-0.056																				
Tanda bagi $\frac{dy}{dx}$	-	0	-																				
Lakaran tangen	\	-	\																				
Lakaran graf																							

No.	Penyelesaian	Sub Markah	Jumlah
8	(a) Pada titik B, $y = 0$ $x = (0)^2 + 3$ $x = 3$ Maka, titik B ialah (3,0). (b) Luas rantau berlorek $R = \frac{1}{2} \times 4 \times 4 + \int_0^1 x \, dy$ $= \frac{1}{2} \times 4 \times 4 + \int_0^1 (y^2 + 3) \, dy$ $= 8 + \left[\frac{y^3}{3} + 3y \right]_0^1$ $= 8 + \left[\frac{(1)^3}{3} + 3(1) - \left(\frac{(0)^3}{3} + 3(0) \right) \right]$ $= 11\frac{1}{3}$ (c) Isi padu janaan $= \frac{1}{3} \times \pi \times (1)^2 \times 1 + \int_3^4 \pi y^2 \, dx$ $= \frac{1}{3} \times \pi \times (1)^2 \times 1 + \int_3^4 \pi(x - 3) \, dx$ $= \frac{1}{3} \pi + \pi \left[\frac{x^2}{2} - 3x \right]_3^4$ $= \frac{1}{3} \pi + \pi \left[\frac{(4)^2}{2} - 3(4) - \left(\frac{(3)^2}{2} - 3(3) \right) \right]$ $= \frac{1}{3} \pi + \frac{1}{2} \pi$ $= \frac{5}{6} \pi$	1 1 1 1 1 1 1 1 1 1	10

No.	Penyelesaian	Sub Markah	Jumlah
9	(a) (i) $\overrightarrow{DB} = \overrightarrow{DA} + \overrightarrow{AB}$	1	
	$= -5\overrightarrow{AE} + \underline{x}$		
	$= \underline{x} - 5y$	1	
	(ii) $\overrightarrow{AF} = \overrightarrow{AB} + \overrightarrow{BF}$	1	
	$= \underline{c} + \frac{1}{5}(-\underline{x} + 5y)$	1	
	$= \frac{4}{5}\underline{x} + y$	1	
	(b) $\overrightarrow{DC} = m x - y$		
	$\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$		
	$\overrightarrow{AC} = 5y + mx - y$		
	$= mx + 4y$	1	
	$\overrightarrow{AF} = n \overrightarrow{AC}$		
	$\frac{4}{5}x + y = n(mx + 4y)$	1	
	$\frac{4}{5}x + y = mnx + 4ny$		
	Bandingkan x dan y	1	
	$1 = 4n$		
	$n = \frac{1}{4}$		
	$\frac{4}{5} = mn$	1	
	$\frac{4}{5} = m(\frac{1}{4})$		
	$m = \frac{16}{5}$	1	10

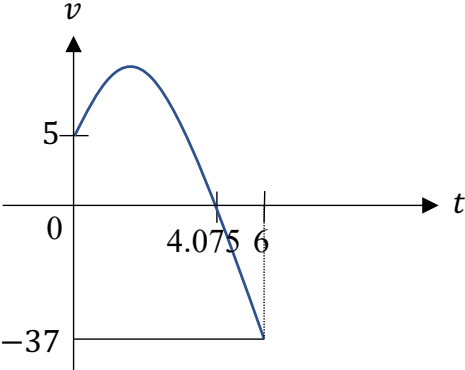
No.	Penyelesaian						Sub Markah	Jumlah
10	(a)						1	
	Masa/Times, t (hari/days)	1	2	3	4	5		
	$\log_{10}N$	1.78	1.90	2.0	2.08	2.18		
	Plot log N melawan t (skala seragam dan paksi betul) 1m						1	
	6 titik diplot dengan betul 2m						1	
	5 atau 4 titik diplot betul 1m						1	
	Garis lurus terbaik 1m						1	
	b) i) $N = Ar^t$ $\log_{10}N = \log_{10}A + t\log_{10}r$ $\log_{10}N = t\log_{10}r + \log_{10}A$ $\log_{10}A = y \text{ intercept}$							
	(1m)							

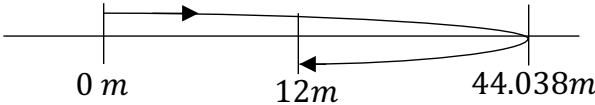
No.	Penyelesaian	Sub Markah	Jumlah
	$\log_{10}A = 1.69$ $A = 48.98$ (1m) $\log_{10}r = \text{gradient}$ $= \frac{2.28-1.69}{6-0}$ $= 0.0983$ (1m) $r = 1.254$ (1m) c) when t = 7, $\log_{10}N = 2.38$ $N = 239$ (1m)		10

No.	Penyelesaian	Sub Markah	Jumlah
11	(a) (i)		
	$P(X = 3) = {}^8C_3(0.1)^3(0.9)^5$	1	
	$= 0.03307$	1	
	(ii) $P(X > 5) = P(X = 6) + P(X = 7) + P(X = 8)$	1	
	$= {}^8C_6(0.9)^6(0.1)^2 + {}^8C_7(0.9)^7(0.1)^1 + {}^8C_8(0.9)^8(0.1)^0$	1	
	$= 0.9619$	1	
	(b) (i) $P(X > 35)$		
	$= P\left(Z > \frac{35-25}{8}\right)$	1	
	$= P(z > 1.25)$		
	$= 0.1056$	1	
	(ii) $\frac{100}{600} = 0.1667$		
	$P(X < t) = 0.1667$		
	$P\left(Z < \frac{t-25}{8}\right) = 0.1667$	1	
	$\frac{t-25}{8} = -0.967$	1	
	$t = 17.264$	1	10

No.	Penyelesaian	Sub Markah	Jumlah
12	(a) $x + y \geq 40,$	1	10
	$y \leq 2x,$	1	
	$3x + 2y \leq 180$	1	
	(b) Rujuk graf		
	Lukis sekurang-kurangnya satu garis lurus betul (1 M)	1	
	Lukis semua garis lurus betul (1 M)	1	
	Lorekkan rantau R dengan betul (1M)	1	
	(c) (i) Daripada graf,		
	$x_{minimum} = 30,$	1	
	$x_{maksimum} = 53$	1	
	(ii)		
	$k = 120x + 80y$		
	Daripada graf, (14,26) untuk titik minimum		
	$k = 120(14) + 80(26)$	1	
	$= 3760$	1	

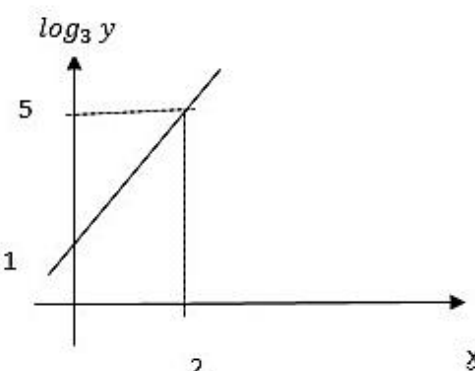
No.	Penyelesaian	Sub Markah	Jumlah
	12(b) The graph shows a coordinate plane with a grid. The x-axis is labeled from 0 to 70 in increments of 10. The y-axis is labeled from 0 to 100 in increments of 10. Three lines are plotted: $y = 2x$, $x + y = 40$, and $3x + 2y = 180$. The feasible region R is the area bounded by these three lines in the first quadrant. The region R is shaded with diagonal lines. The vertices of R are $(0,0)$, $(15,25)$, and $(53,0)$. The line $y = 2x$ passes through $(0,0)$ and $(50,100)$. The line $x + y = 40$ passes through $(0,40)$ and $(40,0)$. The line $3x + 2y = 180$ passes through $(0,90)$ and $(60,0)$. The feasible region R is the area bounded by these three lines in the first quadrant. The region is shaded with diagonal lines. The vertices of R are $(0,0)$, $(15,25)$, and $(53,0)$.		

No.	Penyelesaian	Sub Markah	Jumlah
13	(a) $a = 11 - 6t$ $v = \int 11 - 6t \, dt$ $v = 11t - \frac{6t^2}{2} + c$ $v = 11t - 3t^2 + c$ Pada masa $t = 0, v = 5,$ $5 = 11(0) - 3(0)^2 + c$ $5 = c$ Maka, $v = 11t - 3t^2 + 5$ (b) $v = 11(6) - 3(6)^2 + 5$ $v = -37$  Bentuk parabola  1 markah Titik (0,5), (4.075,0) dan (6,-37) diberi 1 markah. (c) (i) $s = \int 11t - 3t^2 + 5 \, dt$ $s = \frac{11}{2}t^2 - \frac{3t^3}{3} + 5t + c$ Pada masa $t = 0, s = 0,$ $s = 0$ Maka, $s = \frac{11}{2}t^2 - t^3 + 5t$ Apabila $t = 6,$ $s = \frac{11}{2}(6)^2 - (6)^3 + 5(6)$ $s = 12$	1 1 1 1 1 1 1	

No.	Penyelesaian	Sub Markah	Jumlah
	(ii) Apabila $t = 4.075$, $s = \frac{11}{2}(4.075)^2 - (4.075)^3 + 5(4.075)$ $= 44.038$  $t = 0$ $t = 6$ $t = 4.075$ Jumlah jarak = $44.038 + (44.038 - 12)$ $= 76.076 \text{ m}$ Kaedah 2: $\text{Jumlah jarak} = \int_0^{4.075} 11t - 3t^2 + 5 \, dt + \left \int_{4.075}^6 11t - 3t^2 + 5 \, dt \right $ $= \left[\frac{11}{2}t^2 - t^3 + 5t \right]_0^{4.075} + \left \left[\frac{11}{2}t^2 - t^3 + 5t \right]_{4.075}^6 \right $ $= \frac{11}{2}(4.075)^2 - (4.075)^3 + 5(4.075) - \frac{11}{2}(0)^2 - (0)^3 + 5(0) + \left \frac{11}{2}(6)^2 - (6)^3 + 5(6) - \left(\frac{11}{2}(4.075)^2 - (4.075)^3 + 5(4.075) \right) \right $ $= 44.038 + -32.038 $ $= 76.076$	1 1 1 1 1	10

No.	Penyelesaian	Sub Markah	Jumlah
15	Menggunakan formula $I_{17/14} = \frac{P_{17}}{P_{14}} \times 100$	K1	4
(a)	p = 125 q = 48.00 r = 20.00	N1 N1 N1	
(b)	$\bar{I}_{17/14} = \frac{125 \times 12 + 120 \times 14 + 90 \times 10 + 115 \times 4}{12 + 14 + 10 + 4}$ $= 113.5$	K1 N1	
(c)	Komoditi B: $I_{21/14} = 156$ Komoditi D: $I_{\frac{21}{14}} = 103.5$	P1 P1	4
	$\bar{I}_{21/14} = \frac{125 \times 12 + 156 \times 14 + 90 \times 10 + 103.5 \times 4}{12 + 14 + 10 + 4}$ $= 124.95$	K1 N1	

SKEMA GERAK GEMPUR PERCUBAAN MATEMATIK TAMBAHAN KERTAS 1

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
1.	$\angle AOC = 60^\circ$ $\angle AOB = 2 \times 60^\circ \quad \dots 1\text{m}$ $= 120^\circ$ $= \frac{120^\circ}{180^\circ} \times \pi \text{ rad}$ $= 2.0944 \text{ rad} \quad \dots 1\text{m}$	K1 N1	 2
2.	(a) $p = 2$ $q = 1$ (b) 	N1 N1 P1P1	 4
3.	a) $256(5^{3n}) + 2^{8n}(256)$ $256(5^{3n} + 2^{8n})$ b) $\frac{3}{5}[2^{2(p)}] = 2^q \text{ atau/or } 9[2^{3(p)}] = 10[2^{2(q)}]$ $\frac{5}{2} = 2^p$ $5 = 2^{p+1}$	K1 N1 K1 K1 N1	 5

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
4.	$y = \frac{24}{x^2}$ $\frac{dy}{dx} = -\frac{48}{x^3}$ $\delta y = \frac{dy}{dx} \times \delta x$ $\left(-\frac{48}{x^3}\right) \times (\delta x)$ Apabila $x = 6$, $\delta x = p$ $\delta y = \left(-\frac{48}{6^3}\right)(p)$ $= \frac{2}{9} p$	K1 N1 K1 N1	4
5.	a) $3x^2 - (1+k)x + 1 + k = 0$ $b^2 - 4ac > 0$ $[-(1+k)]^2 - 4(3)(1+k) > 0$ $k^2 - 10k - 11 > 0$ $k < -1 \text{ dan } k > 11$ b) $p = -3$, dan $q = -7$ atau / or $a = \frac{4}{3}$ $f(x) = \frac{4}{3}(x-3)^2 - 7$ c) $f(x) = -\frac{4}{3}(x-3)^2 - 7$ paksi simetri tidak berubah	P1 K1 N1 P1 N1 N1 N1	7

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
6.	a) $\cos \theta = \frac{24}{30}$ $\angle AOB = 1.287 \text{ rad}$ b) $\frac{1}{2} \times 30^2 \times (2 \times 3.142 - 1.287)$ <i>atau / or</i> $\frac{1}{2} (30)(30) \sin 73.74$ $\frac{1}{2} \times 30^2 \times (2 \times 3.142 - 1.287) + \frac{1}{2} (30)(30) \sin 73.74$ 2680.65 cm^2	K1 N1 K1 K1 N1	5
7.	a) $gf(x) = p(2x - 7) + 3$ $5q = -7p + 3$ $q = \frac{-7p+3}{5}$ b) (i) $\frac{m}{2} = 5$ $m = 10$ (ii) $g^{-1}(x) = x - 3$	K1 K1 N1 K1 N1 N1	7
8.	a) $\frac{-4-2}{-2-1} \times \frac{-4-h}{3-(-3)} = -1$ $h = -1$ b) $m_{PQ}=2$ <i>atau / or</i> $m_{RS} = -\frac{1}{2}$ $y = 2x$ <i>atau / or</i> $2y = -x - 5$ @ $y = -\frac{1}{2}x - \frac{5}{2}$ <i>* penyelesaian kaedah penghapusan @ penggantian</i> koordinat titik persilangan garis PQ dan RS = $((-1, -2))$	K1 N1 K1 K1 K1 N1	6

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
9.	a) $\left[\frac{(5x+2)^2}{10} \right]_1^2$ $= \frac{19}{2}$ b) $10 - [3x]_1^3$ $= 10 - [3(3) - 3(1)]$ $= 4$	K1 N1 K1 K1 N1	5
10	(a) Katakan a = sebutan pertama, d = beza sepunya a = 18 d = 4 ** $T_1 = 18 = a$ $T_2 = 18 + 4 = a + d$ $T_3 = 18 + 4 + 4 = a + 2d$ $T_4 = 18 + 4 + 4 + 4 = a + 3d$ $\vdots$ $\vdots$ $\vdots$ $T_n = 18 + 4 + 4 + \dots + 4 = a + (n - 1)d$ (terbukti) n - 1 kali ** Nota : sekurang-kurangnya 4 JA ditunjukkan K1K1 (b) (i) $S_8 = 2(8)^2 - 4(8)$ $= 96$ (ii) $T_8 = S_8 - S_7$ $= 96 - [2(7)^2 - 4(7)]$ $= 26$	N1 K1K1 N1 K1 N1 K1 N1	8

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
11.	(a) $\frac{(n+1)!}{2!(n-1)!} - \frac{n!}{2!(n-2)!}$ $\frac{(n+1)n(n-1)!}{2!(n-1)!} - \frac{n(n-1)(n-2)!}{2!(n-2)!}$ $\frac{(n+1)n}{2} - \frac{n(n-1)}{2}$ $\frac{2n}{2}$ $n = \text{sebelah kanan}$ (b) Bilangan cara menyusun 8 orang duduk di sebuah meja bulat $(8 - 1)!$ Bilangan cara menyusun Dorty dan Ben duduk bersebelahan $(7 - 1)! \times 2$ Bilangan cara Dorty dan Ben tidak duduk bersebelahan $5\,040 - 1\,440$ 3600	K1 K1 N1 K1 K1 N1	7
12.	i) ${}^6C_4\left(\frac{3}{5}\right)^4\left(\frac{2}{5}\right)^2$ $\frac{972}{3125} @ 0.31104$ ii) $P(x \geq 5) = P(x=5) + P(x=6)$ $= {}^6C_5\left(\frac{3}{5}\right)^5\left(\frac{2}{5}\right)^1 + {}^6C_6\left(\frac{3}{5}\right)^6\left(\frac{2}{5}\right)^0$ $= \frac{729}{3125} @ 0.2333$	K1 N1 K1 N1	4

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
13.	a) $\sqrt{10}$ b) $\tilde{v}_A = (3i + j)t$ $\tilde{v}_B = (-2i + 3j)t$ c) Vektor kedudukan halaju kapal B $= (10i + 4j) + (-2i + 3j)t$ $(3i + j)t = (10i + 4j) + (-2i + 3j)t$ $(3i + j)t = (10 - 2t)i + (4 + 3t)j$ $3t = 10 - 2t \qquad t = 4 + 3t$ $t = 2 \qquad t = -2$ $h = 2 \text{ jam/hours}$	N1 N1 N1 K1 K1 K1, K1 N1	8
14.	$x = \frac{2-3y}{2} \quad \text{atau / or} \quad y = \frac{2-2x}{3}$ $2y + 3x = 13xy$ $2\left(\frac{2-2x}{3}\right) + 3x = 13x\left(\frac{2-2x}{3}\right)$ atau / or $2y + 3\left(\frac{2-3y}{2}\right) = 13y\left(\frac{2-3y}{2}\right)$ $26x^2 - 21x + 4 = 0 \quad \text{atau / or} \quad 39y^2 - 21y - 6 = 0$ $(13x - 4)(2x - 1) = 0 \quad \text{atau / or} \quad (13y - 6)(3y - 1) = 0$ $x = \frac{1}{2} \text{ and } x = \frac{4}{13} \quad \text{atau / or} \quad y = \frac{1}{3} \text{ and } y = \frac{6}{13}$ $x = \frac{1}{2} \text{ and } y = \frac{1}{3}$ $x = \frac{4}{13} \text{ and } y = \frac{6}{13}$	K1 K1 K1 K1 K1 K1 N1 N1	8

SKEMA PPC MATEMATIK TAMBAHAN KERTAS 2

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
1.	(a) $4a - 2b + c = -10$ $a + b + c = 8$ $4a + 2b + c = 6$ <i>Nota :</i> <i>Salah satu persamaan tepat N1</i> <i>Ketiga-tiga persamaan tepat N1</i> (b) Hapus anu pertama dengan penggantian @ penghapusan Hapus anu kedua dengan penggantian @ Penghapusan $a = 2 @ b = 4 @ c = 6$ $y = 2x^2 + 4x + 6$	N1N1 K1 K1 N1N1 N1	7
2.	a) $\frac{1+\sqrt{2}}{1-\sqrt{2}} \left(\frac{1+\sqrt{2}}{1+\sqrt{2}} \right)$ $\frac{(1+\sqrt{2})^2}{1^2-(\sqrt{2})^2}$ $\frac{1+2\sqrt{2}+2}{1-2}$ $-(3+2\sqrt{2})$ $-3-2\sqrt{2}$ b) $3 - \log_4(x-4) = \frac{1}{2}$ $\log_4(x-4) = \frac{5}{2}$ $x-4 = 4^{\frac{5}{2}}$ $x-4 = 32$ $x = 36$	K1 K1 N1 K1 K1 N1	6

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
3.	(a) $T_{12} = 255(1.14)^{11}$ $= 1077.69$ (b) $a = 255, r = 1.14$ atau $a = 290, d = 1$ Pilihan 1: $S_{12} = \frac{255(1.14^{12} - 1)}{1.14^{12} - 1}$ $= 6954.04$ Pilihan 2: $S_{24} = \frac{24}{2}[2(290) + (n - 1)(1)]$ $= 7236 \text{ or } 7236.00$ (c) Pilihan 1, $T_{12} = 1077.69$ Pilihan 2, $T_{24} = 290 + 23(1) = 313$ Pilihan 2 Bayaran bulanan tertinggi bagi pilihan 1, RM 313 atau Bayaran bulanan terbesar bagi pilihan 2, RM1077.69 melibatkan peratus penggunaan belanja bulanan yang terlalu tinggi atau setara	K1 N1 P1 K1 N1 K1 N1 K1 N1 N1	7

[illegible]

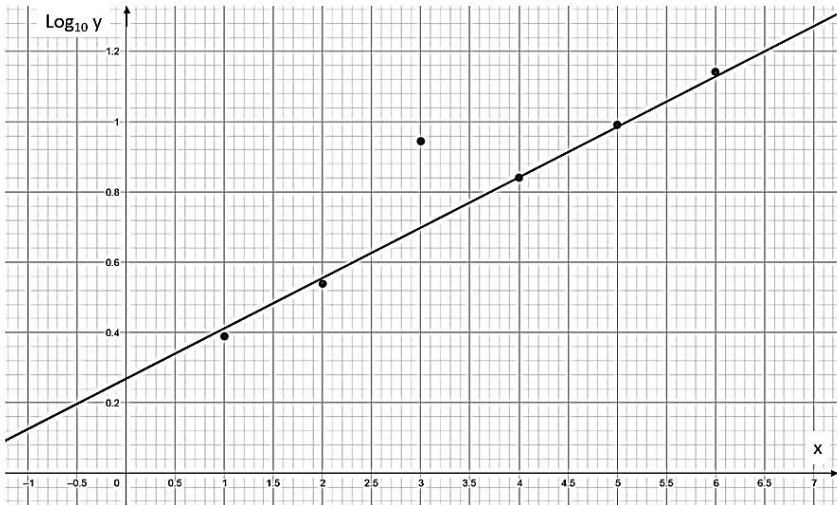
8

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
6.	a. $P(-\frac{4}{3}, 0), Q(0, 2)$ $(x + \frac{4}{3})^2 + y^2 = x^2 + (y - 2)^2$ $6x + 9y - 5 = 0$ b. $6(1) + 9(\frac{1}{3}) - 5 = 4 \neq 0$ Tidak melalui titik R c. $\frac{1}{2} \left \begin{array}{cccccc} 0 & -\frac{4}{3} & 0 & 1 & 0 \\ 0 & 0 & 2 & \frac{1}{3} & 0 \end{array} \right$ or $\frac{1}{2} \left[(0 - \frac{8}{3} + 0 + 0) - (0 + 2 + 0 + 0) \right]$ $= \frac{7}{3}$	P1P1 K1 N1 K1 N1 K1 N1	8

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
7.	(a) $\frac{dy}{dx} = 6x^2 - 18x + 12$ Apabila $x = \frac{1}{2}$, $\frac{dy}{dx} = 6\left(\frac{1}{2}\right)^2 - 18\left(\frac{1}{2}\right) + 12 = \frac{9}{2}$ Kecerunan lengkung pada P ialah $\frac{9}{2}$ (b) Kecerunan normal pada P = $-\frac{2}{9}$ Persamaan normal kepada lengkung pada P, $y - 8 = -\frac{2}{9}\left(x - \frac{1}{2}\right)$ $9y - 72 = -2x + 1$ $9y + 2x = 73$ (c) Apabila $\frac{dy}{dx} = 0$ $6x^2 - 18x + 12 = 0$ $x^2 - 3x + 2 = 0$ $(x - 1)(x - 2) = 0$ $x = 1$ or $x = 2$ $\frac{d^2y}{dx^2} = 0$ Apabila $x = 1$, $y = 2 - 9 + 12 + 4 = 9$ dan $d^2y / dx = 12 - 18 = -6 < 0$ Maka titik maksimum = A (1, 9) Apabila $x = 2$, $y = 16 - 36 + 24 + 4 = 8$ dan $d^2y / dx = 12 (2) - 18 = 6 > 0$ Maka titik minimum = B (2, 8)	K1 N1 K1 N1 K1 N1 K1 N1	8

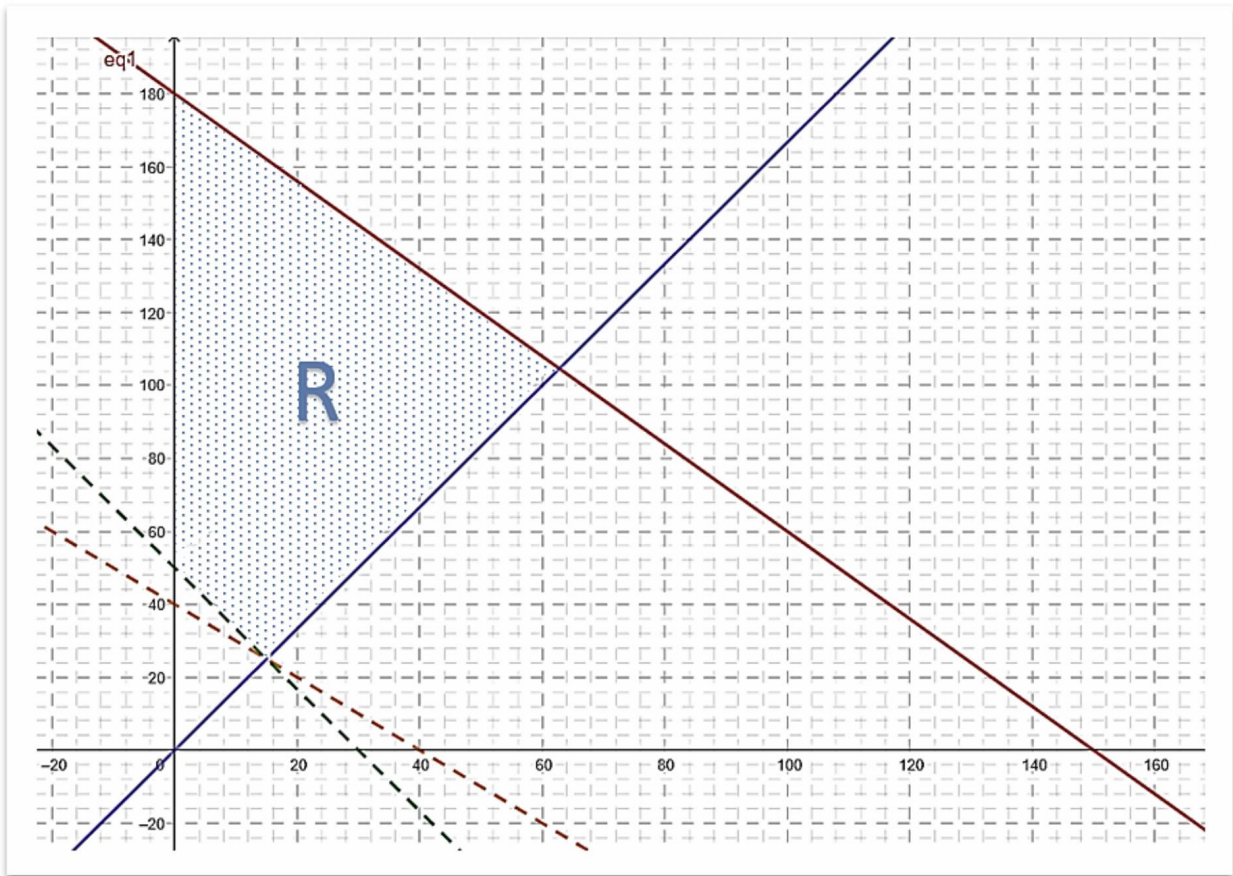
No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
8.	a. $\left[\frac{2y^{\frac{3}{2}}}{3} \right]_k^{16} = 26 \left[\frac{2y^{\frac{3}{2}}}{3} \right]_0^k$ $\frac{2}{3} (16)^{\frac{3}{2}} - \frac{2}{3} (k)^{\frac{3}{2}} = 26 \left[\frac{2}{3} (k)^{\frac{3}{2}} - \frac{2}{3} (0)^{\frac{3}{2}} \right]$ $k = \frac{16}{9}$ b) $\left[\frac{2y^{\frac{3}{2}}}{3} \right]_0^{\frac{16}{9}}$ $= \frac{2}{3} \left(\frac{16}{9} \right)^{\frac{3}{2}} - \frac{2}{3} (0)^{\frac{3}{2}}$ $= \frac{128}{81}$ c) $\pi \left[\frac{x^5}{5} \right]_0^4$ $\pi \left(\frac{4^5}{5} - \frac{0^5}{5} \right) = \frac{1024}{5} \pi$	K1K1 K1 N1 K1 K1 N1 K1 K1N1	10

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
9.	(a) (i) $\overrightarrow{OF} = 3\underline{y}$ (ii) $\overrightarrow{OE} = \overrightarrow{OP} + \overrightarrow{PE}$ $= 3\underline{x} + \frac{1}{3}\overrightarrow{PQ}$ $= 3\underline{x} + \frac{1}{3}(-3\underline{x} + 6\underline{y})$ $= 3\underline{x} - \underline{x} + 2\underline{y}$ $\overrightarrow{OE} = 2\underline{x} + 2\underline{y}$ (b) $\overrightarrow{PG} = h\overrightarrow{PF}$, $\overrightarrow{OG} = k\overrightarrow{OE}$ (i) $\overrightarrow{PO} + \overrightarrow{OG} = h\overrightarrow{PF}$ $-3\underline{x} + \overrightarrow{OG} = h(-3\underline{x} + 3\underline{y})$ $\overrightarrow{OG} = -3h\underline{x} + 3\underline{x} + 3h\underline{y}$ $\overrightarrow{OG} = (3 - 3h)\underline{x} + 3h\underline{y}$ (ii) $\overrightarrow{OG} = k\overrightarrow{OE}$ $= k(2\underline{x} + 2\underline{y})$ $\overrightarrow{OG} = 2k\underline{x} + 2k\underline{y}$ <i>Seterusnya / Hence</i> $(3 - 3h)\underline{x} + 3h\underline{y} = 2k\underline{x} + 2k\underline{y}$ $3 - 3h = 2k$ $3 - 3(\frac{2}{3}k) = 2k$ $4k = 3$ $k = \frac{3}{4}$ $3h = 2k$ $h = \frac{1}{2}$	K1 K1 N1 K1 N1 N1 N1 N1 N1	10

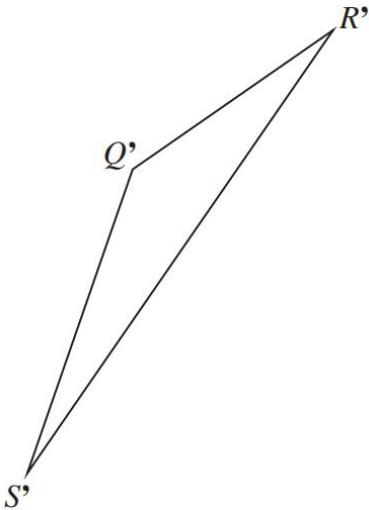
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks														
	c) $OP = 3(2) = 6$ atau / or $OF = 3(3) = 9$ atau / or $PF = -3(2) + 6(3)$ $S = \frac{6+9+12}{2}$ atau / or $\sqrt{\frac{27}{2}\left(\frac{27}{2}-6\right)\left(\frac{27}{2}-9\right)\left(\frac{27}{2}-12\right)}$ 117.38	K1 K1 N1															
10.	a) <table><tr><td>x</td><td>1.0</td><td>2.0</td><td>3.0</td><td>4.0</td><td>5.0</td><td>6.0</td></tr><tr><td>$\log_{10} y$</td><td>0.3892</td><td>0.5391</td><td>0.9445</td><td>0.8407</td><td>0.9912</td><td>1.1418</td></tr></table> $\log_{10} y = \frac{1}{2} \log_{10} k x + \frac{\log_{10} a}{2}$ Nota: (i) Graf satu titik betul K1 (ii) Semua titik betul N1 (iii) Penyuaian terbaik N1  b) i) $\frac{1}{2} \log_{10} k = \frac{1.1418-0.3892}{6-1} *$ $k = 2.000$ ii) $a=3.0903...$ c) 0.7	x	1.0	2.0	3.0	4.0	5.0	6.0	$\log_{10} y$	0.3892	0.5391	0.9445	0.8407	0.9912	1.1418	N1 P1 K1 N1 N1 K1 N1 N1 N1	10
x	1.0	2.0	3.0	4.0	5.0	6.0											
$\log_{10} y$	0.3892	0.5391	0.9445	0.8407	0.9912	1.1418											

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
11.	a (i) Use ${}^{10}C_r (0.65)^r (0.35)^{10-r}$ Write $P(X = 8) + P(X = 9) + P(X = 10)$ 0.2616 (ii) $\sigma^2 = 960(0.35)(0.65)$ 218.4 b) i) $P(125 < x < 139)$ $P(Z > 0.214) - P(Z < 1.214)$ 0.3028 (ii) $(101 < X < a) = 0.8276$ $P(-1.5 < Z < a) = 0.8276$ $\frac{a - 122}{14} = 1.25$ $a = 139.5$	K1 P1 N1 K1 N1 K1 N1 K1 K1 N1	

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
12.	a) I : $x + y > 40$ II : $6x + 5y \leq 900$ III : $3y \geq 5x$ b) Rujuk graf Melukis sekurang-kurangnya 1 garis lurus daripada ketaksamaan melibatkan x dan y Melukis ketiga-tiga garis lurus dengan betul Kawasan yang memenuhi ketaksamaan dilorek dengan betul. c) Jumlah jualan , $P = 5x + 3y$ $5x + 3y = 150$ $\frac{x}{30} + \frac{y}{50} = 1$ Titik minimum (0,40) Jumlah jualan minimum $= 5(0) + 3(40)$ $= \text{RM}120$ Titik maksimum (62,105) Jumlah jualan maksimum $= 5(62) + 3(105)$ $= \text{RM}625$ Julat jumlah jualan $= 120 < P \leq 625$	N1 N1 N1 K1 N1 N1 K1 K1 K1 N1	10



No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
13	a) $v = \int 6t - 16$ $v = 3t^2 - 16t + c$ $t=0, v = -12, c = -12$ $v = 3t^2 - 16t - 12$ $t = \frac{8}{3}, v = -\frac{100}{3}$ b) $s = \int 3t^2 - 16t - 12$ $= t^3 - 8t^2 - 12t + c$ $t = 0$ and $s = 0$, then $c = 0$ $s = t^3 - 8t^2 - 12t$ $t = 5, s = -135$ m $t = 6, s = -144$ m Jarak $AB = -144 - -135$ $= 9$ m	K1 N1 K1 N1 K1 K1 N1 N1 K1 N1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Penuh Total Marks
14	(a)(i) $8.3^2 = 5.1^2 + 11.9^2 - 2(5.1)(11.9) \cos / \cos \angle SQR$ 35.57° (ii) $\frac{11.9}{\sin 65^\circ} = \frac{PS}{\sin 79.43^\circ}$ $PS = 12.907 \text{ cm}$ (b) $\frac{5.1 + 8.3 + 11.9}{2}$ $\sqrt{12.65(12.65 - 5.1)(12.65 - 8.3)(12.65 - 11.9)}$ 17.652 cm^2 44.67 cm^2 (c)  144.43°	K1 N1 K1 N1 K1 K1 N1 N1 N1 N1	10

No.	Skema Pemarkahan <i>Marking Scheme</i>	Markah <i>Marks</i>	Markah Penuh <i>Total Marks</i>
15.	$\frac{40.20}{Q_0} \times 100 = 110$ 36.55 $I_{\frac{2021}{2017}} = 125 \times \frac{140}{100}$ 175 $y = 35$ $\frac{125(25) + x(30) + 110(10) + 140(35)}{100} = 145$ 179.17 $145 = \frac{P_{2021}}{42.10} \times 100$ 61.05	K1 N1 K1 N1 N1 P1K1 N1 K1 N1	10

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

No	Penyelesaian dan skema pemarkahan	Ceraian markah	Jumlah markah
1	$2\pi - \frac{2}{5}\pi = \frac{8}{5}\pi$ $s = (7)(\frac{8}{5}\pi)$ $s = \frac{56}{5}\pi$	K1 N1	2
2	$y = 4$ $\log_2 y = \log_2 2^2$ $= 2$ $y = 32$ $\log_2 y = \log_2 2^5$ $y = 5$ A graph on a Cartesian coordinate system. The vertical axis is labeled $\log_2 y$ and the horizontal axis is labeled x. The origin is labeled 0. A straight line is drawn through two points, $P'(1,2)$ and $Q'(3,5)$.	K1 K1 N1 N1	4
3	$4^x(4^2 + 4 + 1) = 84$ $4^x(21) = 84$ $4^x = 16$ $4^x = 4^2$ $x = 2$	K1 K1 K1 K1 N1	5
4	$A = \pi j^2$ $\delta j = 0.02$ $\frac{dA}{dj} = 2\pi j$ $\delta A = 2\pi (2) \times 0.02$ $\delta A = 0.08\pi$	P1 K1 K1 N1	4

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

5	(a) $f(x) > 0$ $x^2 + 3x - 4 > 0$ $(x + 4)(x - 1) > 0$ $x < -4, x > 1$ $f(x) = 8x^2 - x + 2$ $= 8\left(x - \frac{1}{2(8)}\right)^2 - 8\left(\frac{1}{16}\right)^2 + 2$ $= 8\left(x - \frac{1}{16}\right)^2 + \frac{63}{32}$ $h = \frac{1}{16}$ $k = \frac{63}{32}$ $h(x) = -8\left(x - \frac{1}{16}\right)^2 - \frac{63}{32}$	K1 N1 K1 N1 N1 K1 N1	7
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SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

6	a) $\frac{30}{180} \times 3.142$ 0.5237 rad b) $s = j\left(\frac{60}{180} \times 3.142\right)$ $s_{RS} = 1.0473j$ $\cos 30 = \frac{A}{j} \text{ atau } \sin 60 = \frac{O}{j}$ $0.866j \times 2 = 1.7321j$ $\text{perimeter} = j + j + 1.7321j + 1.0473j$ $4.7794j$	K1 N1 K1 K1 K1 N1	6
7	a) Katakan $y = \frac{x-1}{x}$ $yx = x - 1$ $1 = x - yx$ $f(x) = \frac{1}{1-x}$ b) $g^{-1}(x) = \frac{x+2}{3}$ $g^{-1}f(x) = \frac{\frac{1}{1-x} + 2}{3}$ $= \frac{\frac{1+2-2x}{1-x}}{3}$ $= \frac{3-2x}{3(1-x)} ; x \neq 1$	K1 N1 K1 K1 N1	6

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

8	(a) $m_{AB} = \frac{4-1}{-1-1} = -\frac{3}{2}$ @ $m_{BC} = \frac{a-4}{5-(-1)} = \frac{a-4}{6}$ $m_{AB} \times m_{BC} = -1$ $-\frac{3}{2} \times \frac{a-4}{6} = -1$ $a-4 = \frac{-12}{-3}$ $a = 8$ (b) $y = -\frac{3}{2}x + c$ $8 = -\frac{3}{2}(5) + c$ $c = 8 + \frac{15}{2}$ $c = \frac{31}{2}$ $y = -\frac{3}{2}x + \frac{31}{2}$ @ $2y = -3x + 31$	K1 K1 N1 K1 N1	6
9	(a) $\frac{1}{2} \left[\frac{x}{x^2-3} \right]_1^2$ $\frac{1}{2} \left[\frac{2}{2^2-3} - \frac{1}{1^2-3} \right]$ $\frac{5}{4}$ (b) $\int_{-2}^0 f(x)dx = \int_{-2}^4 f(x)dx + \int_4^0 f(x)dx$ $= 4 - 2$ $= 2$	P1 K1 N1 P1 N1	5

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

10	(a)Jujukan : 4, 7 , 10 $d_2 - d_1 = 10 - 7 = 3$ $d_3 - d_2 = 7 - 4 = 3$ Beza sepunya jangjang ini adalah sama , maka bilangan lubang heksagon membentuk Jangjang Aritmetik. (b) $a + 4d = 21$ atau $a + 8d = 36$ $a = 12$ $d = 3$ $S_{50} = \frac{50}{2}[2(12) + (50 - 1)(3)]$ $= 4275$	K1 K1 N1 K1 K1 K1 K1 N1	8
11	(a) $(7 - 1)! 2$ $6! \times 2$ 1440 Bilangan cara untuk menyusun 8 orang duduk di sebuah meja bulat $(8 - 1)!$ $7!$ 5040 Bilangan cara untuk Menyusun Durga dan Benny duduk bersebelahan $(7 - 1)! 2$ $6! \times 2$ 1440 Oleh itu, bilangan cara untuk Menyusun Durga dan Benny tidak duduk bersebelahan ialah $5040 - 1440$ 3600	K1 K1 N1 K1 K1 N1	7

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

12	(a) $p=0.1, q=0.9$ $P(X=3)$ ${}^{10}C_3(0.1)^3(0.9)^7$ 0.0574 (b) $P(X > 2)$ $1 - P(X=0) - P(X=1) - P(X=2)$ $= 1 - {}^{10}C_0(0.1)^0(0.9)^{10} - {}^{10}C_1(0.1)^1(0.9)^9 - {}^{10}C_2(0.1)^2(0.9)^8$ 0.07019	K1 N1 K1 N1	4
13	(a) $S_Q = 10\hat{i} + 40\hat{j}$ $ S_Q = \sqrt{10^2 + 40^2}$ $= \sqrt{1700}$ atau 41.23km (b) $V_P = 15\hat{i} + 30\hat{j}$ $V_Q = 10\hat{i} + 10\hat{j}$ (c) $(15\hat{i} + 30\hat{j})t = (10\hat{i} + 40\hat{j}) + t(10\hat{i} + 10\hat{j})$ $15t = 10 + 10t \quad \text{atau} \quad 30t = 40 + 10t$ $t = 2$, maka kedua-dua bot akan bertembung selepas 2 jam	P1 K1 N1 N1 N1 K1 K1 N1	8
14	Diberi luas $PQRS = 112 \text{ cm}^2$ Maka, $(14x)(2y) = 112$ $28xy = 112$ $xy = 4 \text{ ——— (1)}$ Diberi perimeter kertas yang tinggal $PSTRQ = 52 \text{ cm}$ $PS + QR + PQ + \text{Panjang lengkok } STR = 52$ $2y + 2y + 14x + \frac{1}{2}(2\pi r) = 52$ $4y + 14x + (22/7)(7x) = 52$ $4y + 14x + 22x = 52$ $4y + 36x = 52$ $y + 9x = 13 \text{ ——— (2)}$	K1 K1 P1	

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

Dari persamaan (2): $y = 13 - 9x$ — (3) Ganti (3) ke dalam (1): $x(13 - 9x) = 4$ $13x - 9x^2 = 4$ $9x^2 - 13x + 4 = 0$ $(x - 1)(9x - 4) = 0$ $x = 1 \text{ atau } 4/9$ Dari (3): Nilai $x = 1$, Nilai y yang sepadan $= 13 - 9(1)$ $= 4.$ Nilai $x = 4/9$, $y = 9$	K1 K1 N1 N1 N1	8
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SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 1)
MATEMATIK TAMBAHAN KERTAS 1 2022

15	(a) $\cos 2\theta = 1 - 2\sin^2\theta$ $1 - 2p^2$ (b)(i) $2\sin(\theta + 45^\circ)\sin(\theta - 45^\circ)$ $= 2(\sin\theta \cos 45^\circ + \cos\theta \sin 45^\circ)(\sin\theta \cos 45^\circ - \cos\theta \sin 45^\circ)$ $= 2(\sin^2\theta \cos^2 45^\circ - \cos^2\theta \sin^2 45^\circ)$ $= 2\left(\sin^2\theta \left(\frac{1}{\sqrt{2}}\right)^2 - \cos^2\theta \left(\frac{1}{\sqrt{2}}\right)^2\right)$ $= 2 \times (\sin^2\theta - \cos^2\theta)$ $= -\cos 2\theta$ (c) $2\sin(\theta + 45^\circ)\sin(\theta - 45^\circ) + \frac{1}{2} = 0$ $2\sin(\theta + 45^\circ)\sin(\theta - 45^\circ) = -\frac{1}{2}$ $-\cos 2\theta = -\frac{1}{2}$ $2\theta = \cos^{-1} -\frac{1}{2}$ $2\theta = 60^\circ, 300^\circ, 420^\circ, 660^\circ$ $\theta = 30^\circ, 150^\circ, 240^\circ, 330^\circ$	K1 N1 K1 K1 N1 K1 K1 N1	8
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KOTA TINGGI SET 1

KERTAS 2

MATEMATIK TAMBAHAN

KERTAS 2

SKEMA PEMARKAHAN
SET 2

No	Solutions and Mark Scheme	Sub Marks	Total Marks
1	$x + y + z = 20$ -- ① $60x + 40y + 40z = 840$ atau $3x + 2y + 2z = 42$ -- ② $x + y = z$ -- ③ Hapus anu pertama dengan penggantian @ penghapusan Hapus x : $2z = 20$ Hapus y : $2z = 20$ Hapus z : $x + y = 10$ Hapus anu kedua dengan penggantian @ penghapusan *Panduan : $-2x = -4$ $-2y = -16$ $2z = 20$ $z = 10$ @ $x = 2$ @ $y = 8$ $x = 2$ @ $y = 8$ @ $z = 10$	K1 K1 K1 K1 K1 N1 N1	7

No	Solutions and Mark Scheme	Sub Marks	Total Marks
2(a)(i)	$\frac{1}{2} (5 - 2\sqrt{2}) (5 + 2\sqrt{2})$ $\frac{17}{2}$	K1 N1	2
(ii)	$AC^2 = (5 - 2\sqrt{2})^2 + (5 + 2\sqrt{2})^2$ 8.124	K1 N1	2
(b)	$\log_2 \frac{y^2}{x^4} = 2$ $y=2x$	K1 N1	 2
			6

No	Solutions and Mark Scheme	Sub Marks	Total Marks
3(a)	$a = 24\,000$ dan $r = 1.06$ $T_7 = 24\,000 (1.06)^6$ $= \text{RM } 34\,044.46$	P1 K1 N1	3
(b)	$24\,000 (1.06)^{n-1} > 48\,000$ $n = 13$	K1 N1	2
(c)	$\frac{24\,000(1.06^7 - 1)}{1.06 - 1}$ $\text{RM } 201\,452$	K1 N1	 2
			7
4(a)	$\alpha + \beta = -\frac{10}{3}$ @ $\alpha\beta = -\frac{8}{3}$ Menulis hasil tambah punca baharu, $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ dan ganti nilai $\alpha + \beta = -\frac{10}{3}$, $\alpha\beta = -\frac{8}{3}$ $\frac{(\alpha+\beta)^2 - 2\alpha\beta}{\alpha\beta} = \frac{(-\frac{10}{3})^2 - 2(-\frac{8}{3})}{(-\frac{8}{3})}$ $-\frac{37}{6}$ Hasil darab punca baharu, $\frac{\alpha}{\beta} \times \frac{\beta}{\alpha} = 1$ $x^2 + \frac{37}{6}x + 1 = 0 // 6x^2 + 37x + 6 = 0$	K1 K1 N1	 4
(b)	$(-4)^2 - 4(4)(6p) < 0$ $p > \frac{1}{6}$	K1 N1	 2
			6

No	Solutions and Mark Scheme	Sub Marks	Total Marks
6(a)(i)	Titik tengah QS = (6, 0) Kedudukan kantin tidak berada di tengah-tengah antara rumah merah dan rumah kuning	K1 N1	2
(ii)	$\frac{1}{2} (2(10) + (16)(-8) + (10)(2) + (10)(8)) - ((8)(10)) + (2)(10) + (-8)(16) + (10)(2) $ $\frac{1}{2} -320 $ 160	K1 N1	2
(b)	$\sqrt{(x-2)^2+(y-8)^2}=\sqrt{(x-16)^2+(y-10)^2}$ $7x + y - 72 = 0$	K1 N1	2
(c)	Ganti (10, 8) ke dalam $7x + y - 72 = 0$ $0 \neq -10$, Tidak	K1 N1	2
			8

No	Solutions and Mark Scheme	Sub Marks	Total Marks
7(a)(i)	$16x + 2y = 120$ $y = 60 - 8x$ Luas, $A = \frac{1}{2} \times 6x \times 4x + 6xy$ $12x^2 + 6x(60 - 8x)$ $36x(10 - x)$	P1	3
		K1	
		N1	
(ii)	Kamirkan A terhadap x $\frac{dA}{dx} = 360 - 72x$ Menyamakan $\frac{dA}{dx} = 0$ $360 - 72x = 0$ $x = 5$	K1	3
		N1	
(iii)	Ganti nilai $x = 5$ ke dalam $A = 36x(10 - x)$ 900	K1	2
		N1	8

No	Solutions and Mark Scheme	Sub Marks	Total Marks
8 (a)	$\frac{1}{4}x^2 + 5 = x + 8$ $K (-2,6)$	K1 N1	2
(b)(i)	Mencari luas segitiga Rujukan : Luas segitiga = $\frac{1}{2} \times 2 \times 2$ Kamirkan x terhadap y dan guna had $\int_5^6 \frac{(4y-20)^{\frac{3}{2}}}{4(\frac{3}{2})} dy$ $\frac{(4(6)+20)^{\frac{3}{2}}}{4(\frac{3}{2})} - \left[\frac{(4(5)+20)^{\frac{3}{2}}}{4(\frac{3}{2})} \right]$ Rujukan : Luas segitiga + Luas lengkung $2 + \frac{8}{6}$ $\frac{10}{3} \text{ unit}^2 // 3.33 \text{ unit}^2$	K1 K1 K1 N1	4
(ii)	Kamirkan y^2 terhadap x dan guna had $\pi \int_{-2}^0 (\frac{1}{4}x^2 + 5)^2 dx$ $V = \pi \left[\frac{x^5}{16(5)} + \frac{5x^3}{2(3)} + 25x \right] \Big _{-2}^0$ $0 - \left[\frac{(-2)^5}{16(5)} + \frac{5(-2)^3}{2(3)} + 25(-2) \right] \pi$ Mencari isipadu kon $V_{kon} = \frac{1}{2} \times \pi \times 6^2 \times 6 + \frac{856}{15} \pi$ $108\pi + \frac{856}{15} \pi$ $\frac{2476}{15} \pi \text{ unit}^3$	K1 K1 K1 K1 N1	4 4
			10

No	Solutions and Mark Scheme	Sub Marks	Total Marks
9(a)	Tulis hukum segitiga vektor bagi $\Delta KOM @ \Delta LON$ $\overrightarrow{KM} = \overrightarrow{KO} + \overrightarrow{OM} \text{ atau } \overrightarrow{LN} = \overrightarrow{LO} + \overrightarrow{ON}$ $\overrightarrow{KM} = 9i - 6j$ $\overrightarrow{LN} = 4i + 6j$	K1 N1 N1	3
(b)(i)	$\overrightarrow{NP} = \left(\frac{1}{1+\lambda}\right)\overrightarrow{NL}$ $\overrightarrow{OP} = 4j + \left(\frac{1}{1+\lambda}\right)(-4i - 6j)$ $\overrightarrow{PM} = 4j + \left(\frac{\mu}{1+\mu}\right)(9i - 6j)$	P1 N1 N1	3
(ii)	$LP = PN$, maka $\lambda = 1$ Guna hukum segi tiga vektor bagi ΔOPM dalam sebutan i dan j $4j + \left(\frac{\mu}{1+\mu}\right)(9i - 6j) = (2i - j) + (4i - 3j)$ Banding pekali bagi i dan j $\frac{9\mu}{1+\mu} = 6 \text{ atau } \frac{6\mu}{1+\mu} = -4$ $\mu = 2$	N1 K1 K1 N1	4 10

No	Solutions and Mark Scheme							Sub Marks	Total Marks
10									
(a)	$\log_{10} y$	0.342	0.699	0.919	1.22	1.462	1.799	N1	4
	Graf garis lurus $\log_{10} y$ melawan x dilukis							K1	
	- paksi-paksi betul dan skala seragam								
	-sekurang-kurangnya satu titik diplot betul								
	6 titik diplot betul							N1	
	Garis lurus penyuaian terbaik							N1	
(b)(i)	2.5							N1	
(ii)	$\log_{10} y = (3 \log_{10} T)x + \log_{10} K$							P1	
	$m^* = 3 \log_{10} T$								
	$0.5828 = 3 \log_{10} T$							K1	
	$T = 1.5641$							N1	
	$c^* = \log_{10} K$								
	$\log_{10} K = 0.06$							K1	
	$K = 1.148$							N1	6
									10

No	Solutions and Mark Scheme	Sub Marks	Total Marks
11(a)(i)	$320(1 - p) = 128$ $p = 0.6$	K1 N1	5
(ii)	${}^8C_6(0.6)^6 (0.4)^2 \text{ atau } {}^8C_7(0.6)^7 (0.4)^1 \text{ atau } {}^8C_8(0.6)^8 (0.4)^0$ ${}^8C_6(0.6)^6 (0.4)^2 + {}^8C_7(0.6)^7 (0.4)^1 + {}^8C_8(0.6)^8 (0.4)^0$ 0.3154	K1 K1 N1	
(b)(i)	$P\left(z < \frac{47 - 50}{5.8}\right)$ 0.3026	K1 N1	
(ii)	$P\left(z > \frac{t - 50}{5.8}\right) = 0.25$ $\frac{t - 50}{5.8} = 0.674$ t = 53.91	K1 K1 N1	
			10

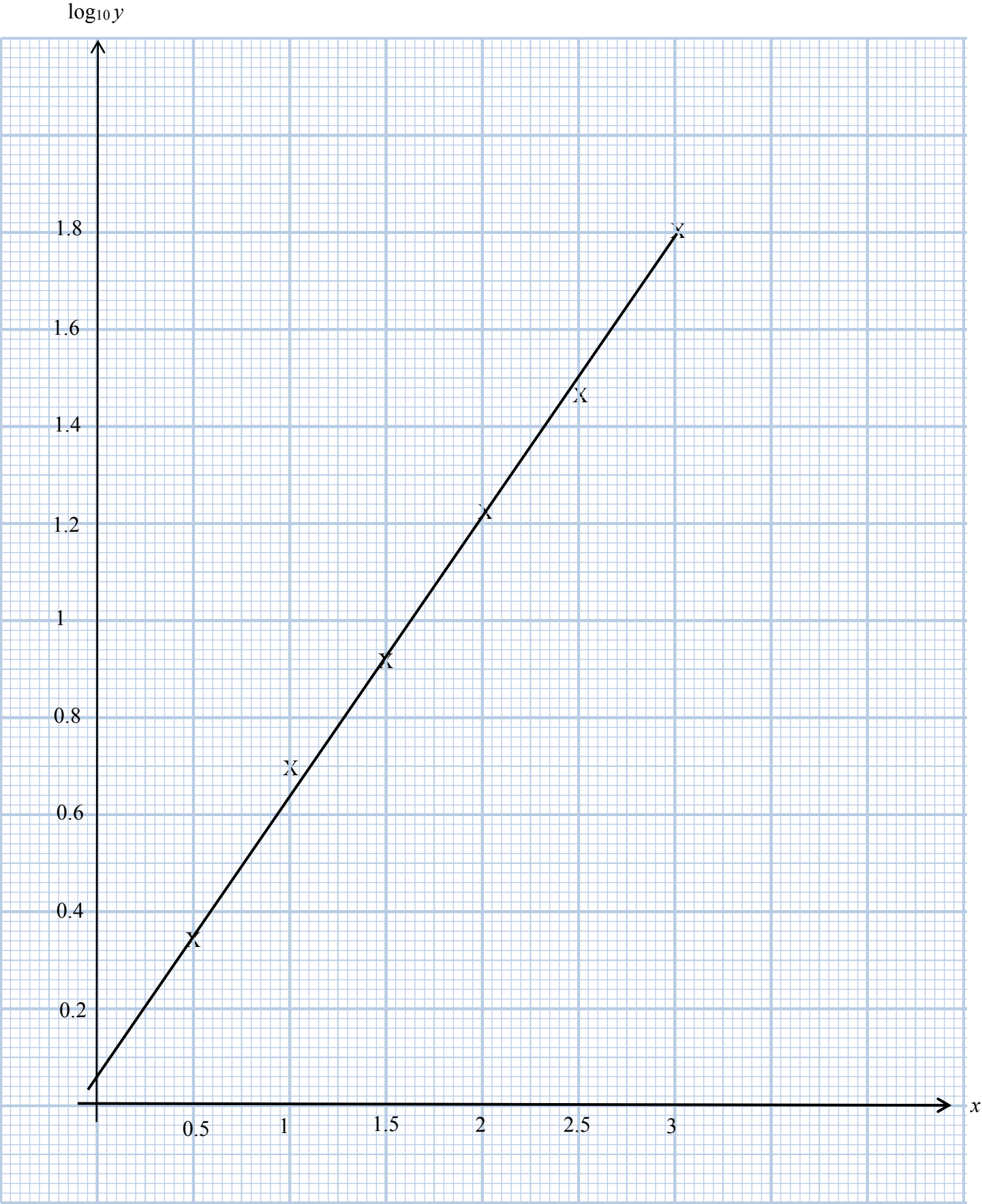
No	Solutions and Mark Scheme	Sub Marks	Total Marks
12(a)	I : $10x + 20y \leq 400$ atau $x + 2y \leq 40$ II : $x \geq y$ III : $y \geq 5$	N1 N1 N1	3
(b)	Sekurang-kurangnya 1 garis dilukis dengan betul mengikut ketaksamaan yang melibatkan x dan y 3 garis dari ketaksamaannya dilukis dengan betul Rantau dilorek dengan betul	K1 N1 N1	3
(c)(i)	$x_{maksimum} = 20$	N1	
(ii)	Titik maksimum (30 , 5) Gantikan (30, 5) ke dalam $200x + 300y$ $200(30) + 300(5)$ RM 7500	N1 K1 N1	4
			10

No	Solutions and Mark Scheme	Sub Marks	Total Marks
13(a)	$\frac{7}{4}$	N1	1
(b)	Kamirkan a terhadap t $v = 7t - 2t^2 + 4$ Gantikan $t = \frac{7}{4}$ ke dalam $v = 7t - 2t^2 + 4$ $v = 7\left(\frac{7}{4}\right) - 2\left(\frac{7}{4}\right)^2 + 4$ $10\frac{1}{8} \text{ ms}^{-1}$	K1 K1	3
(c)	Guna $7t - 2t^2 + 4 = 0$ dan selesaikan persamaan kuadratik $(t - 4)(2t + 1) = 0$ $t = 4$	K1 N1	2
(d)	Kamirkan v terhadap t $s = \frac{7}{2}t^2 - \frac{2}{3}t + 4t$ Ganti $t = 4$ atau $t = 6$ ke dalam s $\left[\frac{7(4)^2}{2} - \frac{2(4)^3}{3} + 4(4)\right]$ atau $\left[\frac{7(6)^2}{2} - \frac{2(6)^3}{3} + 4(6)\right]$ Guna $2 S_{t=4} + S_{t=6}$ atau Guna $\left \int_0^4 V dt\right + \int_4^6 V dt$ $29\frac{1}{3} + \left -23\frac{1}{3}\right $ $52\frac{2}{3}$	K1 K1 K1 N1	4 10

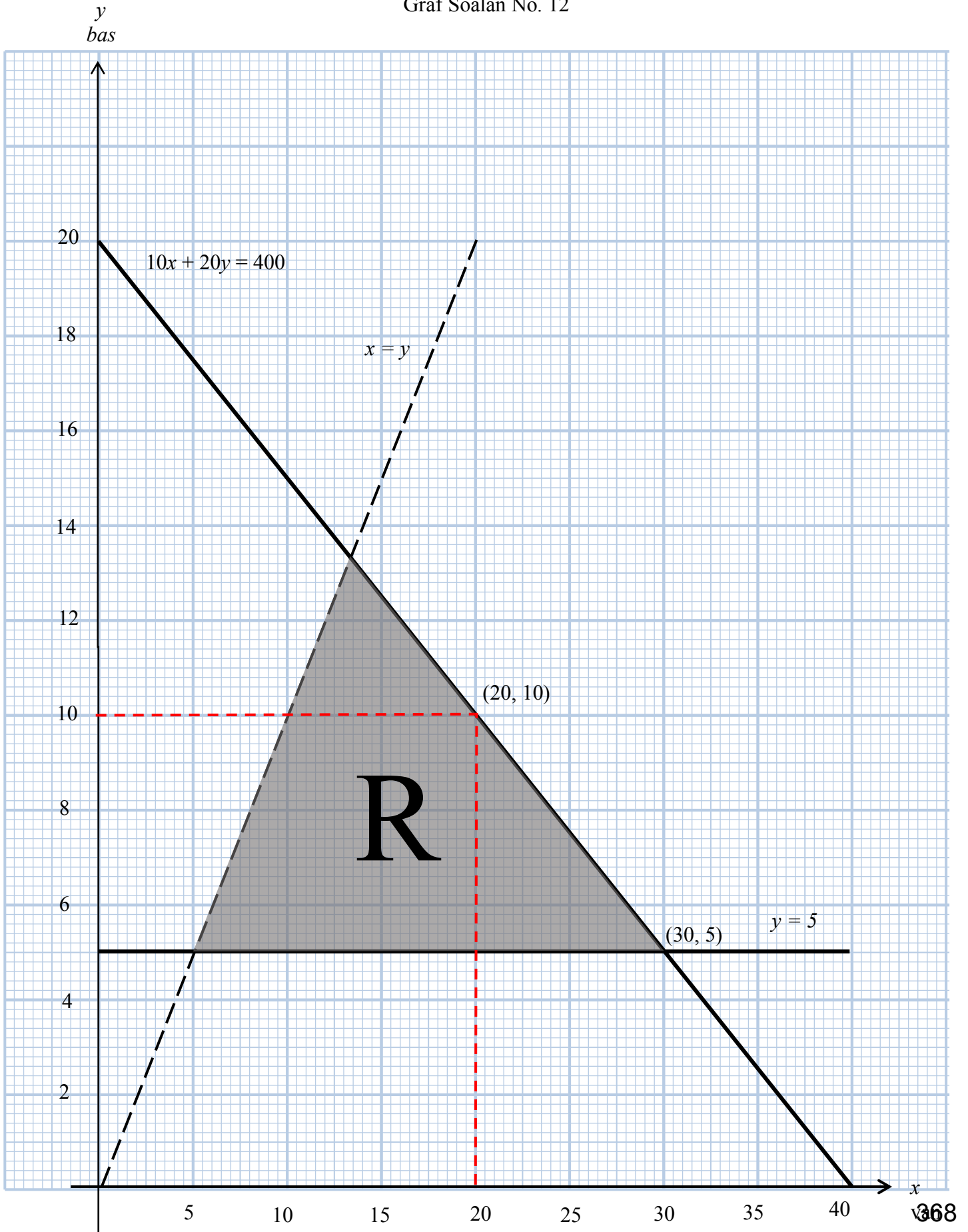
No	Solutions and Mark Scheme	Sub Marks	Total Marks
14(a)(i)	$AC^2 = 12^2 + 8^2 - 2(12)(8)\cos 84^\circ$ $AC = 14.759\text{cm}$	K1 N1	2
(ii)	$\angle ABC = 180^\circ - 84^\circ = 96^\circ$ $\frac{\sin 96^\circ}{14.759} = \frac{\sin \angle BAC}{5}$ $\angle BAC = 19.69^\circ$ $\angle ACB = 180^\circ - 96^\circ - 19.69^\circ$ 64.31°	P1 K1 K1 N1	4
(b)(i)	$s = \frac{12+8+14.759}{2} = 17.3795$ Guna rumus heron $\text{Luas } \triangle ADC = \sqrt{17.3795(17.3795 - 12)(17.3795 - 8)(17.3795 - 14.759)}$ 47.9371cm^2	K1 N1	2
(ii)	Jarak terdekat, t $= \frac{1}{2} \times 14.759 \times t = 47.9371$ $t = 6.496\text{ cm}$	K1 N1	2
			10

No	Solutions and Mark Scheme	Sub Marks	Total Marks
15(a)	$x = 114$	N1	1
(b)	$110 = \frac{91.50}{Q_0} \times 100$ RM83.18	K1	
		N1	2
(c)	$I_{2023/2022} = \frac{129}{121} \times 100$ 106.61 Mengalami kenaikan harga sebanyak 6.61 peratus	K1	
		N1	
		N1	3
(d)(i)	$111.3 = \frac{(105)(y) + (110)(4) + (114)(3) + (121)(1)}{y + 4 + 3 + 1}$ y = 2	K1	
		N1	2
(ii)	$113 = \frac{P_{2022}}{92.50} \times 100$ RM 102.95	K1	
		N1	2
			10

Graf Soalan No. 10



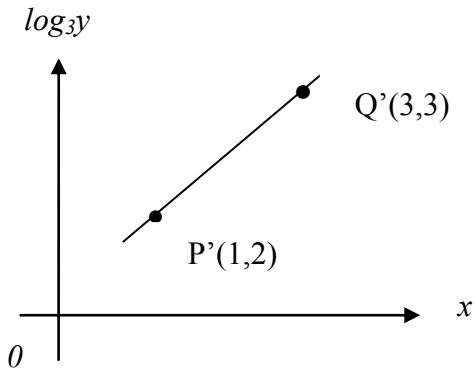
Graf Soalan No. 12



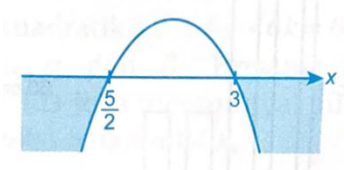
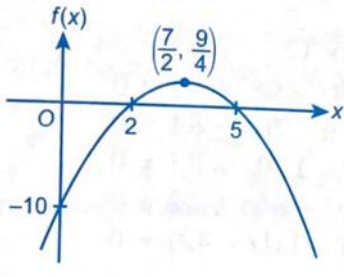
KOTA TINGGI SET 2

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)

MATEMATIK TAMBAHAN KERTAS 1 2022

No	Penyelesaian dan skema pemarkahan	Ceraian markah	Jumlah markah
1	$2\pi - \frac{14}{9}\pi = \frac{4}{9}\pi$ $s = (6)(\frac{4}{9}\pi)$ $s = \frac{8}{3}\pi$	K1 N1	2
2	$y = 9$ $\log_3 y = \log_3 3^2$ $= 2$ $y = 27$ $\log_3 y = \log_3 3^3$ $= 3$ 	K1 K1 N1, N1	4
3	$3^x(3^2 + \frac{1}{3} + 1) = \frac{27}{31}$ $3^x(\frac{31}{3}) = \frac{27}{31}$ $3^x = 81$ $3^x = 3^4$ $x = 4$	K1 K1 K1 K1 N1	5

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

4	$V = x^3$ $\delta x = 0.03$ $\frac{dv}{dx} = 3x^2$ $\delta v = 3(4)^2 \times 0.03$ $\delta v = 1.44$	P1 K1 K1 N1	4
5	a) $-2x^2 + 11x - 15 \leq 0$ $(x - 3)(-2x + 5) \leq 0$  $x \leq \frac{5}{2}$ atau $x \geq 3$ b)(i) $f(x) = -[x^2 - 7x + (-\frac{7}{2})^2 - (-\frac{7}{2})^2] - 10$ $= -(x - \frac{7}{2})^2 + \frac{9}{4}$ $p = \frac{9}{4}$ (ii)  (iii) $f(x) = (x - \frac{7}{2})^2 - \frac{9}{4}$	K1 N1 K1 K1 K1 N1 N1	7

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

6	a) $j = \frac{15.71}{\frac{\pi}{2}}$ $j = 10$ Panjang sisi = 10 cm b) $\frac{1}{2}(10)^2(1.571) = 78.55 \quad \text{atau} \quad \frac{1}{2}(5)^2(3.142) = 39.275$ $5 \times 5 = 25 \quad \text{atau} \quad \frac{39.275}{2} = 19.6375$ $25 - 19.6375 = 5.3625$ $5.3625 \times 2 = 10.725$ $\text{luas kawasan berlorek} = 78.55 - 39.275 - 10.725$ 28.55 cm^2	K1 N1 K1 K1 K1 N1	6
7	(a) Domain bagi $f^{-1}(x)$ = Julat bagi $f(x)$ $f(-3) = -5, \quad f(1) = 3$ Domain bagi $f^{-1}(x)$: $-5 \leq x \leq 3$ (b) $f^{-1}(x) = \frac{x-1}{2}, \quad f^{-1}(-2) = \frac{-2-1}{2}$ $= \frac{-3}{2}$ $g f^{-1}\left(-\frac{3}{2}\right) = \left(-\frac{3}{2}\right)^2 + 4$ $= \frac{25}{5}$ (c) $g^{-1}(x)$ tidak wujud kerana $g(x)$ bukan hubungan satu kepada satu dalam domain yang diberi $g^{-1}(x)$ wujud untuk domain $x < 0$ dan $x > 0$.	K1 N1 K1 N1 K1 N1	6

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

8	(a) $m_{PQ} = \frac{-12 - (-6)}{3 - (-1)} = -\frac{6}{4} = -\frac{3}{2} \quad @ \quad m_{PR} = \frac{6 - (-6)}{e - (-1)} = \frac{12}{e + 1}$ $m_{PQ} \times m_{PR} = -1$ $-\frac{3}{2} \times \frac{12}{e + 1} = -1$ $-18 = -e - 1$ $e = 17$ (b) $y = -\frac{3}{2}x + c$ $6 = -\frac{3}{2}(17) + c$ $c = 8 + \frac{51}{2}$ $c = \frac{59}{2}$ $y = -\frac{3}{2}x + \frac{59}{2} \quad @ \quad 2y = -3x + 59$	K1 K1 N1 K1 N1	6
9	(a) $[3x^2 - 1]_1^2$ $[3(2)^2 - 1] - [3(1)^2 - 1]$ 9 (b) $\int_{-2}^4 k \, dx - \int_{-2}^4 g(x) \, dx = 7$ $[kx] - 5 = 7$ $[4k - 2k] - 5 = 7$ $k = 2$	K1 N1 K1 K1 N1	5

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

10	a)Jujukan : 13, 17, 21 $T_2 - T_1 = 17 - 13 = 4$ $T_3 - T_2 = 21 - 17 = 4$ Beza sepunya jangjang ini adalah sama , maka susunan kerusi membentuk Jangjang Aritmetik. b) $a + 4d - (a + d) = 12$ $d = 4$ $a = 6$ $S_{50} = \frac{6}{2}[2(6*) + (6 - 1)(4)]$ $= 96$	K1 K1 N1 K1 K1 K1 K1 N1	8
11	a) $= \frac{(10-1)!}{2}$ $= 181\ 440$ b) $= \frac{(7-1)! \times 4!}{2}$ $= 8\ 640$ c) Jika dua biji manik istimewa disusun bersebelahan, bilangan cara $= \frac{(9 - 1)! 2!}{2}$ $= 40320$ Bilangan cara $= 181\ 440 - 40\ 320$ $= 141\ 120$	N1 K1 K1 N1 K1 K1 N1	7
12	a) $p = \frac{3}{5}, q = \frac{2}{5}$ $P(X=2)$ $= {}^8C_2 \left(\frac{3}{5}\right)^2 \left(\frac{2}{5}\right)^6$ $= 0.04129$	K1 N1	4

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

	b) $P(X > 2)$ $= 1 - P(X=0) - P(X=1) - P(X=2)$ $= 1 - {}^8C_0\left(\frac{3}{5}\right)^0\left(\frac{2}{5}\right)^8 - {}^8C_1\left(\frac{3}{5}\right)^1\left(\frac{2}{5}\right)^7 - {}^8C_2\left(\frac{3}{5}\right)^2\left(\frac{2}{5}\right)^6$ $= 0.9502$	K1 N1	
13	a) $v = \sqrt{2^2 + (-3)^2}$ $= 3.6056$ $= \binom{1}{4} + 3 \binom{2}{-3}$ $= \binom{7}{-5}$ atau $= 7i - 5j$ b) $\binom{1}{4} + t \binom{2}{-3} = \binom{11}{-11}$ $1 + 2t = 11$ $t = 5$	K1 N1 K1 N1 K1 K1 K1 N1	8
14	Luas mural: $7xy = 28$(1) Perimeter $ABCDE$: $7x + 2y + \frac{22}{7} \times \frac{7x}{2} = 26$ $7x + 2y + 11x = 26$ $18x + 2y = 26$ $y = \frac{26-18x}{2} \text{ (2)}$ Gantikan (2) ke dalam (1) . $7x \left(\frac{26-18x}{2} \right) = 28$ $91x - 63x^2 = 28$ $63x^2 - 91x + 28 = 0$ $7(9x - 4)(x - 1) = 0$ $x = \frac{4}{9} \text{ atau } x = 1$ Apabila $x = \frac{4}{9}$ maka jejari ialah $\frac{14}{9} m$. Apabila $x = 1$ maka jejari ialah $\frac{7}{2} m$.	P1 K1 K1 K1 K1 N1 N1	8

SKEMA PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM (SET 2)
MATEMATIK TAMBAHAN KERTAS 1 2022

15	a) $\cos 105^\circ = \cos (60^\circ + 45^\circ)$ $= \cos 60^\circ \cos 45^\circ - \sin 60^\circ \sin 45^\circ$ $= \frac{1}{2} \left(\frac{1}{\sqrt{2}} \right) - \frac{\sqrt{3}}{2} \left(\frac{1}{\sqrt{2}} \right)$ $= \frac{1 - \sqrt{3}}{2\sqrt{2}}$ $= \left(\frac{1 - \sqrt{3}}{2\sqrt{2}} \right) \left(\frac{\sqrt{2}}{\sqrt{2}} \right)$ $= \frac{\sqrt{2} - \sqrt{6}}{4}$ b) i) $\tan \theta \sin 2\theta = \frac{\sin \theta}{\cos \theta} \times 2 \sin \theta \cos \theta$ $= 2 \sin 2\theta$ $= 1 - \cos 2\theta$ ii) $\tan \theta \sin 2\theta = \frac{1}{4}$ $1 - \cos 2\theta = \frac{1}{4}$ $\cos 2\theta = \frac{3}{4}$ $2\theta = 41^\circ 25', 318^\circ 35', 401^\circ 25', 678^\circ 35'$ $\theta = 20^\circ 43', 159^\circ 18', 200^\circ 43', 339^\circ 18'$	K1 K1 N1 K1 N1 K1 K1 N1	8
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KOTA TINGGI SET 2

KERTAS 2

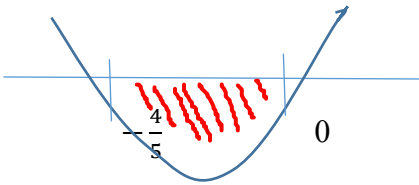
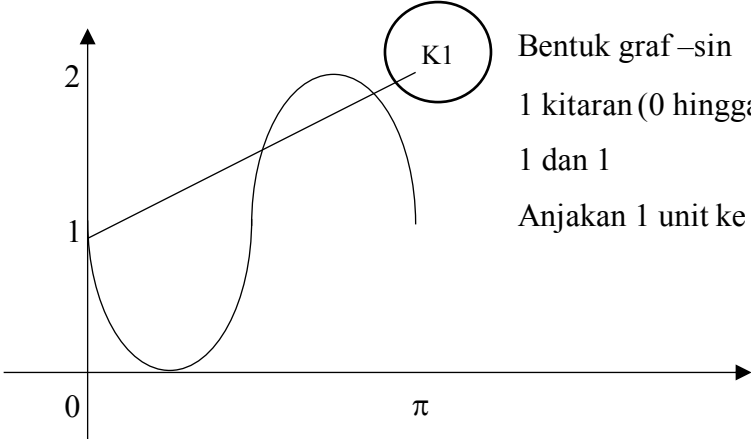
MATEMATIK TAMBAHAN

KERTAS 2

SKEMA PEMARKAHAN
SET 2

No	Solutions and Mark Scheme	Sub Marks	Total Marks
1	x - harga nasi lemak y - harga mi goreng z - harga secawan kopi $3x + 2y + z = 30 \quad \text{----} \textcircled{1}$ $5x + y + z = 27 \quad \text{----} \textcircled{2}$ $2y = x + 3z \quad \text{----} \textcircled{3} \quad \boxed{\text{P2}}$ **Nota : Betul SEMUA persamaan P2 Betul 2 persamaan P1 <u>Hapus anu pertama dengan penghapusan atau penggantian</u> K1 $7x - 2z = 24$ ATAU $11x + 5z = 54$ ATAU persamaan didalam sebutan x dan y ATAU persamaan didalam sebutan y dan z <u>Hapus anu kedua dengan penghapusan atau penggantian</u> K1 $57x = 228$ ATAU persamaan tinggal SATU anu sahaja Maka, harga sepinggan nasi lemak, $x = \text{RM } 4.00$ N1 Harga sepinggan mi goreng, $y = \text{RM}5.00$ N1 Harga secawan kopi, $z = \text{RM}2.00$ N1	7	7

No	Solutions and Mark Scheme	Sub Marks	Total Marks
2	(a)(i) $2\sqrt{5} + 5 + 6 + 3\sqrt{5}$ (K1) $5\sqrt{5} + 11$ (N1) (ii) $\frac{\sqrt{25}\sqrt{2} + \sqrt{9}\sqrt{2}}{\sqrt{4}\sqrt{2}}$ (K1) 4 (N1) (b) $\log_{10} \left(\frac{2x+6}{2x-1} \right) = 1$ (K1) $\frac{2x+6}{2x-1} = 10$ (K1) $x = \frac{8}{9}$ (N1)	4	
		3	7
3	(a) $r = 1.08$ (P1) $x(1.08)^2 = 139\,968$ (K1) $x = \text{RM } 120\,000.00$ (N1) (b) $T_8 = 120\,000(1.08)^7$ (K1) $= \text{RM } 205\,658.91$ (N1) (c) $120\,000(1.08)^{n-1} > 240\,000$ (K1) $n = 11$ (N1)	3	
		2	
		2	7

No	Solutions and Mark Scheme	Sub Marks	Total Marks
4	(a) $\alpha, 2\alpha$ HTP, $\alpha + 2\alpha = -3$ ATAU HDP, $2\alpha^2 = -q + \frac{1}{2}$ (K1) $\alpha = -1$ $q = -\frac{3}{2}$ (N1) Punca baharu = $-1, \frac{-1}{2}$ HTP, $-1 - \frac{1}{2}$ ATAU HDP, $(-1)\left(-\frac{1}{2}\right)$ (K1) $2x^2 + 3x + 1 = 0$ (N1) (b) $(-k - 2)^2 - 4(1)(-k^2 + 1) < 0$ (K1)  $-\frac{4}{5} < k < 0$ (N1)	4	
5	(a)(b)  Bentuk graf -sin (K1) (P1) 1 kitaran (0 hingga π) dan amplitude - 1 dan 1 (P1) Anjakan 1 unit ke atas (P1) $y = \frac{x}{\pi} + 1$ (K1) Bilangan penyelesaian = 3 (N1)	6	

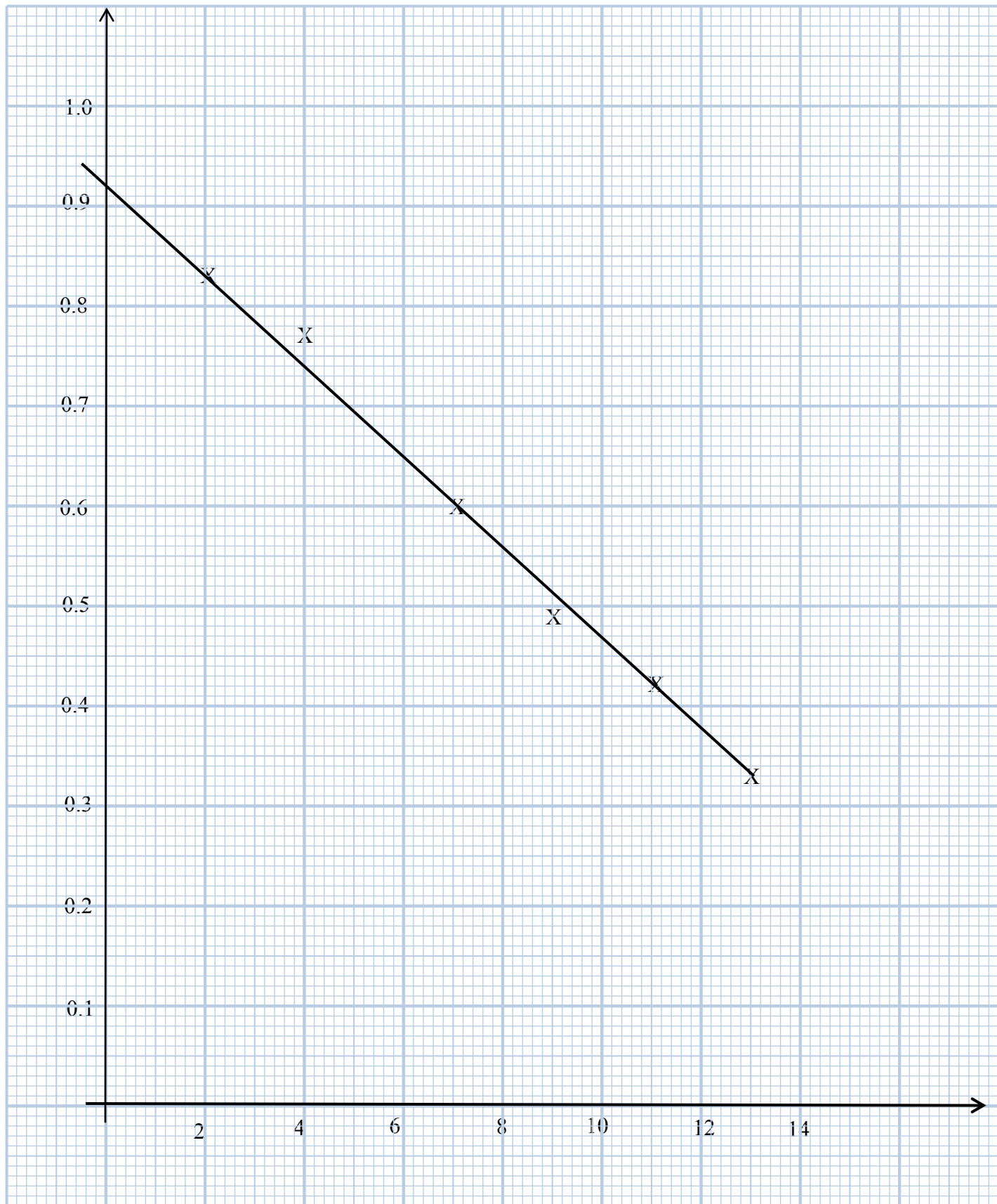
No	Solutions and Mark Scheme	Sub Marks	Total Marks
(b)	$\frac{dA}{dx} = 40 - 2 \left[1 + \frac{\pi}{12} \right] x \quad \text{K1}$ $40 - 2 \left[1 + \frac{\pi}{12} \right] x = 0 \quad \text{K1}$ $x = \frac{240}{12 + \pi} \quad \text{N1}$ $y = \frac{240 + 40\pi}{12 + \pi} \quad \text{N1}$	4	7
8			
(a)	$6 - y = 6y - y^2 \quad \text{K1}$ $A(5,1), B(0,6) \quad \text{N1} \quad \text{N1}$	3	
(b)	Rujukan : Luas segitiga = $\frac{1}{2} \times 5 \times 5$ $A = 3y^2 - \frac{y^3}{3} \Big _1^6 \quad \text{K1}$ $3(6)^2 - \frac{(6)^3}{3} - \left[3(1)^2 - \frac{(1)^3}{3} \right] \quad \text{K1}$ Rujukan : Luas lengkung – luas segitiga $\frac{100}{3} - \frac{25}{2} \quad \text{K1}$ $\frac{125}{6} \text{ unit}^2 \quad \text{N1}$	4	
c	$V = \pi \left[\frac{(6-x)^3}{-3} \right] \Big _5^6 \quad \text{K1}$ $\frac{(6-6)^3}{-3} - \left[\frac{(6-5)^3}{-3} \right] \pi \quad \text{K1}$ $\frac{1}{3} \pi \text{ unit}^3 \quad \text{N1}$	3	

No	Solutions and Mark Scheme	Sub Marks	Total Marks
	ATAU Jejari = 1 dan tinggi = 1 P1 $V = \frac{1}{3}\pi(1)^2(1)$ K1 $\frac{1}{3}\pi$ N1		10
9	(a)(i) $\overrightarrow{CA} = \overrightarrow{CB} + \overrightarrow{BA}$ K1 $\frac{4}{3}b - a$ N1 (a)(ii) $\frac{8}{21}b - \frac{2}{7}a$ K1 $\frac{8}{21}b + \frac{5}{7}a$ N1 (b) $h\underline{a} + k\underline{b} = \frac{3}{5}h\underline{a} - \frac{3}{2}k\underline{b} + \frac{5}{7}\left(\underline{a} - \frac{4}{3}\underline{b}\right)$ K1 $h = \frac{3}{5}h + \frac{5}{7}$ ATAU $k = \frac{-3}{2}k - \frac{20}{21}$ K1 $h = \frac{25}{14}$ ATAU $k = \frac{-8}{21}$ N1 N1 (c) $\overrightarrow{CA} = \sqrt{\left(\frac{4}{3}(9)\right)^2 + ((-1)(5))^2}$ K1 N1	4 4 2	10

No	Solutions and Mark Scheme	Sub Marks	Total Marks
(b)(i)	$P\left(\frac{50-55}{15} < z < \frac{65-55}{15}\right)$ ATAU $P(-0.333 < z < -0.667)$ (K1) $1 - 0.3696 - 0.2523$ (K1) 0.3781 (N1)		
(b)(ii)	0.0808 (P1) $\frac{25}{0.0808}$ (K1) 309 (N1)	6	10
12			
(a)	I : $x + y \leq 600$ (N1) II : $y < 2x$ (N1) III : $20x + 32y \geq 8000$ atau $5x + 8y \geq 2000$ (N1)	3	
(b)	Sekurang-kurangnya 1 garis dilukis dengan betul mengikut ketaksamaan yang melibatkan x dan y (K1) 3 garis dari ketaksamaannya dilukis dengan betul (N1) Rantau dilorek dengan betul (N1)	3	
(c)(i)	$150 \leq x \leq 300$ (N1)		
(c)(ii)	Guna titik maksimum (210, 390) (N1) $8(210) + 13(390)$ (K1) RM 6750.00 (N1)	4	10

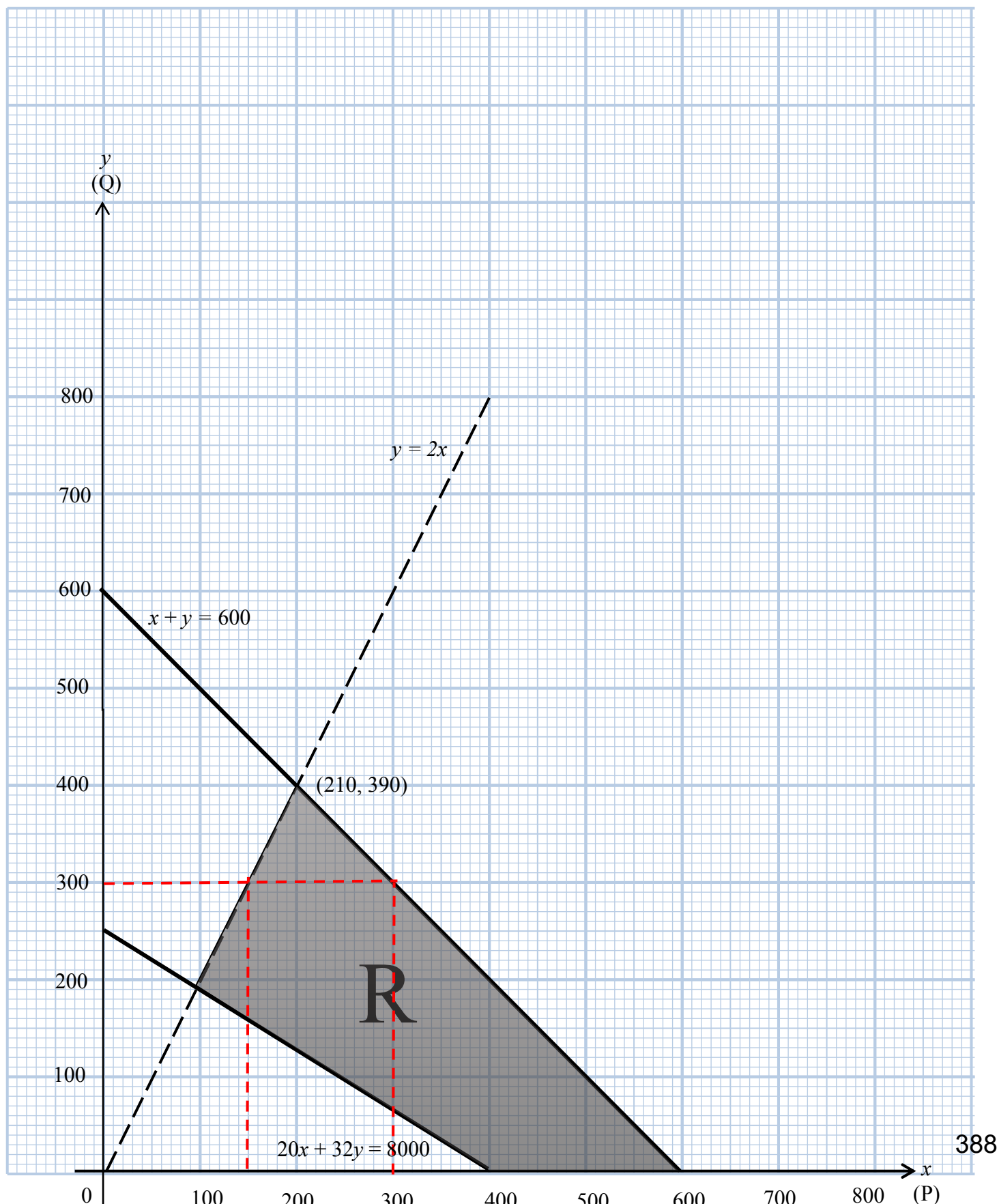
No	Solutions and Mark Scheme	Sub Marks	Total Marks
(a)(ii)	$PR^2 = 3^2 + 6^2 - 2(3)(6)\cos \alpha$ (K1) $PR = \sqrt{45 - 36\cos \alpha}$ (N1)	4	
(b)(i)	$\sqrt{97 - 72\cos \theta} = \sqrt{45 - 36\cos \alpha}$ (K1) $97 - 72\cos \theta = 45 - 36\cos(180^\circ - \theta)$ (K1) $\cos \theta = \frac{13}{27}$ (Terbukti) (N1)		
(b)(ii)	$s = \frac{3 + 6 + 9 + 4}{2}$ (K1) $\sqrt{(11 - 9)(11 - 6)(11 - 4)(11 - 3)}$ (K1) $4\sqrt{35} \text{ cm}^2 @ 23.6643 \text{ cm}^2$ (N1)	6	10
15			
(a)(i)	$\frac{37.70}{Q} \times 100 = 105$ (K1) RM 35.90 (N1)		
(a)(ii)	$\frac{Q}{120} = \frac{135}{100}$ (K1) 162 (N1)	4	
(b)	$I = \frac{135(40) + 30x + 105(10) + 130(20)}{100} = 128$ $x = 125$ (N1)	2	
(c)	$\frac{128 \times 110}{100}$ (K1) 140.8 (N1) $\frac{9.60}{100} = \frac{\text{Kos}}{140.8}$ (K1) Kos = RM13.52 (N1)	4	10

10(a)
 $\log_{10} y$



x

12(a)



SKEMA PEMARKAHAN
MATEMATIK TAMBAHAN – KERTAS 1
PERCUBAAN 2022
TINGKATAN 5

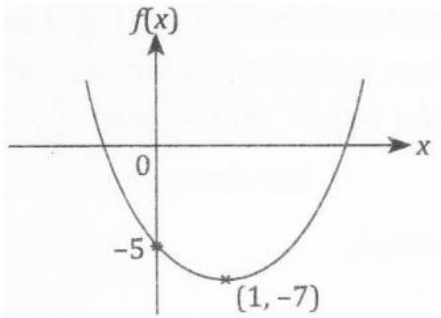
BAHAGIAN A [64 MARKAH]				
Nombor	Penyelesaian markah		Sub Markah	Markah Penuh
1	(a)	$-\frac{5}{6}k = 5$ $k = -6$	K1 N1	4
	(b)	$y - x = \frac{1}{2}x^2 + \frac{11}{2}$ $m = \frac{1}{2} \text{ dan pintasan-}y = \frac{11}{2}$	K1 N1	
2	(a)	(i) $-\frac{2}{3}$ (ii) $S_n = \frac{2(1)}{1 - \left(-\frac{2}{3}\right)}$ $\frac{6}{5}$	K1 K1 N1	5
	(b)	$\frac{h}{h^3} = 1$ $\frac{h}{9}$ $h = 3 \text{ dan } h = -3$	K1 N1	
3	(a)	Sebelah kanan $= {}^nC_r(r!)$ $= \frac{n!}{(n-r)!} \times r!$ $= \frac{n!}{(n-r)!}$ $= {}^nP_r = \text{sebelah kiri/terbukti}$	K1 N1	5
	(b)	$\frac{{}^8P_6}{2(6)} \text{ atau } \frac{{}^8P_7}{2(7)} \text{ atau } \frac{{}^8P_8}{2(8)}$ $\frac{{}^8P_6}{2(6)} + \frac{{}^8P_7}{2(7)} + \frac{{}^8P_8}{2(8)}$ 7080	K1 K1 N1	

4	(a)	(i) 3 (ii) $\cos 2\theta = \frac{2}{3}$ $2\theta = 48.19^\circ, 311.81^\circ$ $\theta = 24.10^\circ, 155.91^\circ$	N1 K1 K1 N1	6
	(b)	$\tan A = \frac{15}{8}$ $\frac{8}{15}$	P1 N1	
5	(a)	$2^y \times 2^{3x} = 5 + 2^{3x}$ $2pq = 5 + 2p$ atau setara $p = \frac{5}{2(q-1)}$	K1 K1 N1	6
	(b)	$(m+4)^2 = m+10$ atau $x^2 + 7x + 6 = 0$ $(x+1)(x+6) = 0$ $m = -1, -6$	K1 K1 N1	
6	(a)	gf atau $g(x-6000)$ $gf(x) = 0.03(x-6000)$	K1 N1	4
	(b)	$gf(x) = 0.03(10500-6000)$ RM 135	K1 N1	
7	(a)	$f(x) = (x-4)^2 - 9$ $f(x) = -(x-4)^2 + 9$	P1 N1	
	(b)	$3m = 5$ atau $-2n = -2$ $m = \frac{5}{3}$ $n = 1$	K1 N1 N1	5

8	(a)	$\frac{(x-1)(2x)-x^2}{(x-1)^2}$ $4\left[\frac{2^2}{(2-1)^2}-0\right]_0^2$ 16	K1	6
			K1	
			N1	
	(b)	$\frac{dy}{dx} = 6x^2 + 5x$ $y = 2x^3 + \frac{5}{2}x^2 + c, \text{ dan gantikan nilai } x \text{ dan } y \text{ untuk}$ $\text{nilai } c = -\frac{5}{2}$ $y = 2x^3 + \frac{5}{2}x^2 - \frac{5}{2}$	K1	
			N1	
9	(a)	$k = \frac{1}{3}$ ${}^4C_4 p^4 q^0 = \frac{1}{81}$ $p = \frac{1}{3}$	K1	6
			K1	
			N1	
	(b)	$1 - 2P(Z > m) = 8P(Z > h) \text{ atau } P(Z > h) = 0.1$ $P(Z < h) = 0.9$ $h = 1.281 \text{ atau } 1.282$	K1	
			K1	
			N1	
10	(a)	$\overrightarrow{AO} + \overrightarrow{OE} = m(\overrightarrow{AO} + \overrightarrow{OD}) \quad \text{K1}$ $\overrightarrow{OE} = m\vec{d} + (1-n)\vec{a} \quad \text{N1}$	K1	
			N1	
	(b)			
	(i)	$\overrightarrow{OE} = 3n\vec{d} + 2n\vec{a}$ $2n = 1 - m \text{ atau } m = 3n$ $2n = 1 - 3n \text{ atau } m = 3\left(\frac{1-m}{2}\right)$ $n = \frac{1}{5} \text{ dan } m = \frac{3}{5}$	K1	
			K1	
			N1	

		(ii) $\overrightarrow{AE} = \frac{3}{5} \overrightarrow{AD}$ K1 $DE : EA = 2 : 3$ N1	K1 N1	7
11		$\frac{1}{\log_2 y}$ atau $\frac{1}{\log_y 2}$ P1 $(\log_2 y)^2 = 4$ atau $(\log_y 2)^2 = \frac{1}{4}$ K1 $\log_2 y = 2$ atau $\log_2 y = -2$ atau $\log_y 2 = \frac{1}{2}$ atau $\log_y 2 = -\frac{1}{2}$ K1 $4, \frac{1}{4}$ N1	P1 K1 K1 N1	4
12	(a)	(i) $p = 3$ N1 $q = 1$ N1 (ii) $r + 4 = 3$ K1 $r = -1$ N1	N1 N1 K1 N1	6
	(b)	$\frac{1}{2} [(11 \times 4) + (3 \times 2) + 8x] - [(8 \times 3) + 4x + (11 \times 2)] = 0$ ATAU $\frac{8-4}{11-3} = \frac{4-2}{3-x}$ $x = -1$	K1 N1	

BAHAGIAN B																												
[16 MARKAH]																												
13	(a)	$6x - 2x^2 = 0$ $2x(3 - x) = 0$ $\left(0, \frac{1}{2}\right), \left(3, \frac{19}{2}\right)$	K1 K1 N1																									
	(b)	$\frac{d^2y}{dx^2} = 6 - 4x$ dan 6 atau $\frac{d^2y}{dx^2} = 6 - 4x$ dan -6 ATAU <table><tr><td>x</td><td>-1</td><td>0</td><td>1</td></tr><tr><td>$\frac{dy}{dx}$</td><td>-</td><td>0</td><td>+</td></tr><tr><td>tangen</td><td>\</td><td>—</td><td>/</td></tr></table> atau <table><tr><td>x</td><td>2</td><td>3</td><td>4</td></tr><tr><td>$\frac{dy}{dx}$</td><td>+</td><td>0</td><td>-</td></tr><tr><td>tangen</td><td>/</td><td>—</td><td>\</td></tr></table> $\left(0, \frac{1}{2}\right)$ titik minimum dan $\left(3, \frac{19}{2}\right)$ titik maksimum	x	-1	0	1	$\frac{dy}{dx}$	-	0	+	tangen	\	—	/	x	2	3	4	$\frac{dy}{dx}$	+	0	-	tangen	/	—	\	K1 N1	
x	-1	0	1																									
$\frac{dy}{dx}$	-	0	+																									
tangen	\	—	/																									
x	2	3	4																									
$\frac{dy}{dx}$	+	0	-																									
tangen	/	—	\																									
	(c)	$\frac{dy}{dx} = 6(2) - 2(2)^2$ $\delta y = [6(2) - 2(2)^2] \times 0.01$ $\frac{43}{6} + 0.04 = \frac{1081}{150}$	P1 K1 N1	8																								
14	(a)	(i) $\frac{3}{4} rad$ (ii) $\frac{1}{2}r^2\left(\frac{3}{4}\right) - 6$ $\frac{1}{2}r^2\left(\frac{3}{4}\right) = 54$ atau $r = 12$ Panjang SU = 8	N1 K1 K1 N1																									
	(b)	(i) $\frac{1}{2}(30)^2(2.65)$ atau $\frac{1}{2}(12)^2(2.65)$ $\frac{1}{2}(30)^2(2.65) - \frac{1}{2}(12)^2(2.65)$ 1001.7 cm ²	K1 K1 N1																									

		(ii) 7	N1	
15	(a)	$2\left(x - \frac{n}{4}\right)^2 - \frac{n^2}{8} + p$ $\frac{n}{4} = 1 \text{ atau } -\frac{n^2}{8} + p = -7$ $n = 4$ $p = -5$	K1 K1 N1 N1	
	(b)	 Bentuk graf Titik minimum	P1 P1	
	(c)	$(-4)^2 - 4(2)(-5 - h) > 0$ $h > -7$	K1 N1	8

SKEMA PEMARKAHAN TAMAT

No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
1(a)	Menukar asas $\frac{\log 16}{\log 5}$ atau $\frac{\log 125}{\log 3}$ atau $\frac{\log \sqrt{3}}{\log 4}$ (terima apa-apa asas yang sama) Menggunakan hukum log $\frac{4 \log 2}{\lg 5} \times \frac{3 \log 5}{\lg 3} \times \frac{\frac{1}{2} \log 3}{\lg 4}$ 3	K1 K1 N1	6
(b)	$(\sqrt{x-2})^2 = (\sqrt{x}-1)^2$ $(2\sqrt{x})^2 = (3)^2$ $x = \frac{9}{4}$	K1 K1 N1	
2	Mencari beza sepunya $d = 4$ Menggunakan rumus $T_n = a + (n-1)d$ $7 + (17-1)4$ 71	P1 K1 N1	3
3(a)	Mencari f^2 $2(2x+4) + 4$ $4x + 12$	K1 N1	4
(b)	Menggantikan nilai $2m$ dalam f^2 $4(2m) + 12 = 28$ $m = 2$	K1 N1	
4(a)	$\frac{y}{x^2} = 6 - \frac{3}{2}x$ $q = 6 - \frac{3}{2}p$ OR $-\frac{3}{2} = \frac{q-6}{p-0}$ $p = \frac{12-2q}{3}$ atau $p = 4 - \frac{2}{3}q$	K1 K1 N1	5
(b)	Menggantikan $p = 8$ atau/dan $q = -6$ dalam 4(a) $p = 4 - \frac{2}{3}(-6)$ Ya. Memuaskan persamaan.	K1 N1	

No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
5	$\overline{AB} = \overline{AO} + \overline{OB}$ atau $\overline{AC} = \overline{AO} + \overline{OC}$ (a) $\overline{AB} = -i - 2j + 3i + 5j$ atau $ \overline{AB} = \sqrt{2^2 + 3^2}$ $\frac{2i + 3j}{\sqrt{13}}$ (b) $\overline{AC} = -i - 2j + 6i + kj$ $5^2 + (k-2)^2 = 13^2$ $14, -10$	P1 K1 N1 K1 K1 N1	6
6 (a)	$150 + 300t = 2550$ $t = 8$ Tahun 2019	K1 N1 N1	6
(b)	$p(-5) + q = 11$ atau $\frac{2-q}{p} = 7$ atau $p(7) + q = 2$ Selesaikan persamaan linear serentak melibatkan p dan q $p = -\frac{3}{4}, q = \frac{29}{4}$	K1 K1 K1 N1	
7(a)	$S(5, 4)$ $m_{\perp} = -2$ $y = -2x + 4$	P1 K1 N1	6
(b)	$PR = \sqrt{(x-0)^2 + (y-4)^2}$ atau $PU = \sqrt{(x+3)^2 + (y-0)^2}$ $\sqrt{(x-0)^2 + (y-4)^2} = 2\sqrt{(x+3)^2 + (y-0)^2}$ $3x^2 + 3y^2 + 24x + 8y + 20 = 0$	K1 K1 N1	
8(a)	15504	N1	6
(b)	2730	N1	
(c)(i)	40320	N1	
(ii)	$6P_3$ atau $5!$	K1	
	$6P_3 \times 5!$ $14, 400$	K1 N1	

No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
9(a)	$\frac{(1-2x)^5}{(5)(-2)} + c$ atau $-2mn(1-2x)^{n-1}$ $-\frac{1}{2}$	K1 N1	6
(b)	$\theta = 2t - 0.4\frac{t^2}{2} + c$ $\theta = 2t - 0.2t^2 + 22$ Suhu paling tinggi ialah 27°C apabila $t = 5$ Ali dan rakan-rakannya dapat pergi ke taman tema.	K1 N1 K1 N1	
10	$(15)(0.4)$ atau $15(0.4)(1-0.4)$	K1	5
(a)(i)	6	N1	
(ii)	3.6	N1	
(b)	$1 - {}^{15}C_0(0.4)^0(0.6)^{15}$ 0.9995	K1 N1	
11 (a)(i)	$-\frac{1}{\sqrt{1-m^2}}$	N1	7
(ii)	$\frac{5}{\cos \theta \cos 180^\circ + \sin \theta \sin 180^\circ}$	K1	
	$\frac{5}{m}$	N1	
(b)	$2 \sin A \cos^2 A + \sin A \cos A - \sin A = 0$	K1	
	$\sin A(2 \cos A - 1)(\cos A + 1) = 0$	K1	
	$0^\circ, 60^\circ, 180^\circ, 300^\circ, 360^\circ$ $0, \frac{1}{3}\pi, \pi, \frac{5}{3}\pi, 2\pi$	K1 N1	
12(a)	$\frac{3(3)+3k(1)}{1+3} = \frac{15}{4}$ atau $\frac{0(3)+(5k+3)(1)}{1+3} = \frac{13}{4}$ $k = 2$	K1 N1	4
(b)	$\frac{1}{2} -2(13)+6(2)+10(0)+3(5)-[5(6)+10(13)+3(2)+(-2)0] $ 82.5	K1 N1	

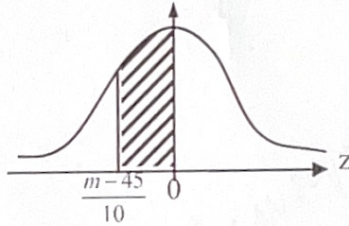
No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
13(a)	$x = 3$ $f(x) = a(x-3)^2 + 2$ (sebarang nilai a)	P1 P1	8
(b)	Gunakan titik (0,0) atau (6,0) untuk mencari nilai a $0 = a(0-3)^2 + 2$ atau $0 = a(6-3)^2 + 2$ $f(x) = -\frac{2}{9}(x-3)^2 + 2$ $PC_1 = C_1C_2 = C_2Q = 2$ $f(2) = -\frac{2}{9}(2-3)^2 + 2$ $1\frac{7}{9} + 1.5$ $3\frac{5}{18}$ meter	K1 N1 K1 K1 K1 N1	
14(a)	(i) $A = \frac{1}{2}(p)(4p^2 - 2)$ $A = 2p^3 - p$ $\frac{dA}{dp} = 6p^2 - 1$ or $\delta p = 0.06$ $\delta A = (6 \times 2^2 - 1) \times 0.06$ 1.38 (b) $\frac{dr}{dp} = 8p$ $\frac{dr}{dt} = 8(2) \times 0.03$ 0.48	K1 N1 K1 K1 N1 K1 K1 N1	8

No.	Skema Pemarkahan	Sub Markah	Jumlah Markah
15(a)	$8\theta = 5.402$	K1	8
	$\theta = 0.6753 \text{ rad}$	N1	
	(b) $\sqrt{8^2 - 5^2}$	K1	
	$5.402 + (25 - 8) + 8 + 5.402 + 5 + 9 + (8 - \sqrt{8^2 - 5^2})$ atau setara	K1	
	51.56 cm	N1	
	(c) $\frac{1}{2}(8)^2 (0.6753)$ atau $\frac{1}{2} \times [8 + 1.755](5)$	K1	
	$\left[\frac{1}{2}(8)^2 (0.6753) \right] + \left[\left(\frac{1}{2} \times [8 + 1.755](5) \right) - \frac{1}{2}(8)^2 (0.6753) \right]$	K1	
	24.39 cm^2	N1	

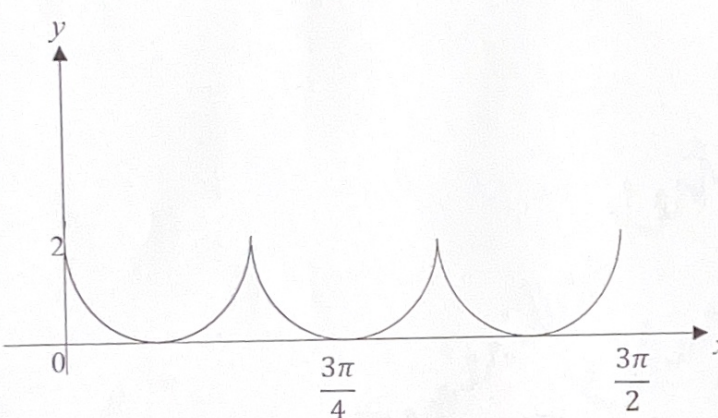
PERATURAN PEMARKAHAN TAMAT

No.	Skema Pemarkahan	Sub Markah	Total Markah
1	$\frac{100}{x} + \frac{100}{y} = 2.5$ $x = 20 + y$ $40y + 40(20 + y) = y(20 + y)$ $y = \frac{-(-60) \pm \sqrt{(-60)^2 - 4(1)(-800)}}{2}$ $y = 71.23, y = -11.23$ $x = 91.23, x = -8.77$ $Masa = 1.10 \text{ saat}$	P1 K1 K1 K1 N1 N1 N1	7
2(a)(i)	$f(3) = \ln(4(3) - 2)$ 2.303	K1 N1	7
(ii)	$\ln(4x - 2) > 5$ $4x - 2 > e^5$ $x > 37.60$	 K1 N1	
(b)	$(m^{\frac{1}{3}})^2 - 2(m^{\frac{1}{3}}) - 15 = 0 \quad \text{or} \quad \text{let } m^{\frac{1}{3}} = x, x = 2 + \frac{15}{x}$ $(m^{\frac{1}{3}} - 5)(m^{\frac{1}{3}} + 3) = 0 \quad \text{or} \quad (x - 5)(x + 3) = 0$ $m^{\frac{1}{3}} = 5 \text{ atau } m^{\frac{1}{3}} = -3$ $m = 125, m = -27$	 K1 K1 N1	
3(a)(i)	$(x - \alpha)(x - \beta) = 0$ dan $x^2 - (\alpha + \beta)x + \alpha\beta = 0$ atau $x^2 + \left(\frac{b}{a}\right)x + \frac{c}{a} = 0$ Guna $\alpha + \beta = -\frac{b}{a}$ dan $\alpha\beta = \frac{c}{a}$	K1 N1	7
(ii)	$SOR = \frac{15}{3}, POR = -3$	N1N1	
(b)	$4x^2 - 6x - 23 = 0$ $\frac{-(-6) \pm \sqrt{(-6)^2 - 4(4)(-23)}}{2(4)}$ $\frac{3 \pm \sqrt{101}}{4}$	K1 K1 N1	

No.	Skema Pemarkahan	Sub Markah	Total Markah
4(a)	$\frac{dy}{dx} = 3x^2 - 12 \quad m = 15$	K1	7
	$y + 9 = 15(x - 3)$	K1	
	$y = 15x - 54$	N1	
(b)	$P = y^2 - 12y + 16$ atau setara	P1	
	$\frac{dP}{dy} = 2y - 12$	K1	
	$P = (6)^2 - 12(6) + 16$ -20	K1 N1	
5(a)	$8\left(\frac{\pi}{3}\right)$ atau $8\left(60^\circ \times \frac{\pi}{180^\circ}\right)$	K1	7
	$8 + 4\left[8\left(\frac{\pi}{3}\right)\right] + 8$ atau $8 + 4\left[8\left(60^\circ \times \frac{\pi}{180^\circ}\right)\right] + 8$	K1	
	$49.50 - 49.51 \text{ cm}$	N1	
(b)	$\frac{1}{2}(8)^2\left(\frac{\pi}{3}\right)$ atau $\frac{1}{2}(8)^2(1.047)$	K1	
	$\frac{1}{2}(8)(8)\sin 60^\circ$	K1	
	$4\left(\frac{1}{2}(8)^2\left(\frac{\pi}{3}\right) - \frac{1}{2}(8)(8)\sin 60^\circ\right)$ $23.20 - 23.21 \text{ cm}^2$	K1 N1	
6 (a)	$d_1 = \log y - \log x$ dan $d_2 = \log z - \log y$	K1	7
	$x = \frac{y^2}{z}$, $\log y - \log \frac{y^2}{z} = \log z - \log y$ atau setara		
	$d_1 = d_2$	N1	
(b)(i)	$T_{10} = 1(2)^9$	K1	
	512	N1	
(ii)	$\frac{1(2^n - 1)}{2 - 1} = 16383$	K1	
	$n \log_{10} 2 = \log_{10} 16384$	K1	
	14	N1	

No.	Skema Pemarkahan	Sub Markah	Total Markah
7	$P\left(Z > \frac{70-45}{10}\right)$ atau $P\left(Z > \frac{39-45}{10}\right)$ (a) 0.00621 (b) 190×0.2743 52 orang murid (c) $P\left(\frac{m-45}{10} < Z < \frac{45-45}{10}\right)$ $P\left(Z < \frac{45-45}{10}\right) - P\left(Z < \frac{m-45}{10}\right)$ atau  $\frac{m-45}{10} = -1.036 // -1.037$ 34.63 // 34.64	K1 N1 K1 N1 K1 K1 K1 N1	8
8(a)(i)	$\overline{AC} = \overline{AO} + \overline{OC}$ atau $\overline{OD} = \overline{OA} + \overline{AD}$ $\overline{AC} = -\underline{x} + \frac{3}{5}\underline{y}$ (ii) $\overline{OD} = -\underline{x} + \frac{2}{3}\left(-\underline{x} + \underline{y}\right)$ $\overline{OD} = \frac{1}{3}\underline{x} + \frac{2}{3}\underline{y}$ (b)(i) $\overline{OE} = \frac{1}{3}h\underline{x} + \frac{2}{3}h\underline{y}$ (ii) $\overline{OE} = -\underline{x} + k\left(-\underline{x} + \frac{3}{5}\underline{y}\right)$ $\overline{OE} = (1-k)\underline{x} + \frac{3}{5}k\underline{y}$ (c) $\frac{1}{3}h\underline{x} + \frac{2}{3}h\underline{y} = (1-k)\underline{x} + \frac{3}{5}k\underline{y}$ $\frac{1}{3}h = 1-k$ atau $\frac{2}{3}h = \frac{3}{5}k$ Samakan pekali $\underline{x}$ atau $\underline{y}$ $h = \frac{9}{13}, k = \frac{10}{13}$	K1 N1 K1 N1 N1 K1 N1 K1 N1N1	10

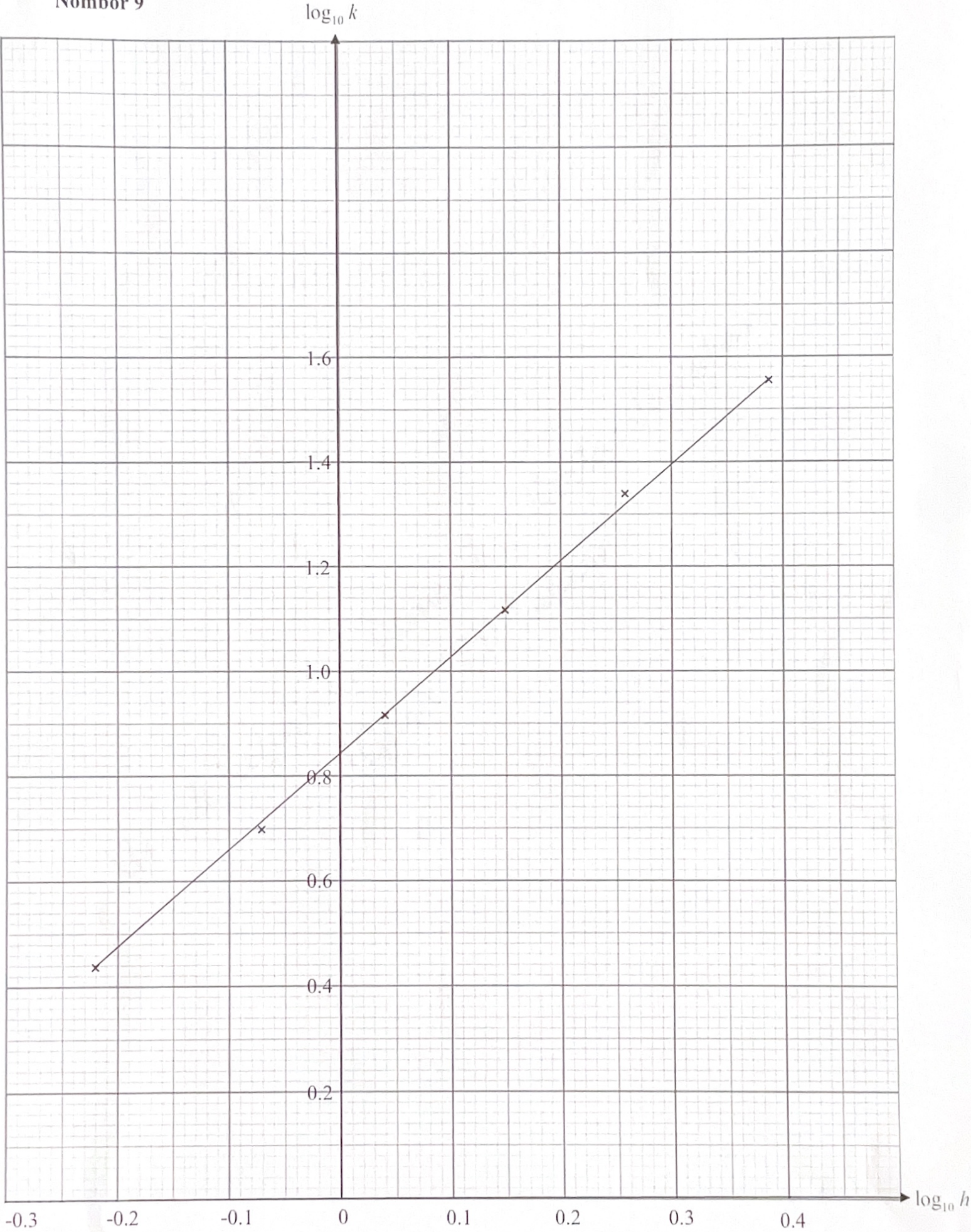
No.	Skema Pemarkahan	Sub Markah	Total Markah														
9(a)	<table><tr><td>$\log_{10} h$</td><td>-0.22</td><td>-0.07</td><td>0.04</td><td>0.15</td><td>0.26</td><td>0.39</td></tr><tr><td>$\log_{10} k$</td><td>0.44</td><td>0.70</td><td>0.92</td><td>1.12</td><td>1.34</td><td>1.56</td></tr></table>	$\log_{10} h$	-0.22	-0.07	0.04	0.15	0.26	0.39	$\log_{10} k$	0.44	0.70	0.92	1.12	1.34	1.56	N1	10
	$\log_{10} h$	-0.22	-0.07	0.04	0.15	0.26	0.39										
	$\log_{10} k$	0.44	0.70	0.92	1.12	1.34	1.56										
		N1															
	Plot $\log_{10} k$ melawan $\log_{10} h$ dengan paksi betul dan skala seragam (sekurang-kurangnya satu titik diplot betul, skala seragam dan graf garis lurus)	K1															
	Semua titik di plot betul	K1															
	Garis penyuaian terbaik	N1															
	(b)(i)	$\log_{10} k = \frac{p}{2} \log_{10} h - \log_{10} q$	P1														
		$\frac{p}{2} = \frac{1.56 - 0.44}{0.39 - (-0.22)}$	K1														
		$p = 3.672$	N1														
(ii)		$-\log_{10} q = 0.84$	K1														
	$q = 0.1445$	N1															
10 (a)	$A(0,1)$	P1	10														
(b)	$\frac{1}{4} \left[\frac{y^3}{3} - y \right]_1^3$ atau $\frac{1}{4} \left[\frac{y^3}{3} - y \right]_1^3$	K1															
	$2(3) - \int_0^2 f(x) dx$	K1															
	$\left \frac{1}{4} \left[\frac{y^3}{3} - y \right]_{-1}^1 \right + (6 - m) - \frac{1}{4} \left[\frac{y^3}{3} - y \right]_1^3$	K1															
	$\left \frac{1}{4} \left(\left(\frac{1^3}{3} - 1 \right) - \left(\frac{(-1)^3}{3} - (-1) \right) \right) \right + (6 - m) - \left(\frac{1}{4} \left(\left(\frac{3^3}{3} - 3 \right) - \left(\frac{1^3}{3} - 1 \right) \right) \right)$	K1															
	$\frac{14}{3} - m$	N1															
(c)	$\int_0^2 \frac{1}{4} \pi (x^4 + 4x^2 + 4) dx$	K1															
	$\frac{1}{4} \pi \left[\frac{x^5}{5} + \frac{4x^3}{3} + 4x \right]_0^2$	K1															
	$\frac{1}{4} \pi \left[\left(\frac{2^5}{5} + \frac{4(2)^3}{3} + 4(2) \right) - (0) \right]$	K1															
	$\frac{22}{3} \pi \text{ unit}^3$	N1															

No.	Skema Pemarkahan	Sub Markah	Total Markah
11(a)	$\frac{2 \tan \theta}{1 - \tan^2 \theta}$	K1	10
(i)	$\tan 2\theta$	N1	
(ii)	$\tan 2\theta = \frac{\sqrt{3}}{2}$	K1	
	$\angle Rujukan = 40.89^\circ$	N1	
	$\theta = 20.45^\circ, 110.45^\circ, 200.45^\circ$	N1	
(b)			
	Bentuk graf sinus	P1	
	$1\frac{1}{2}$ kitaran	P1	
	Amplitud = 2	P1	
	Mutlak dan anjakan 2 unit ke atas	P1	
	$0 < k < 2$	N1	

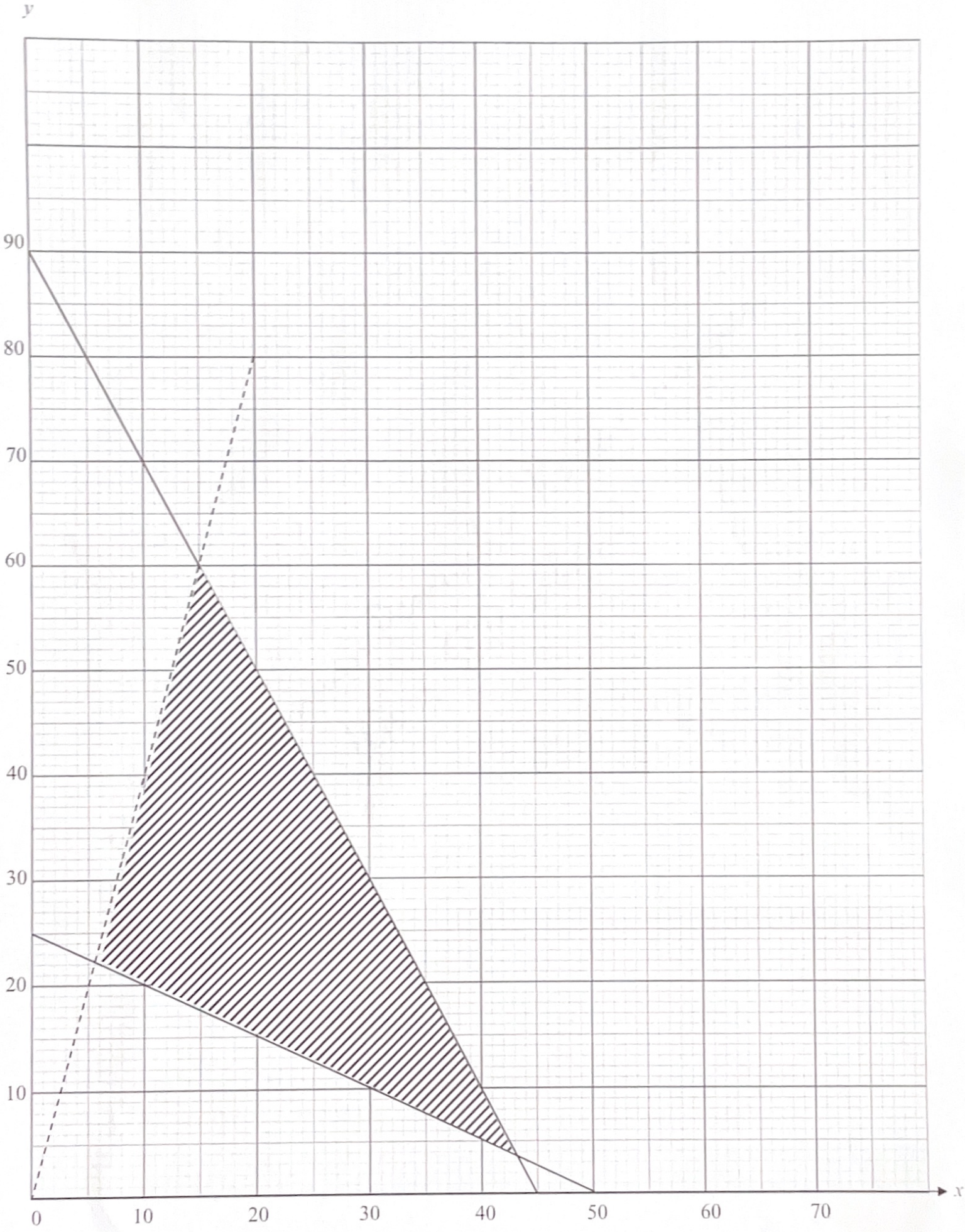
No.	Skema Pemarkahan	Sub Markah	Total Markah
12(a)	(i) $AC^2 = 12.5^2 + 8.4^2 - 2(12.5)(8.4)\cos 64^\circ$	K1	
	11.61 cm	N1	
	(ii) $\frac{\sin \angle ACD}{6} = \frac{\sin 116^\circ}{11.61}$	K1	
	$\angle ACD = 27.68^\circ$	N1	
	$\angle CAD = 180^\circ - 116^\circ - 27.68^\circ$	K1	
	$\angle CAD = 36.32^\circ$	N1	
(b)(i)	$\frac{1}{2}(6)(11.608)\sin 36.32^\circ$	K1	
	20.63 cm ²	N1	
	(ii) $\frac{1}{2}(11.61)(h) = 20.63$	K1	
	3.554 cm	N1	
13(a)	$\frac{Q_{2021}}{15.50} \times 100 = 120 \quad \text{atau} \quad \frac{18.00}{Q_{2019}} \times 100 = 125$	K1	10
	(i) $Q_{2021} = \text{RM}18.60$	N1	
	(ii) $Q_{2019} = \text{RM}14.40$	N1	
	(b) $\frac{120(2) + 3x + 130(4) + 125(1)}{2 + 3 + 4 + 1} = 135$	K1	
	$x = 155$	N1	
	(c) 138 atau 123.5 atau 135	P1	
	$\bar{I} = \frac{138(2) + 3(155) + 123.5(4) + 135(1)}{2 + 3 + 4 + 1}$	K1	
	$\bar{I} = 137$	N1	
	(d) $\frac{Q_{2022}}{45.30} \times 100 = 137$	K1	
	$Q_{2022} = \text{RM}62.06$	N1	

No.	Skema Pemarkahan	Sub Markah	Total Markah
14(a)	$y < 4x$	N1	10
	$40x + 20y \leq 1800$	N1	
	$30x + 60y \geq 1500$	N1	
	(b) Satu garis lurus dilukis dengan betul	K1	
	Ketiga-tiga garis lurus dilukis dengan betul	K1	
	Rantau dilorek dengan betul	N1	
	(c)(i) 59	N1	
	(ii) Titik Minimum (6,22)	N1	
	$14(6) + 19.25(22)$	K1	
	507.5	N1	
15(a)	$\frac{dv}{dt} = 2qt$ dan $2q(2) = -4$	K1	10
	$q = -1$	N1	
	$s = pt + (-1)\frac{t^3}{3}$	K1	
	$6p + (-1)\frac{(6)^3}{3} = -48$	K1	
	$p = 4$	N1	
	(b) $4 + (-1)t^2 = 0$	K1	
	$t = 2$	N1	
	(c) $4t - \frac{t^3}{3}$	K1	
	$\left[4(5) - \frac{5^3}{3}\right] - \left[4(4) - \frac{4^3}{3}\right]$	K1	
	$16\frac{1}{3}$	N1	

Nombor 9



Nombor 14





**MODUL PINTAS
TINGKATAN 5**

3472/1

**MATEMATIK TAMBAHAN
Kertas 1**

2 jam

Dua jam

PERATURAN PEMARKAHAN MATEMATIK TAMBAHAN K1 3472/1

NO	PENYELESAIAN	MARKAH		
1.	(a) $\frac{p^2}{3} \times 3^p \times 2^{-(p+2)} \times y^{-3p} \times y^{p+2} = q^1 y^{-2}$ $y^{-3p+p+2} = y^{-2}$ $-2p + 2 = -2$ $p = 2$ $\frac{p^2}{3} \times 3^p \times \left(\frac{1}{2}\right)^{p+2} = q^1$ $q = \frac{3}{4}$ Bandingkan kuasa y atau nilai pemalar dapat K1	K1	4	7
	N1	K1		
	(b) $\left(\frac{\log_3 9}{\log_3 \sqrt{y}}\right) \left(\frac{\log_3 y}{\log_3 x}\right) (\log_3 x)$ $\left(\frac{2\log_3 3}{\frac{1}{2}\log_3 y}\right) \left(\frac{\log_3 y}{\log_3 x}\right) (\log_3 x)$ 4	K1	3	
	K1	N1		
2.	$x = 7 - 2y \dots \dots \dots (1)$ $ x + y = 4 \dots \dots \dots (2)$ Gantikan (1) ke dalam (2) $ 7 - 2y + y = 4$ $7 - y = \pm 4$ $y = 3, \quad y = 11$ $x = 1, \quad x = -15$	P1	4	4
		K1		
		N1		
		N1		

NO	PENYELESAIAN	MARKAH		
3.	(a) $a = 15000 \text{ dan } r = 1 + \frac{0.045}{2}$ $T_{11} = 15000 \left(1 + \frac{0.045}{2}\right)^{10}$ $= \text{RM } 18738.05$	P1 K1 N1	3	5
	(b) $\text{RM } 18738.05 - \text{RM } 15000$ $= \text{RM } 3738.05$	K1 NI	2	
4.	(a) $\sin(x + 45^\circ) \sin(x - 45^\circ)$ $= (\sin x \cos 45^\circ + \cos x \sin 45^\circ)(\sin x \cos 45^\circ - \cos x \sin 45^\circ)$ $= \left(\frac{1}{\sqrt{2}} \sin x + \frac{1}{\sqrt{2}} \cos x\right) \left(\frac{1}{\sqrt{2}} \sin x - \frac{1}{\sqrt{2}} \cos x\right)$ $= \left(\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}\right) (\sin x + \cos x)(\sin x - \cos x)$ $= \frac{1}{2} \sin^2 x - \frac{1}{2} \cos^2 x$ $= \frac{1}{2} (-\cos 2x)$ $= -\frac{1}{2} \cos 2x$	K1 K1 K1	3	7
	(b) $\tan 2x = \frac{12}{5}$ $\frac{2 \tan x}{1 - \tan^2 x} = \frac{12}{5}$ $12 - 12 \tan^2 x = 10 \tan x$ $12 \tan^2 x + 10 \tan x - 12 = 0$ $6 \tan^2 x + 5 \tan x - 6 = 0$ $(2 \tan x + 3)(3 \tan x - 2) = 0$ $\tan x = \frac{2}{3}, -\frac{3}{2}$ $\tan x < 0, \tan x = -\frac{3}{2}$	P1 K1 K1 N1	4	

NO	PENYELESAIAN	MARKAH		
5.	(a) $y = 0,$ $x^2 - 9x + 18 = 0$ $(x - 3)(x - 6) = 0$ atau $b^2 - 4ac = (-9)^2 - 4(1)(18)$ $x = 3$ atau $x = 6$ $= 9 > 0$ Lokus R bersilang dengan paksi-x pada titik $(3, 0)$ dan $(6, 0)$. <i>Locus R intersects the x – axis at point $(3, 0)$ and $(6, 0)$.</i> atau Lokus R bersilang dengan paksi-x pada dua titik berbeza. <i>Locus R intersects the x – axis at two different points.</i>	K1 N1 N1	3	7
	(b) $y = -3x + 8$ ——— (1) $x^2 + y^2 - 9x + y + 18 = 0$ ——— (2) Substitute (1) into (2), $x^2 + (-3x + 8)^2 - 9x + (-3x + 8) + 18 = 0$ $x^2 + 9x^2 - 48x + 64 - 9x - 3x + 8 + 18 = 0$ $10x^2 - 60x + 90 = 0$ $x^2 - 6x + 9 = 0$ atau $(x - 3)(x - 3) = 0$ $b^2 - 4ac$ $= (-6)^2 - 4(1)(9)$ $x = 3$ $= 0$ $y = -3x + 8$ ialah tangen kepada lokus R. $y = -3x + 8$ is a tangent to the locus R.	K1 K1 K1 N1	4	
6.	(a) i) $k = 3$ ii) $y = \frac{2}{3-x}$ $y(3 - x) = 2$ $-xy = 2 - 3y$ $x = \frac{-2+3y}{y}$ $h(x) = \frac{-2+3x}{x}, x \neq 0$	N1 K1 N1	3	6

NO	PENYELESAIAN	MARKAH		
	(b) $a\left(\frac{x+5}{2}\right) + b = 4 + 3x$ $\frac{a}{2} = 3$ atau $\frac{5a}{2} + b = 4$ $a = 6$ $b = -11$	K1 K1 N1	3	
7.	(a) $\left[2y = (m-1)x + \frac{10}{x}\right]\frac{x}{2}$ $xy = \frac{(m-1)x^2}{2} + 5$	N1	1	4
	(b) $\frac{m-1}{2} = -3$ atau $5n = 5$ $m = -5$ $n = 1$	K1 N1 N1	3	
8.	(a) $\overrightarrow{BC} = -3\underline{x} + 6\underline{y}$	N1	1	4
	(b) $\overrightarrow{AK} = \overrightarrow{AB} + \overrightarrow{BK}$ atau $\overrightarrow{AK} = \overrightarrow{AC} + \overrightarrow{CK}$ $= 3\underline{x} + \frac{n}{n+2}\overrightarrow{BC}$ $= 6\underline{y} + \left(\frac{-2}{n+2}\right)\overrightarrow{BC}$ $= 3\underline{x} + \frac{n}{n+2}(-3\underline{x} + 6\underline{y})$ $= 6\underline{y} - \frac{2}{n+2}(-3\underline{x} + 6\underline{y})$ $= \left(\frac{6}{n+2}\right)\underline{x} + \left(\frac{6n}{n+2}\right)\underline{y}$ $= \left(\frac{6}{n+2}\right)\underline{x} + \left(\frac{6n}{n+2}\right)\underline{y}$	K1 K1 N1	3	
9.	(a) $9 = 15\beta$ $\beta = 0.6 \text{ rad}$	K1 N1	2	5
	(b) $\frac{1}{2} (15)^2(0.6)$ atau / or $\frac{1}{2} (7.5)(15)\sin 34.37^\circ$ $\frac{1}{2} (15)^2(0.6) - \frac{1}{2} (7.5)(15)\sin 34.37^\circ$ 35.74	K1 K1 N1	3	

NO	PENYELESAIAN	MARKAH		
10.	(a) $(2x - 1)(x + 3) \leq 0$ $-3 \leq x \leq \frac{1}{2}$	K1 N1	2	4
	(b) $(3q)^2 - 4(p)(4) = 0$ $q = \pm \frac{4\sqrt{p}}{3}$	K1 N1	2	
11.	(a) $\int_1^3 x \, dx - 2 \int_1^3 g(x) \, dx$ $\left[\frac{x^2}{2}\right]_1^3 - 2(-10)$ 24	K1 K1 N1	3	6
	(b) $g(x) = \int 2x - 8 \, dx$ $g(x) = \frac{2x^2}{2} - 8x + c$ $0 = 1^2 - 8(1) + c$ $c = 7$ $g(x) = x^2 - 8x + 7$	K1 K1 N1	3	
12.	(a) ${}^5C_5 (p^5)(1-p)^0 = 0.16807$ $(p^5) = 0.16807$ $\log_{10} p^5 = \log_{10} 0.16807$ atau $p = \sqrt[5]{0.16807}$ $p = 0.7$	K1 N1	2	5
	(b) $P(x=4) + P(x=5)$ ${}^5C_4 (0.7)^4 (0.3)^1 + {}^5C_5 (0.7)^5 (0.3)^0$ 0.5282	K1 K1 N1	3	
13.	(a) (i) ${}^3P_3 \times 3 \times {}^4P_2$ 216 (ii) $({}^4P_3 \times {}^3P_2 \times 3)$ atau $({}^4P_4 \times {}^3P_1 \times 2)$ atau $({}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2)$ ${}^4P_3 \times {}^3P_2 \times 3 + {}^4P_4 \times {}^3P_1 \times 2 + {}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2$ 720	K1 N1 K1 K1 N1	5	

NO	PENYELESAIAN	MARKAH		
	(b) $\frac{n(n-1)(n-2)!}{r!(n-r)(n-1-r)(n-2-r)!} = \frac{(n-2)!}{r!(n-2-r)!}$ $\frac{n(n-1)}{(n-r)(n-1-r)} = 1$ $n^2 - n = n^2 - n - nr - nr + r + r^2$ $0 = -2nr + r + r^2$ $2nr = r + r^2$ $n = \frac{r+r^2}{2r}$ $n = \frac{1+r}{2}$	K1		8
		K1	3	
		N1		
14.	(a) i) $\frac{dx}{dt} = 3t^2$ ii) $\frac{dy}{dx} = \frac{9t^5}{2} \times \frac{1}{3t^2}$ $\frac{dy}{dx} = \frac{3t^3}{2}$ $\frac{dy}{dx} = \frac{3(x+6)}{2}$	N1		8
	(b) $\frac{dy}{dx} = 3(3 - 15x)^2(-15), \quad m = -5$ $-5 = -45(3 - 15x)^2$ $x = \frac{8}{45} \quad \text{atau} \quad x = \frac{2}{9}$ $y = \left(3 - 15\left(\frac{8}{45}\right)\right)^3 \quad \text{atau} \quad y = \left(3 - 15\left(\frac{2}{9}\right)\right)^3$ $y = \frac{1}{27} \quad \text{atau} \quad y = -\frac{1}{27}$ $\left(\frac{8}{45}, \frac{1}{27}\right) \quad \text{atau/or} \quad \left(\frac{2}{9}, -\frac{1}{27}\right)$	K1		
		K1		8
		N1	5	
		K1		8
		N1		

NO	PENYELESAIAN	MARKAH		
15.	(a) $ax^2 + bx + c = 0$ $x^2 + \frac{b}{a}x = -\frac{c}{a}$ $x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$ $\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$ $x + \frac{b}{2a} = \frac{\pm\sqrt{b^2-4ac}}{2a} \quad \text{atau} \quad x = \frac{\pm\sqrt{b^2-4ac}}{2a} - \frac{b}{2a}$ $x = \frac{-b+\sqrt{b^2-4ac}}{2a} \quad \text{atau} \quad x = \frac{-b-\sqrt{b^2-4ac}}{2a}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	K1	5	
		K1		
		K1		
		N1		
		N1		
	(b) $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(9)(5)}}{2(9)}$ $x = \frac{6 \pm \sqrt{-144}}{18}$ $x = \frac{6 \pm (\sqrt{144})(\sqrt{-1})}{18}$ $x = \frac{6 \pm 12i}{18}$ $x = \frac{1 \pm 2i}{3}$ $x = \frac{1+2i}{3}, \quad x = \frac{1-2i}{3}$	K1	3	8
		K1		
		N1		



**MODUL PINTAS
TINGKATAN 5**

3472/2

**MATEMATIK TAMBAHAN
Kertas 2**

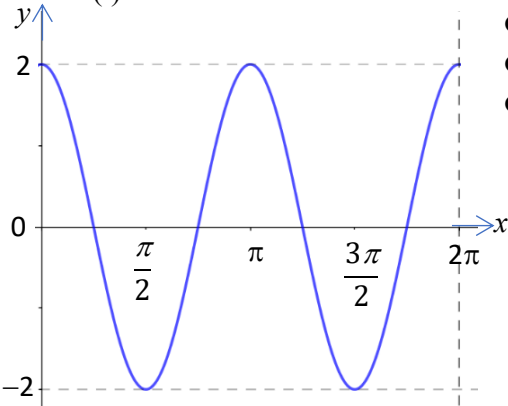
$2\frac{1}{2}$ jam

Dua jam tiga puluh minit

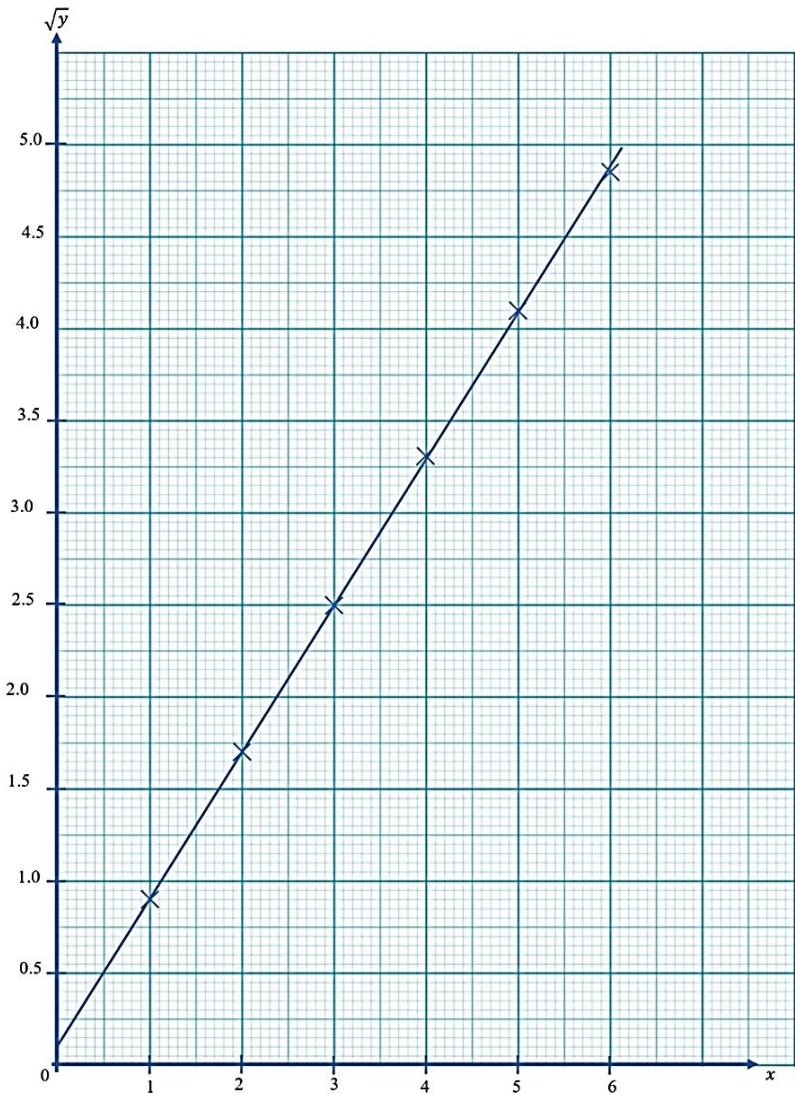
**PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN K2
3472/2**

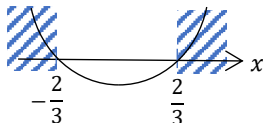
NO.	PENYELESAIAN	MARKAH		
1	(a) (i) $\frac{3}{2}(2\underline{i} + 4\underline{j})$ ATAU $\frac{3}{2}\begin{pmatrix} 2 \\ 4 \end{pmatrix}$ $3\underline{i} + 6\underline{j}$ ATAU $\begin{pmatrix} 3 \\ 6 \end{pmatrix}$ $(3, 6)$ (ii) $\overrightarrow{OS} = \overrightarrow{OP} + \frac{1}{6}\overrightarrow{PQ}$ ATAU $\overrightarrow{OS} = \overrightarrow{OQ} + \frac{5}{6}\overrightarrow{QP}$ $6\underline{i} + \frac{1}{6}(-6\underline{i} + (3\underline{i} + 6\underline{j}))$ ATAU $\begin{pmatrix} 6 \\ 0 \end{pmatrix} + \frac{1}{6}\begin{pmatrix} -6+3 \\ 6 \end{pmatrix}$ $(3\underline{i} + 6\underline{j}) + \frac{5}{6}(-3\underline{i} - 6\underline{j} + 6\underline{i})$ ATAU $\begin{pmatrix} 3 \\ 6 \end{pmatrix} + \frac{5}{6}\begin{pmatrix} -3+6 \\ -6 \end{pmatrix}$ $(\frac{11}{2}, 1)$	K1	4	8
	(b) $-2\underline{i} - 4\underline{j} + \frac{11}{2}\underline{i} + \underline{j}$ ATAU $\begin{pmatrix} -2 \\ -4 \end{pmatrix} + \begin{pmatrix} 11 \\ 2 \end{pmatrix}$ $\frac{7}{2}\underline{i} - 3\underline{j}$ ATAU $\begin{pmatrix} 7 \\ 2 \\ -3 \end{pmatrix}$ $\sqrt{\left(\frac{7}{2}\right)^2 + (-3)^2}$ $\frac{\sqrt{85}}{2}$ $\frac{1}{\frac{\sqrt{85}}{2}}\left(\frac{7}{2}\underline{i} - 3\underline{j}\right)$ ATAU $\frac{1}{\frac{\sqrt{85}}{2}}\begin{pmatrix} 7 \\ 2 \\ -3 \end{pmatrix}$ $\frac{7\sqrt{85}}{85}\underline{i} - \frac{6\sqrt{85}}{85}\underline{j}$ ATAU $\begin{pmatrix} \frac{7\sqrt{85}}{85} \\ \frac{6\sqrt{85}}{85} \end{pmatrix}$	K1		
2	(a) $\frac{1}{2}(2 + \sqrt{3})(3 + \sqrt{48})$ $\frac{1}{2}(6 + 2\sqrt{48} + 3\sqrt{3} + \sqrt{144})$ $9 + \frac{11}{2}\sqrt{3}$	K1	3	7
	(b) $\frac{1}{2}\log_a \frac{48 \times 0.25}{3^5}$ atau $\log_a \left(\frac{48 \times 0.25}{3^5}\right)^{\frac{1}{2}}$ $\log_a \left(\frac{4}{81}\right)^{\frac{1}{2}}$ ATAU $P^2 = \frac{4}{81}$ $\frac{2}{9}$ 2	K1		
		K1	4	

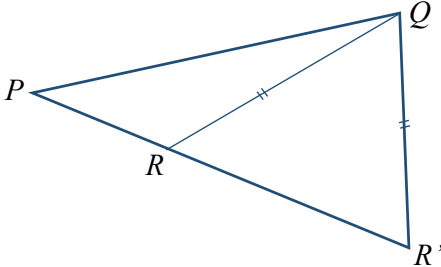
NO.	PENYELESAIAN	MARKAH		
3	$x + y + z = 17$, $x + 2y = 2z + 4$ $100z + 10y + x = 3(100x + 10y + z) - 79$ $97z = 299x + 20y - 79$ (tertunjuk) Hapus satu pemboleh ubah $x + y + \left(\frac{x+2y-4}{2}\right) = 17$ ATAU cara lain yang setara $3x + 4y = 38$ atau $3z - y = 13$ atau $x + 4z = 30$ $x = \frac{38-4y}{3}$ atau $y = 3z - 13$ atau $z = \frac{30-x}{4}$ ATAU $y = \frac{38-3x}{4}$ atau $z = \frac{y+13}{3}$ atau $x = 30 - 4z$ Hapus dua pemboleh ubah $299(30 - 4z) + 20(3z - 13) - 97z = 79$ atau setara $x = 2$ atau $y = 8$ atau $z = 7$ Nombor asal ialah 287	P1, P1 K1 K1 K1 N1 N1	7	7
4	(a) $\dots, a + d, a + 2d, a + 5d, \dots$ $\frac{a + 2d}{a + d} = \frac{a + 5d}{a + 2d}$ $d = -2a$ $r = 3$	K1 K1 K1 N1	4	7
	(b) $\frac{n}{2}[2(1) + (n - 1)3] = 925$ $(n - 25)(3n + 74) = 0$ $T_{25} = 1 + (25 - 1)(3) = 73$	K1 K1 N1	3	
5	(a) $\frac{360^\circ}{7} \times \frac{3.142}{180}$ 0.8977	N1	1	7
	(b) $\angle AOD = 3\left(\frac{360^\circ}{7}\right) = 154.29^\circ // 2.963 \text{ rad.}$ $(5) \sin\left(\frac{154.29^\circ}{2}\right)$ atau $(5)(0.8977)$ ATAU $5^2 + 5^2 - 2(5)(5) \cos 154.29^\circ$ $7\left[2(5) \sin\left(\frac{154.29^\circ}{2}\right)\right] + 3(5)(0.8977)$ ATAU $7 \times \sqrt{5^2 + 5^2 - 2(5)(5) \cos 154.29^\circ} + 3(5)(0.8977)$ = 81.71 cm 81.71 cm dan cukup 81.71 cm and enough	P1 K1 K1 N1	4	

NO.	PENYELESAIAN	MARKAH		
	(c) $3 \left[\frac{1}{2} (5)^2 \left(0.8977 - \sin \left(\frac{360}{7} \right)^\circ \right) \right]$ 4.345 cm^3	K1 N1	2	
6	(a) $x^2 = -x^2 + 4$ $x = \sqrt{2}$	K1 N1	2	8
	(b) $\int_0^{\sqrt{2}} x^2 dx + \int_{\sqrt{2}}^2 -x^2 + 4 dx$ $= \left[\frac{x^3}{3} \right]_0^{\sqrt{2}} + \left[-\frac{x^3}{3} + 4x \right]_{\sqrt{2}}^2$ $= \left[\frac{\sqrt{2}^3}{3} - 0 \right] + \left[\left(-\frac{2^3}{3} + 4(2) \right) - \left(-\frac{\sqrt{2}^3}{3} + 4\sqrt{2} \right) \right]$ $= \frac{16-8\sqrt{2}}{3} \text{ unit}^2 \text{ or } 1.562 \text{ unit}^2$	K1 K1 N1	3	
	(c) $\pi \int_2^4 4 - y dy + \pi \int_0^2 y dy$ $= \pi \left[4y - \frac{y^2}{2} \right]_2^4 + \pi \left[\frac{y^2}{2} \right]_0^2$ $= \pi \left[\left(4(4) - \frac{4^2}{2} \right) - \left(4(2) - \frac{2^2}{2} \right) \right] + \pi \left[\frac{2^2}{2} - 0 \right]$ $= 4\pi \text{ unit}^3$	K1 K1 N1	3	
7	(a) $2 \left[\frac{\frac{\cos x}{\sin x} - \frac{\sin x}{\cos x}}{\left(\frac{1}{\cos x} \right) \left(\frac{1}{\sin x} \right)} \right]$ $2(\cos^2 x - \sin^2 x) = 2 \cos 2x$	K1 N1	2	6
	(b) (i)  ● bentuk $\cos x$ ● ulang 2 kitaran ● $-2 \leq y \leq 2$ (ii) $2 \leq n \leq 4$	P1 P1 P1 N1	4	

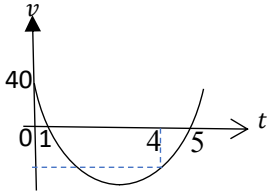
NO	PENYELESAIAN	MARKAH		
8	(a) (i) ${}^5C_4 \left(\frac{2}{3}\right)^4 \left(\frac{1}{3}\right)^1$ $= \frac{80}{243} = 0.3292$ (ii) ${}^5C_3 \left(\frac{1}{3}\right)^3 \left(\frac{2}{3}\right)^2$ ATAU ${}^5C_4 \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right)^1$ ATAU ${}^5C_5 \left(\frac{1}{3}\right)^5 \left(\frac{2}{3}\right)^0$ ATAU ${}^5C_2 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^3$ ATAU ${}^5C_1 \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^4$ ATAU ${}^5C_0 \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^5$ ${}^5C_3 \left(\frac{1}{3}\right)^3 \left(\frac{2}{3}\right)^2 + {}^5C_4 \left(\frac{1}{3}\right)^4 \left(\frac{2}{3}\right)^1 + {}^5C_5 \left(\frac{1}{3}\right)^5 \left(\frac{2}{3}\right)^0$ ATAU ${}^5C_2 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^3 + {}^5C_1 \left(\frac{2}{3}\right)^1 \left(\frac{1}{3}\right)^4 + {}^5C_0 \left(\frac{2}{3}\right)^0 \left(\frac{1}{3}\right)^5$ $= \frac{17}{81} = 0.2099$	K1 N1 K1 K1 N1	5	10
	(b) (i) $P\left(Z > \frac{2.28-2}{0.3}\right)$ $= 0.1753 // 0.1754$ (daripada Jadual) $= 17.53\% // 17.54\%$ (ii) $P\left(Z < \frac{m-2}{0.3}\right) = 0.15$ (terima $\leq$) $\frac{m-2}{0.3} = -1.036$ $m = 1.689$	K1 N1 K1 K1 N1	5	

NO	PENYELESAIAN	MARKAH									
9	(a) <table border="1"><tr><td>$\sqrt{y}$</td><td>0.91</td><td>1.69</td><td>2.5</td><td>3.3</td><td>4.1</td><td>4.85</td></tr></table> Plot paksi-$\sqrt{y}$ melawan paksi-x dengan skala seragam yang betul dan satu titik diplot dengan betul. Keenam-enam titik diplot dengan betul. Garis lurus penyuaian terbaik. 	$\sqrt{y}$	0.91	1.69	2.5	3.3	4.1	4.85	N1		
$\sqrt{y}$	0.91	1.69	2.5	3.3	4.1	4.85					
		K1									
		N1									
		N1									
			4								
				10							
	(b) (i) $\sqrt{y} = \frac{4}{p}x - \frac{4q}{p}$ $\frac{4}{p} = \frac{4.1^* - 0.1^*}{5^* - 0^*}$ * bagi mana-mana dua pasangan titik di atas garis lurus penyuaian terbaik $p = 5 \sim 5.11$ $-\frac{4q}{p} = 0.10^*$ * merujuk pintasan-y dalam graf $q = -0.19 \sim -0.13$ (ii) $2.03 \sim 2.18$	P1									
		K1									
		N1	6								
		K1									
		N1									
		N1									

NO	PENYELESAIAN	MARKAH																										
10	(a) $\frac{2-(-7)}{8-p} = -\frac{1}{\frac{10-2}{2-8}}$ $p = -4$	K1 N1	2	10																								
	(b) $y - (-7) = -\frac{4}{3}(x - (-4))$ $y = -\frac{4}{3}x - \frac{37}{3}$ $q = 1$	K1 N1 N1	3																									
	(c) $\frac{1}{2} (-10)(-7) + (-4)2 + 8(10) + 2(1) - 1(-4) - (-7)(8) - (2)(2) - 10(-10) $ ATAU $\sqrt{(8-2)^2 + (2-10)^2} \times \sqrt{(8-(-4))^2 + (2-(-7))^2}$ 150	K1 N1	2																									
	(d) $\sqrt{(x - (-10))^2 + (y - 1)^2}$ atau $\sqrt{(x - 8)^2 + (y - 2)^2}$ $2\sqrt{(x - (-10))^2 + (y - 1)^2} = 3\sqrt{(x - 8)^2 + (y - 2)^2}$ $5x^2 + 5y^2 - 224x - 28y + 208 = 0$	P1 K1 N1	3																									
11	(a) (i) tidak tertakrif // tiada jawapan <i>undefined // no solution</i> (ii) <table border="1"><tr><td>x</td><td>-0.1</td><td>-0.01</td><td>-0.001</td><td>-0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-11.9666</td><td>-11.9967</td><td>-11.9997</td><td>-12.0000</td><td>-</td></tr></table> <table border="1"><tr><td>x</td><td>0.1</td><td>0.01</td><td>0.001</td><td>0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-12.0332</td><td>-12.0033</td><td>-12.0003</td><td>-12.0000</td><td>-</td></tr></table> SS-1 jika nilai dalam jadual tidak tepat kepada 4 tempat perpuluhan (iii) -12	x	-0.1	-0.01	-0.001	-0.0001	0	$f(x)$	-11.9666	-11.9967	-11.9997	-12.0000	-	x	0.1	0.01	0.001	0.0001	0	$f(x)$	-12.0332	-12.0033	-12.0003	-12.0000	-	N1 N1 N1	4	10
	x	-0.1	-0.01	-0.001	-0.0001	0																						
$f(x)$	-11.9666	-11.9967	-11.9997	-12.0000	-																							
x	0.1	0.01	0.001	0.0001	0																							
$f(x)$	-12.0332	-12.0033	-12.0003	-12.0000	-																							
(b) $\frac{dy}{dx} = (1)(x^2 - 4) + x(2x)$ $= 3x^2 - 4$ $\frac{d^2y}{dx^2} = 6x$ $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = x(6x) + 3x^2 - 4$ $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = 9x^2 - 4$ $9x^2 - 4 > 0$ $(3x + 2)(3x - 2) > 0$ dan  $x < -\frac{2}{3}$ atau / or $x > \frac{2}{3}$	K1 N1 N1 N1 K1 N1	6																										

NO	PENYELESAIAN	MARKAH		
12	(a) $\frac{1}{2}(7.2 + 3.646 + 4.992)$ $\sqrt{(7.919)(7.919 - 7.2)(7.919 - 3.646)(7.919 - 4.992)}$ 8.439 SS-1 jika mencari luas dengan sudut P, Q atau R .	P1 K1 N1	3	10
	(b) Rumus Kosinus diguna dengan betul $\cos P = \frac{7.2^2 + 4.992^2 - 3.646^2}{2(7.2)(4.992)}$ ATAU $\frac{1}{2}(7.2)(4.992) \sin P = 8.439$ atau setara 28.01°	K1 N1	2	
	(c) (i)  $\angle QR'P$ mesti sudut tirus	N1	5	
	(ii) $\frac{\sin R'}{7.2} = \frac{\sin 28.01^\circ}{3.646}$ atau setara 68.03°	K1 N1		
	(iii) $\sin 28.01^\circ = \frac{t}{7.2}$ atau $\sin 68.03^\circ = \frac{t}{3.646}$ (t boleh diganti oleh mana-mana simbol atau huruf) 3.381	K1 N1		

NO	PENYELESAIAN	MARKAH		
13	(a) I : $y \leq 3x$ II : $5x + 4y \geq 160$	N1 N1	2	10
	(b) Jumlah jisim udang dan ikan pari yang dibeli tidak lebih daripada 100 kg. <i>Total mass of prawn and stingray bought is not more than 100 kg.</i>	N1	1	
	(c) Satu garis lurus dan kedua-dua paksi dilukis dengan skala yang betul. Semua garis dilukis dengan betul. Rantau R dilorek dengan tepat.	K1 N1 N1	3	
	(d) (i) Bila $y = 20$ kg, minimum $x = 16$ kg 16 kg (ii) Fungsi objektif kos, $K = 25x + 20y$ Titik optimum (100, 0) Amaun maksimum wang yang dibayar $= \text{RM } [25(100) + 20(0)]$ $= \text{RM}2500$	N1 P1 K1 N1	4	

NO	PENYELESAIAN	MARKAH		
14	(a) $v = 8t^2 - 48t + 40$ $s = \frac{8t^3}{3} - 24t^2 + 40t$ $16t - 48 = 0 \Rightarrow t = 3$ $s = \frac{8(3)^3}{3} - 24(3)^2 + 40(3)$ $= -24$	K1 K1 K1 N1	4	10
	(b) Bila bola snuker bertukar arah, $v = 0$ $8t^2 - 48t + 40 = 0$ $8(t - 1)(t - 5) = 0$ $t = 1$ or $t = 5$	K1 K1 N1	3	
	(c) Bila $a = 16 \text{ ms}^{-2}$, $16t - 48 = 16$ ATAU $\smile$ dengan pintsan- $y = 40$ $t = 4$ Bila $t = 4$, $v = 8(4)^2 - 48(4) + 40$ ATAU garis $x = 4$ dilukis kepada graf dan menuju ke nilai v negatif $v = -24$  Halaju negatif menunjukkan bola snuker bergerak ke arah kiri apabila pecutannya ialah 16 ms^{-2} .	K1 K1 N1	3	
15	(a) $\frac{P_{2021}}{75} \times 100 = 145$ RM108.75	K1 N1	2	10
	(b) $\frac{(138 \times 10) + (30 \times h) + (145 \times 40) + (108 \times 20)}{100}$ $\frac{(138 \times 10) + (30 \times h) + (145 \times 40) + (108 \times 20)}{100} = 130$ $h = 122$	P1 K1 N1	3	
	(c) (i) $122 \times \frac{115}{100}$ atau $108 \times \frac{90}{100}$ ATAU $\frac{(100 \times 10) + (115 \times 30) + (100 \times 40) + (90 \times 20)}{100}$ $\frac{(138 \times 10) + (140.3 \times 30) + (145 \times 40) + (97.2 \times 20)}{100}$ ATAU $130 \times \frac{102.5}{100}$ 133.33 ATAU 133.25	K1 K1 N1	5	
	(ii) $\frac{P_{2025}}{128} \times 100 = 133.33^*$ (*Jawapan daripada (c)(i)) 170.66 ATAU 170.56	K1 N1		



**MODUL PINTAS
TINGKATAN 5**

3472/1

**MATEMATIK TAMBAHAN
Kertas 1**

2 jam

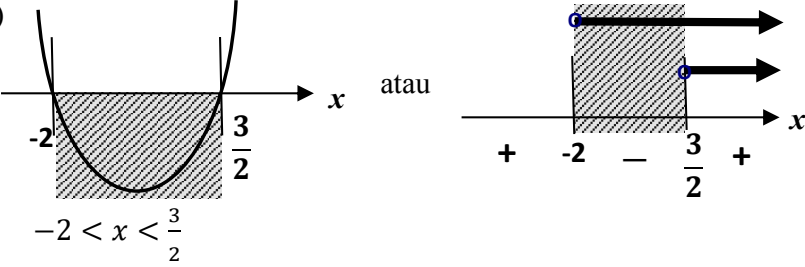
Dua jam

**PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN K1
3472/1**

NO	PENYELESAIAN	MARKAH		
1.	(a) $\frac{p^2}{3} \times 3^p \times 2^{-(p+6)} \times y^{-4p} \times y^{p+6} = q^1 y^{-3}$ $y^{-4p+p+6} = y^{-3}$ $-3p + 6 = -3$ $p = 3$ $\frac{p^2}{3} \times 3^p \times 2^{-(p+6)} = q^1$ $q = \frac{81}{512}$	K1	4	7
	(b) $\left(\log_2 8 \right) \left(\log_2 y \right) \left(\log_2 x \right)$ $\left(\log_2 \sqrt{y} \right) \left(\log_2 x \right) \left(\log_2 x \right)$ $\left(3 \log_2 2 \right) \left(\log_2 y \right) \left(\log_2 x \right)$ $\left(\frac{1}{2} \log_2 y \right) \left(\log_2 x \right) \left(\log_2 x \right)$ 6	K1		
		K1	3	
		N1		
2.	$x = 5 - 2y \dots \dots \dots (1)$ $x + y = 4 \dots \dots \dots (2)$ Gantikan (1) ke dalam (2) $5 - 2y + y = 4$ $5 - y = \pm 4$ $y = 1, \quad y = 9$ $x = 3, \quad x = -13$	P1	4	4
		K1		
		N1		
		N1		

NO	PENYELESAIAN	MARKAH		
3.	$\frac{a(r^4 - 1)}{r - 1} = 10 \left[\frac{a(r^2 - 1)}{r - 1} \right]$ $r^4 - 1 = 10r^2 - 10$ $r^4 - 10r^2 + 9 = 0 \text{ (Tertunjuk/ Proven)}$ $r^4 - 10r^2 + 9 = 0$ $(r^2 - 1)(r^2 - 9) = 0$ $r^2 - 1 = 0 \qquad r^2 - 9 = 0$ $r = \pm 1 \text{ (Abaikan)} \quad \text{atau} \quad r = \pm 3$ $\text{Nilai Positif } r = 3 / \text{The value of } r = 3$	K1 N1 K1 N1 N1	5	5
4.	(a) $\cos 3\alpha = \cos(2\alpha + \alpha)$ $= \cos 2\alpha \cos \alpha - \sin 2\alpha \sin \alpha$ $= (2 \cos^2 \alpha - 1) \cos \alpha - (2 \sin \alpha \cos \alpha) \sin \alpha$ $= 2 \cos^3 \alpha - \cos \alpha - 2 \sin^2 \alpha \cos \alpha$ $= 2 \cos^3 \alpha - \cos \alpha - 2(1 - \cos^2 \alpha) \cos \alpha$ $= 2 \cos^3 \alpha - \cos \alpha - 2 \cos \alpha + 2 \cos^3 \alpha$ $= 4 \cos^3 \alpha - 3 \cos \alpha$	K1 K1 K1 K1	4	7
	(b) $2 \cos^2 \alpha - 1 = 5 \cos \alpha - 3$ $2 \cos^2 \alpha - 5 \cos \alpha + 2 = 0$ $(\cos \alpha - 2)(2 \cos \alpha - 1) = 0$ $\cos \alpha = 2 \text{ (Tiada Penyelesaian)} \qquad 2 \cos \alpha = 1$ $\cos \alpha = \frac{1}{2}$ $\alpha = 60^\circ$	K1 K1 N1	3	

NO	PENYELESAIAN	MARKAH		
	b) $p\left(\frac{2x-3}{3}\right) - q = -3x + 6$ $\frac{2p}{3} = -3$ atau / or $-p - q = 6$ $p = -\frac{9}{2}$ $q = -\frac{3}{2}$	K1 K1 N1	3	
7.	a) $\left(4y = 2x + \frac{q}{x}\right)\frac{x}{4}$ $xy = \frac{x^2}{2} + \frac{q}{4}$	N1	1	4
	b) $\frac{1}{2} = \frac{2-p}{10-0}$ atau $2 = \frac{1}{2}(10) + \frac{q}{4}$ atau $\frac{q}{4} = p$ $p = -3$ $q = -12$	K1 N1 N1	3	
8.	a) $\overrightarrow{OT} = \overrightarrow{OR} + \overrightarrow{RT}$ $= \frac{1}{2}\overrightarrow{OP} + m\overrightarrow{RQ}$ $= \frac{1}{2}(10\underline{b}) + m(-5\underline{b} + 8\underline{a})$ $= (5 - 5m)\underline{b} + 8m\underline{a}$	K1 N1	2	4
	b) $\overrightarrow{OT} = \overrightarrow{OS} + \overrightarrow{ST}$ $= \frac{1}{2}\overrightarrow{OQ} + n\overrightarrow{SP}$ $= \frac{1}{4}(8\underline{a}) + n(-2\underline{a} + 10\underline{b})$ $= (2 - 2n)\underline{a} + 10n\underline{b}$	K1 N1	2	
9.	a) $\frac{1}{2}(18)^2\theta = 150$ $\theta = 0.9259 \text{ rad}$	K1 N1	2	5
	b) $s = 18(2\pi - 0.9259)$ $18(2\pi - 0.9259) + 2(18)$ 132.45 cm	K1 K1 N1	3	

NO	PENYELESAIAN	MARKAH		
10.	a)  $-2 < x < \frac{3}{2}$	K1 N1	2	4
	b) $(-2n)^2 - 4(m)(5) = 0$ $n = \pm\sqrt{5m}$	K1 N1	2	
11.	a) $y = \int 2x \, dx$ $y = x^2 + c$ $3 = 1^2 + c$ $c = 2$ $y = x^2 + 2$	K1 K1 N1	3	6
	b) $\int_2^3 (y-2)^{\frac{1}{2}} \, dy$ $\left[\frac{(y-2)^{\frac{3}{2}}}{\frac{3}{2}(1)} \right]_2^3$ $\left[\frac{(3-2)^{\frac{3}{2}}}{\frac{3}{2}(1)} \right] - \left[\frac{(2-2)^{\frac{3}{2}}}{\frac{3}{2}(1)} \right]$ $\frac{2}{3}$	K1 K1 N1	3	
12.	a) ${}^7C_7 (p^7)(1-p)^0 = 0.04398$ $\log_{10} p^7 = \log_{10} 0.04398$ atau $p = \sqrt[7]{0.04398}$ $p = 0.64$	K1 N1	2	5
	b) ${}^7C_0(0.64)^0(0.36)^7$ atau ${}^7C_1(0.64)^1(0.36)^6$ atau ${}^7C_2(0.64)^2(0.36)^5$ ${}^7C_0(0.64)^0(0.36)^7 + {}^7C_1(0.64)^1(0.36)^6 + {}^7C_2(0.64)^2(0.36)^5$ 0.06255	K1 K1 N1	3	
13.	(a) (i) ${}^3P_3 \times 3 \times {}^4P_2$ 216	K1 N1		

NO	PENYELESAIAN	MARKAH		
	(ii) ${}^4P_3 \times {}^3P_2 \times 3$ atau ${}^4P_4 \times {}^3P_1 \times 2$ atau ${}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2$ ${}^4P_3 \times {}^3P_2 \times 3 + {}^4P_4 \times {}^3P_1 \times 2 + {}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2$ 720	K1 K1 N1	5	8
	(b) $\frac{n(n-1)(n-2)!}{(n-r)(n-1-r)(n-2-r)!} = \frac{(n-2)!}{(n-2-r)!}$ $\frac{n(n-1)}{(n-r)(n-1-r)} = 1$ $n^2 - n = n^2 - n - nr - nr + r + r^2$ $0 = -2nr + r + r^2$ $2nr = r + r^2$ $n = \frac{r + r^2}{2r}$ $n = \frac{1+r}{2}$	K1 K1 N1	3	
14.	a) i) $\frac{dx}{dt} = 2t$ ii) $\frac{dy}{dx} = 14t^3 \times \frac{1}{2t}$ $\frac{dy}{dx} = 7t^2$ $\frac{dy}{dx} = 7(x-3)$	N1 K1 N1	3	8
	b) $2x + 2y = 18$ $y = 9 - x$ atau $2\pi j = x$ $j = \frac{x}{2\pi}$ $I = \pi j^2 t$ $= \pi \left(\frac{x}{2\pi}\right)^2 (y)$ $= \frac{\pi x^2}{4\pi^2} (y)$ $= \frac{1}{4\pi} x^2 (9 - x)$	K1 K1		

NO	PENYELESAIAN	MARKAH		
	$= \frac{9x^2}{4\pi} - \frac{x^3}{4\pi}$ $\frac{dI}{dx} = \frac{9x}{2\pi} - \frac{3x^2}{4\pi}$ $\frac{9x}{2\pi} - \frac{3x^2}{4\pi} = 0$ $\frac{x}{2\pi} \left(9 - \frac{3x}{2} \right) = 0$ $\frac{x}{2\pi} = 0$ $x = 0$ tidak diterima kerana $x > 0$ $9 - \frac{3x}{2} = 0$ <i>Panjang/ Length = 6 dan Lebar/ Width = 3</i>	K1		
		K1	5	
		N1		
15.	(a) $ax^2 + bx + c = 0$ $x^2 + \frac{b}{a}x = -\frac{c}{a}$ $x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$ $\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$ $x + \frac{b}{2a} = \frac{\pm\sqrt{b^2-4ac}}{2a} \text{ atau } x = \frac{\pm\sqrt{b^2-4ac}}{2a} - \frac{b}{2a}$ $x = \frac{-b+\sqrt{b^2-4ac}}{2a} \text{ atau } x = \frac{-b-\sqrt{b^2-4ac}}{2a}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	K1		
		K1	5	
		K1		
		N1		
		N1		
	(b) $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(5)}}{2(1)}$ $x = \frac{4 \pm \sqrt{-4}}{2}$ $x = \frac{4 \pm (\sqrt{4})(\sqrt{-1})}{2}$	K1		
		K1		8

NO	PENYELESAIAN	MARKAH		
			3	
	$x = \frac{4 \pm 2i}{2}$ $x = \frac{4+2i}{2} , x = \frac{4-2i}{2}$ $x = 2 + i , x = 2 - i$	N1		



MODUL PINTAS
TINGKATAN 5
MATEMATIK TAMBAHAN
Kertas 2

3472/2

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

Dua jam tiga puluh minit

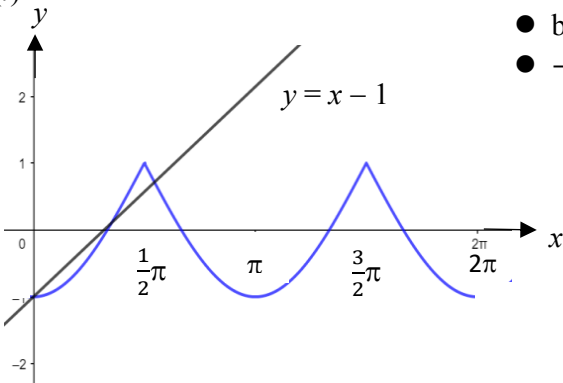
PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN K2
3472/2

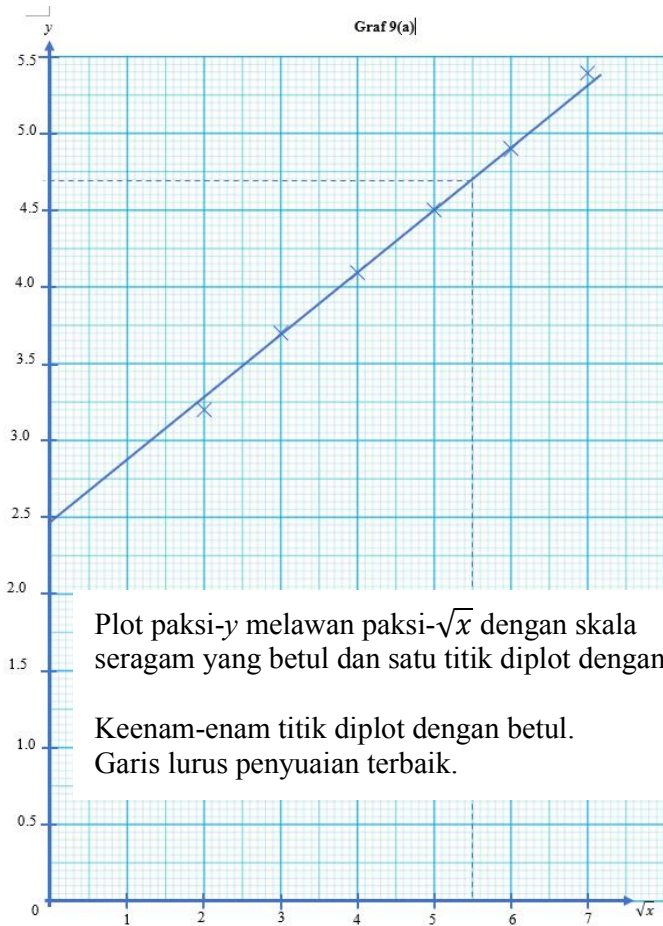
PERATURAN PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM 2022
MODUL PINTAS SELANGOR (SET 2)

MATEMATIK TAMBAHAN KERTAS 2

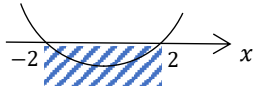
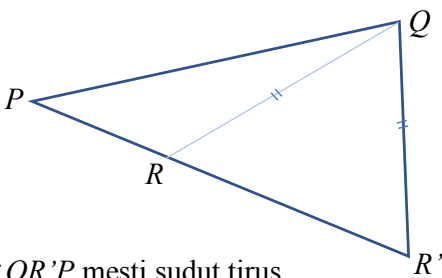
NO.	PENYELESAIAN	MARKAH		
1.	$(a) (i) \overrightarrow{OQ} = \overrightarrow{OP} + \overrightarrow{PQ} \text{ atau } \overrightarrow{OP} = 2\hat{i} - \hat{j} \text{ atau } \overrightarrow{OP} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$ $= (2\hat{i} - \hat{j}) + (4\hat{i} + 3\hat{j}) \text{ atau } \begin{pmatrix} 2 \\ -1 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \end{pmatrix}$ $(6, 2)$ $(ii) \overrightarrow{OR} = \overrightarrow{OP} + 2\overrightarrow{TR}$ $= (2\hat{i} - \hat{j}) + 2(5\hat{i} + 2\hat{j}) \text{ atau } \begin{pmatrix} 2 \\ -1 \end{pmatrix} + 2\begin{pmatrix} 5 \\ 2 \end{pmatrix}$ $(12, 3)$	K1 N1	4	8
	$(b) \overrightarrow{QT} = (6\hat{i} + \hat{j}) + (-5\hat{i} - 2\hat{j}) \text{ atau } \begin{pmatrix} 6 \\ 1 \end{pmatrix} + \begin{pmatrix} -5 \\ -2 \end{pmatrix} \text{ ATAU } \begin{pmatrix} -4 \\ -3 \end{pmatrix} + \begin{pmatrix} 5 \\ 2 \end{pmatrix}$ $= \hat{i} - \hat{j} \text{ atau } = \begin{pmatrix} 1 \\ -1 \end{pmatrix}$ $ \overrightarrow{QT} = \sqrt{(1)^2 + (-1)^2}$ $= \sqrt{2}$ $\frac{1}{\sqrt{2}}(\hat{i} - \hat{j}) \text{ ATAU } \frac{1}{\sqrt{2}}\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ $\frac{\sqrt{2}}{2}\hat{i} - \frac{\sqrt{2}}{2}\hat{j} \text{ ATAU } \begin{pmatrix} \frac{\sqrt{2}}{2} \\ -\frac{\sqrt{2}}{2} \end{pmatrix}$	K1 K1 N1		
2.	$(a) \frac{1}{2}(2 + \sqrt{3})(4 + \sqrt{27})$ $\frac{1}{2}(8 + 2\sqrt{27} + 4\sqrt{3} + \sqrt{81})$ $\frac{17}{2} + 5\sqrt{3}$	K1 K1 N1	3	7
	$(b) \frac{1}{3}\log_a \frac{24}{\frac{3}{8} \times 3^6} \text{ atau } \log_a \left(\frac{24}{\frac{3}{8} \times 3^6} \right)^{\frac{1}{3}}$ $\log_a P = \log_a \left(\frac{64}{729} \right)^{\frac{1}{3}} \text{ ATAU } \log_a P^3 = \log_a \frac{64}{729} \text{ atau setara}$ $\frac{4}{9}$ 2	K1 K1 N1 N1		

NO.	PENYELESAIAN	MARKAH		
3.	$x + y + z = 11$, $x + 2y = z$ $100z + 10y + x = 5(100x + 10y + z) + 46$ $95z = 499x + 40y + 46$ (tertunjuk) Hapus satu pemboleh ubah $x + y + (x + 2y) = 11$ atau cara lain yang setara $2x + 3y = 11$ ATAU $2z - y = 11$ $x = \frac{11-3y}{2}$ atau $y = \frac{11-2x}{3}$ atau $z = \frac{y+11}{2}$ Hapus dua pemboleh ubah $499\left(\frac{11-3y}{2}\right) + 40y - 95\left(\frac{11-3y}{2} + 2y\right) = -46$ atau $499x + 40\left(\frac{11-2x}{3}\right) - 95\left(x + 2\left(\frac{11-2x}{3}\right)\right) = -46$ atau setara $x = 1$ atau $y = 3$ atau $z = 7$ 137	P1 P1 K1 K1 K1 N1 N1	7	7
4.	(a) ..., $a + 2d$, $a + 5d$, $a + 11d$, ... $\frac{a + 5d}{a + 2d} = \frac{a + 11d}{a + 5d}$ $d = a$ $r = 2$	P1 K1 K1 N1	4	7
	(b) $\frac{n}{2}[2(25) + (n - 1)25] > 1000$ $n = 9$ $S_9 = \frac{9}{2}[2(25) + (9 - 1)25]$ $= 1125$	K1 K1 N1	3	
5.	(a) $\frac{360^\circ}{5} \times \frac{3 \cdot 142}{180}$ 1.257	 N1	1	7
	(b) $\angle AOC = 2\left(\frac{360}{5}\right)^\circ = 144^\circ // 2.514 \text{ rad.}$ $(5) \sin\left(\frac{144^\circ}{2}\right)$ atau $(5)(1.257)$ ATAU $5^2 + 5^2 - 2(5)(5) \cos 144^\circ$ $5\left[2(5) \sin\left(\frac{144^\circ}{2}\right)\right] + 2(5)(1.257)$ ATAU $5 \times \sqrt{5^2 + 5^2 - 2(5)(5) \cos 144^\circ} + 2(5)(1.257)$ $= 60.13 \text{ cm}$ atau 60.12 cm 60.13 cm dan tidak cukup 60.13 cm and not enough	P1 K1 K1 N1	4	
	(c) $2\left[\frac{1}{2}(5)^2\left(1.257 - \sin\left(\frac{360}{5}\right)^\circ\right)\right]$ 7.649 cm ²	K1 N1	2	

NO.	PENYELESAIAN	MARKAH		
6.	(a) $-x^2 = x^2 - 4$ $x = -\sqrt{2}$	K1	2	8
	(b) $-\int_{-2}^{-\sqrt{2}} x^2 - 4 \, dx - \int_{-\sqrt{2}}^0 -x^2 \, dx$ $= -\left[\frac{x^3}{3} - 4x\right]_{-2}^{-\sqrt{2}} - \left[-\frac{x^3}{3}\right]_{-\sqrt{2}}^0$ $= -\left[\left(\frac{(-\sqrt{2})^3}{3} - 4(-\sqrt{2})\right) - \left(\frac{(-2)^3}{3} - 4(-2)\right)\right] - \left[0 - \left(-\frac{(-\sqrt{2})^3}{3}\right)\right]$ $= \frac{16 - 8\sqrt{2}}{3} = 1.562$	K1		
	(c) $= \pi \left[\frac{y^2}{2} + 4y\right]_{-4}^{-2} + \pi \left[-\frac{y^2}{2}\right]_{-2}^0$ $= \pi \left[\left(\frac{(-2)^2}{2} + 4(-2)\right) - \left(\frac{(-4)^2}{2} + 4(-4)\right)\right] + \pi \left[-0 - \left(-\frac{(-2)^2}{2}\right)\right]$ $= 4\pi \text{ unit}^3$	K1	3	
7.	(a) $\frac{\frac{2}{\sin x}}{\frac{\cos x}{\sin x} + \frac{\sin x}{\cos x}}$ $\frac{2}{\sin x} \times \frac{\sin x \cos x}{\cos^2 x + \sin^2 x} = 2 \cos x$	K1	2	6
	(b) (i)  ● bentuk $\cos x$ ● $-1 \leq y \leq 1$	P1 P1		
	(ii) garis $y = x - 1$ dilakar 3 penyelesaian	K1 N1	4	

NO	PENYELESAIAN	MARKAH									
8.	(a) (i) ${}^4C_1\left(\frac{1}{6}\right)^1\left(\frac{5}{6}\right)^3$ $=\frac{125}{324}=0.3858$ (ii) ${}^4C_3\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^1$ ATAU ${}^4C_4\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)^0$ ${}^4C_3\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^1+{}^4C_4\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)^0$ $=\frac{5}{16}=0.3125$	K1	5	10							
		N1									
		K1									
		K1									
	(b) (i) $P\left(Z>\frac{350-340}{30}\right)$ $=0.3696$ $=36.96\%$ (ii) $P\left(Z<\frac{280-340}{30}\right)$ $=0.0228$	K1	5								
		N1									
		N1									
		K1									
9.	(a) <table border="1"><tr><td>$\sqrt{x}$</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr></table>  Plot paksi-y melawan paksi-$\sqrt{x}$ dengan skala seragam yang betul dan satu titik diplot dengan betul. Keenam-enam titik diplot dengan betul. Garis lurus penyuaian terbaik.	$\sqrt{x}$	2	3	4	5	6	7	N1	4	10
		$\sqrt{x}$	2	3	4	5	6	7			
		K1									
		N1									
N1											

NO	PENYELESAIAN	MARKAH																										
	(b) (i) $y = 2a\sqrt{x} + b$ $2a = \frac{4.9^*-2.5^*}{6-0^*}$ * bagi mana-mana dua pasangan titik di atas garis penyuaian terbaik $a = 0.2$ $b = 2.475^*$ * merujuk pintasan-y dalam graf (ii) garis $\sqrt{x} = 5.5$ dilukis pada graf 4.7* *Rujuk kepada nilai y apabila $\sqrt{x} = 5.5$	P1 K1 N1 N1 K1 N1	6																									
10.	(a) $\frac{(-16)-(-10)}{p-(-5)} = -\frac{1}{\frac{0-(-10)}{0-(-5)}}$ $p = 7$	K1 N1	2	10																								
	(b) $y - (-16) = 2(x - 7)$ $y = 2x - 30$ $q = 20$	K1 N1 N1	3																									
	(c) $\frac{1}{2} 0(-10) + (-5)(-16) + 7(10) + 20(0) - 0(-5) - (-10)(7) - (-16)(20) - 10(0)$ 270	K1 N1	2																									
	(d) $\sqrt{(x - (-5))^2 + (y - (-10))^2}$ atau $\sqrt{(x - 20)^2 + (y - 10)^2}$ $3\sqrt{(x - (-5))^2 + (y - (-10))^2} = 2\sqrt{(x - 20)^2 + (y - 10)^2}$ $x^2 + y^2 + 50x + 52y - 175 = 0$	P1 K1 N1	3																									
11.	(a) (i) tidak tertakrif // tiada jawapan <i>undefined // no solution</i> (ii) <table><tr><td>x</td><td>- 0.1</td><td>- 0.01</td><td>- 0.001</td><td>- 0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-11.9245</td><td>-11.9925</td><td>-11.9992</td><td>-11.9999</td><td>-</td></tr></table> <table><tr><td>x</td><td>0.1</td><td>0.01</td><td>0.001</td><td>0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-12.0745</td><td>-12.0075</td><td>-12.0007</td><td>-12.0001</td><td>-</td></tr></table> SS-1 jika nilai dalam jadual tidak tepat kepada 4 tempat perpuluhan (iii) -12	x	- 0.1	- 0.01	- 0.001	- 0.0001	0	$f(x)$	-11.9245	-11.9925	-11.9992	-11.9999	-	x	0.1	0.01	0.001	0.0001	0	$f(x)$	-12.0745	-12.0075	-12.0007	-12.0001	-	N1 N1 N1	4	
x	- 0.1	- 0.01	- 0.001	- 0.0001	0																							
$f(x)$	-11.9245	-11.9925	-11.9992	-11.9999	-																							
x	0.1	0.01	0.001	0.0001	0																							
$f(x)$	-12.0745	-12.0075	-12.0007	-12.0001	-																							

NO	PENYELESAIAN	MARKAH		
	(b) $\frac{dy}{dx} = \frac{2x(x)-(x^2-4)}{x^2}$ ATAU $\frac{dy}{dx} = 1 - 4(-1)(x^{-1-1})$ $\frac{d^2y}{dx^2} = \frac{2x(x^2)-2x(x^2+4)}{(x^2)^2}$ ATAU $\frac{d^2y}{dx^2} = 4(-2)x^{-2-1}$ $\frac{dy}{dx} = \frac{x^2+4}{x^2}$ dan $\frac{d^2y}{dx^2} = -\frac{8}{x^3}$ $x^3 \left(\frac{d^2y}{dx^2}\right) + x^2 \left(\frac{dy}{dx}\right) = x^3 \left(-\frac{8}{x^3}\right) + x^2 \left(\frac{x^2+4}{x^2}\right)$ $x^3 \left(\frac{d^2y}{dx^2}\right) + x^2 \left(\frac{dy}{dx}\right) = x^2 - 4$ $(x+2)(x-2) < 0$ dan  $-2 < x < 2$	K1		
		N1		
		K1	6	10
		N1		
		K1		
		N1		
12.	(a) $\frac{1}{2}(6.8 + 3.786 + 4.916)$ $\sqrt{(7.751)(7.751 - 6.8)(7.751 - 3.786)(7.751 - 4.916)}$ 9.103 SS-1 jika mencari luas dengan sudut P, Q atau R.	P1		
		K1	3	
		N1		
	(b) Rumus Kosinus diguna dengan betul $\cos P = \frac{6.8^2 + 4.916^2 - 3.786^2}{2(6.8)(4.916)}$ ATAU $\frac{1}{2}(6.8)(4.916) \sin P = 9.103$ atau setara 33°	K1		
		N1	2	
	(c) (i)  $\angle QR'P$ mesti sudut tirus (ii) $\frac{\sin R'}{6.8} = \frac{\sin 33^\circ}{3.786}$ atau setara 78.02° (iii) $\sin 33^\circ = \frac{t}{6.8}$ (t boleh diganti oleh mana-mana simbol atau huruf) 3.704	N1		10
			5	
		K1		
		N1		
		K1		
		N1		

NO	PENYELESAIAN	MARKAH		
13.	(a) I : $y - x \leq 200$ II : $3y \geq 2x$ III : $x + y \leq 500$	N1 N1 N1	3	10
	(b) Satu garis lurus dan kedua-dua paksi dilukis dengan skala yang betul. Semua garis dilukis dengan betul. Rantau R dilorek dengan tepat.	K1 N1 N1	3	
	(c) (i) Fungsi objektif kos, $K = 30x + 40y$ Titik optimum (150, 350) Amaun maksimum $= \text{RM} [30(150) + 40(350)]$ $= \text{RM}18\,500$ (ii) Minimum $= 30(50) + 40(250) = \text{RM}11\,500$ Maksimum $= 30(250) + 40(250) = \text{RM}17\,500$	K1 N1 N1 N1	4	
14.	(a) $s_A = pt - t^2 = t(p - t)$ $\therefore p = 6$	N1	1	
	(b) $6t - t^2 = 2t$ $t^2 - 4t = 0$ $t(t - 4) = 0$ $t = 4$	K1 K1 N1	3	
	(c) $s_A = 6t - t^2$ $\frac{ds}{dt} = 0$ $6 - 2t = 0$ $t = 3$ $s_3 = 6(3) - (3)^2$ $s_3 = 9$	K1 K1 N1	3	

NO.	PENYELESAIAN	MARKAH		
14.	(d) When $t = 4$, Bagi $A : s_4 = 6(4) - (4)^2 = 8$ $\therefore$ Jarak yang dilalui oleh $A = 9 + 1 = 10$ $\therefore$ Distance travelled by $A = 9 + 1 = 10$ Bagi $B : s_4 = 2(4) = 8$ $\therefore$ Jarak yang dilalui oleh $B = 8$ $\therefore$ Distance travelled by $B = 8$	K1 N1 N1	3	10
15.	(a) $\frac{55}{P_{2019}} \times 100 = 120$ RM45.83	K1 N1	2	10
	(b) $\frac{(147 \times 20) + (10 \times h) + (125 \times 40) + (120 \times 30)}{(147 \times 20) + (10 \times h) + (125 \times 40) + (120 \times 30)} = 130.4$ $h = 150$	K1 K1 N1	3	
	(c) (i) $147 \times \frac{120}{100}$ atau $150 \times \frac{95}{100}$ ATAU $\frac{(120 \times 20) + (95 \times 10) + (100 \times 40) + (100 \times 30)}{100}$ $\frac{(176.4 \times 20) + (142.5 \times 10) + (125 \times 40) + (120 \times 30)}{100}$ ATAU $130.4 \times \frac{103.5}{100}$ 135.53 ATAU 134.96	K1 K1 N1	5	
	(ii) $\frac{P_{2025}}{170} \times 100 = 135.53^*$ (*Jawapan daripada (b)(i)) RM230.40 ATAU RM229.43	K1 N1		

**MODUL PINTAS
TINGKATAN 5**

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**MATEMATIK TAMBAHAN
Kertas 1**

2 jam

Dua jam

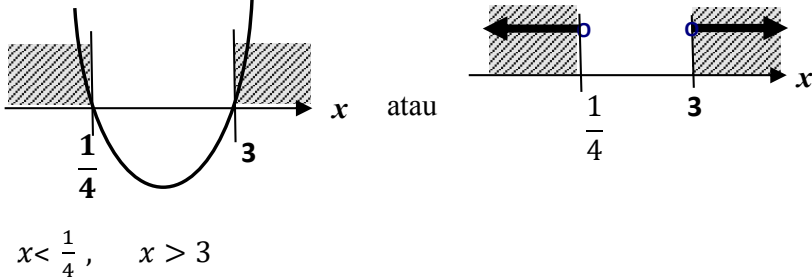
**PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN K1
3472/1**

NO	PENYELESAIAN	MARKAH		
1.	(a) $\frac{p^2}{3} \times 3^p \times 2^{-(p+2)} \times y^{-2p} \times y^{p+2} = q^1 y^{-2}$ $y^{-2p+p+2} = y^{-2}$ $-p + 2 = -2$ $p = 4$ $\frac{p^2}{3} \times 3^p \times \left(\frac{1}{2}\right)^{p+2} = q^1$ $q = \frac{27}{4}$ } Bandingkan kuasa bagi y atau nilai pemalar dapat K1	K1		7
	(b) $\log_x 3 = p: \quad x^p = 3$ $\log_y 2 = q: \quad y^q = 2$ $\log_z 5 = r: \quad z^r = 5$ } Mana-mana satu betul $(x^p)(y^{2q}) - z^r = (3)(y^q)^2 - 5$ $= (3)(2)^2 - 5$ $= 7$	K1	3	
2.	$p = \frac{3}{4} - \frac{k}{2} \dots\dots\dots (1)$ $2k^2 - 10k = -5p + 7 \dots\dots\dots (2)$ Gantikan (1) ke dalam (2) $2k^2 - 10k = -5\left(\frac{3}{4} - \frac{k}{2}\right) + 7$ $2k^2 - 10k = -\frac{15}{4} + \frac{5k}{2} + 7$ $8k^2 - 40k = -15 + 10k + 28$ $8k^2 - 50k - 13 = 0$ $(2k - 13)(4k + 1) = 0$ $k = \frac{13}{2}, k = -\frac{1}{4}$ $p = -\frac{5}{2}, p = \frac{7}{8}$	K1	4	4

NO	PENYELESAIAN	MARKAH		
3.	(a) $a = 5000$ $r = 1.035$ $n = 10$ $T_{10} = 5000 \times 1.035^{10-1}$ $T_{10} = \text{RM}6814.49$	K1 N1	2	5
	(b) $T_n > 7000$ $5000 \times 1.035^{n-1} > 7000$ $1.035^{n-1} > \frac{7000}{5000}$ $(n-1) \log_{10} 1.035 > \log_{10} 1.4$ $n-1 > \frac{\log_{10} 1.4}{\log_{10} 1.035}$ $n-1 > 9.7808$ $n > 10.7808$ $n = 11$	K1 K1 N1	3	
4.	(a) $\sin(x + 45^\circ) \sin(x - 45^\circ)$ $= (\sin x \cos 45^\circ - \cos x \sin 45^\circ)(\sin x \cos 45^\circ + \cos x \sin 45^\circ)$ $= \left(\frac{1}{\sqrt{2}} \sin x - \frac{1}{\sqrt{2}} \cos x\right) \left(\frac{1}{\sqrt{2}} \sin x + \frac{1}{\sqrt{2}} \cos x\right)$ $= \left(\frac{1}{\sqrt{2}} \times \frac{1}{\sqrt{2}}\right) (\sin x - \cos x)(\sin x + \cos x)$ $= \frac{1}{2} \sin^2 x - \frac{1}{2} \cos^2 x$ $= \frac{1}{2} (-\cos 2x)$ $= -\frac{1}{2} \cos 2x$	K1 K1 K1	3	7

NO	PENYELESAIAN	MARKAH		
	(b) $\tan 2x = -\frac{5}{12}$ $\frac{2\tan x}{1-\tan^2 x} = -\frac{5}{12}$ $24\tan x = -5 + 5\tan^2 x$ $0 = 5\tan^2 x - 24\tan x - 5$ $0 = (5\tan x + 1)(\tan x - 5)$ $\tan x = -\frac{1}{5}, 5 \text{ (tidak diterima/ not accepted)}$	P1 K1		
			4	
		K1 N1		
5.	(a) $y = 0,$ $x^2 + 3x - 8 = 0$ $x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-8)}}{2(1)} \quad \text{atau} \quad b^2 - 4ac = (3)^2 - 4(1)(-8)$ $x = 1.70 \text{ atau } x = -4.70 \quad \quad \quad = 41 > 0$ Lokus R bersilang dengan paksi-x pada titik $(-4.70, 0)$ dan $(1.70, 0)$. <i>Locus R intersects the x-axis at $(-4.70, 0)$ and $(1.70, 0)$.</i> atau Lokus R bersilang dengan paksi-x pada dua titik berbeza. <i>Locus R intersects the x-axis at two different points.</i>	K1 N1	3	
	(b) $y = x - 2 \quad \text{--- (1)}$ $x^2 + y^2 + 3x - 3y - 8 = 0 \quad \text{--- (2)}$ Substitute (1) into (2), $x^2 + (x - 2)^2 + 3x - 3(x - 2) - 8 = 0$ $x^2 + x^2 - 4x + 4 + 3x - 3x + 6 - 8 = 0$ $2x^2 - 4x + 2 = 0$ $x^2 - 2x + 1 = 0 \quad \text{atau} \quad (x - 1)(x - 1) = 0$ $b^2 - 4ac$ $= (-2)^2 - 4(1)(1)$ $= 0$ $y = x - 2$ ialah tangen kepada lokus R. <i>$y = x - 2$ is a tangent to the locus R.</i>	K1 K1 K1 N1	4	7

NO	PENYELESAIAN	MARKAH		
6.	a) i) $p = 3$	N1	3	6
	ii) $y = \frac{3}{x-3}$			
	$y(x - 3) = 3$			
	$xy = 3 + 3y$			
	$x = \frac{3+3y}{y}$	K1		
	$f(x) = \frac{3(1+x)}{x}, x \neq 0$ atau/ or $f(x) = \frac{3}{x} + 3, x \neq 0$	N1		
	b) $\frac{x}{4} - \frac{a}{4} = 2bx + \frac{5}{8}$	K1	3	
	$\frac{1}{4} = 2b$ atau $-\frac{a}{4} = \frac{5}{8}$	K1		
	$b = \frac{1}{8}$ dan / and $a = -\frac{5}{2}$	N1		
7.	a) $\log_5 y = \log_5 625 - \log_5 x$		1	4
	$\log_5 y = 4 - \log_5 x$	N1		
	b) $h = 4$	N1	3	
	$-1 = \frac{4-1}{0-k}$ atau $1 = -k + 4$	K1		
	$k = 3$	N1		
8.	$\overrightarrow{AQ} = \lambda \overrightarrow{AC}$		4	4
	$\overrightarrow{AB} = \frac{1}{3}(-9\underline{y})$ $\overrightarrow{BQ} = \frac{1}{4}(\overrightarrow{BD})$			
	$\overrightarrow{BQ} = \frac{1}{4}(\overrightarrow{BA} + \overrightarrow{AD})$			
	$\overrightarrow{BQ} = \frac{1}{4}(3\underline{y} + 4\underline{x})$	K1		
	$\overrightarrow{AQ} = \overrightarrow{AB} + \overrightarrow{BQ}$ atau $\overrightarrow{AC} = \overrightarrow{AD} + \overrightarrow{DC}$			
	$\overrightarrow{AQ} = -\frac{9}{4}\underline{y} + \underline{x}$ $\overrightarrow{AQ} = 4\underline{x} - 9\underline{y}$	K1		
	$-\frac{9}{4}\underline{y} + \underline{x} = \lambda(4\underline{x} - 9\underline{y})$			
	$\frac{-9}{4} = \lambda(-9)$ $1 = \lambda(4)$			
	$\lambda = \frac{1}{4}$ $\lambda = \frac{1}{4}$	K1		
	A, Q dan C adalah segaris / A, Q and C are colinear	N1		

NO	PENYELESAIAN	MARKAH		
9.	a) $\frac{1}{2}(17)^2\theta = 140$ $\theta = 0.9689 \text{ rad}$	K1 N1	2	5
	b) $2\pi - 0.9689$ $S = 17(2\pi - 0.9689) + 2(17)$ 124.36	P1 K1 N1	3	
10.	a)  $x < \frac{1}{4}, \quad x > 3$	K1 N1	2	4
	b) $(-2q)^2 - 4(2p)(6) = 0$ $q = \pm 2\sqrt{3p}$	K1 N1	2	
11.	a) $y = \int -2x \, dx$ $y = -x^2 + c$ $5 = -(2)^2 + c$ $c = 9$ $y = -x^2 + 9$	K1 K1 N1	3	6
	b) $\int_0^2 (-x^2 + 9)dx - (2 \times 5)$ $\left[\frac{-x^3}{3} + 9x \right]_0^2 - 10$ $\left[\left[\frac{-2^3}{3} + 9(2) \right] - \left[\frac{-0^3}{3} + 9(0) \right] \right] - 10$ $\frac{16}{3}$	K1 K1 N1	3	
12.	a) ${}^6C_6 (p^6)(1-p)^0 = 0.0248$ $\log_{10} p^6 = \log_{10} 0.04398 \text{ atau } p = \sqrt[6]{0.0248}$ $p = 0.54$	K1 N1	2	

NO	PENYELESAIAN	MARKAH		
	b) ${}^6C_0(0.54)^0(0.46)^6$ atau ${}^6C_1(0.54)^1(0.46)^5$ $1 - ({}^6C_0(0.54)^0(0.46)^6 + {}^6C_1(0.54)^1(0.46)^5)$ 0.9238	K1 K1 N1	3	5
13.	(a) (i) ${}^3P_3 \times 3 \times {}^4P_2$ 216 (ii) ${}^4P_3 \times {}^3P_2 \times 3$ atau ${}^4P_4 \times {}^3P_1 \times 2$ atau ${}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2$ ${}^4P_3 \times {}^3P_2 \times 3 + {}^4P_4 \times {}^3P_1 \times 2 + {}^4P_3 \times {}^3P_1 \times {}^1P_1 \times 2$ 720	K1 N1 K1 K1 N1	5	8
	(b) $\frac{(n+1)!}{(n+1-4)!} = 4 \frac{n!}{(n-2)!}$ $\frac{(n+1)!}{(n-3)!} = 4 \frac{n!}{(n-2)!}$ $\frac{(n+1)!}{n!} = 4 \frac{(n-3)!}{(n-2)!}$ $\frac{(n+1)n!}{n!} = 4 \frac{(n-3)!}{(n-2)(n-3)!}$ $(n+1)(n-2) = 4$ $n^2 - n - 2 - 4 = 0$ $n^2 - n - 6 = 0$ $(n-3)(n+2) = 0$ $n = 3, n = -2 \text{ (tidak diterima / not accepted)}$	K1 K1 N1	3	
14.	a) i) $\frac{dx}{dt} = 4t$ ii) $\frac{dy}{dx} = 4t^3 \times \frac{1}{4t}$ $\frac{dy}{dx} = t^2$ $\frac{dy}{dx} = \frac{x+4}{2}$	N1 K1 N1	3	

NO	PENYELESAIAN	MARKAH		
	b) $2x + 2y = 25$ $y = \frac{25}{2} - x$ atau $2\pi j = x$ $j = \frac{x}{2\pi}$ $I = \pi j^2 t$ $= \pi \left(\frac{x}{2\pi}\right)^2 (y)$ $= \frac{\pi x^2}{4\pi^2} (y)$ $= \frac{1}{4\pi} x^2 \left(\frac{25}{2} - x\right)$ $= \frac{25x^2}{8\pi} - \frac{x^3}{4\pi}$ $\frac{dI}{dx} = \frac{25x}{4\pi} - \frac{3x^2}{4\pi}$ $\frac{25x}{4\pi} - \frac{3x^2}{4\pi} = 0$ $\frac{x}{4\pi} (25 - 3x) = 0$ $\frac{x}{4\pi} = 0$ $x = 0$ tidak diterima kerana $x > 0$ $25 - 3x = 0$ <i>Panjang/ Length</i> = $\frac{25}{3}$, <i>Lebar/ Width</i> = $\frac{25}{6}$	K1		8
		K1		
		K1	5	
		N1		

NO	PENYELESAIAN	MARKAH		
15.	(a) $ax^2 + bx + c = 0$ $x^2 + \frac{b}{a}x = -\frac{c}{a}$ $x^2 + \frac{b}{a}x + \left(\frac{b}{2a}\right)^2 = -\frac{c}{a} + \left(\frac{b}{2a}\right)^2$ $\left(x + \frac{b}{2a}\right)^2 = \frac{-4ac + b^2}{4a^2}$ $x + \frac{b}{2a} = \frac{\pm\sqrt{b^2-4ac}}{2a} \text{ atau } x = \frac{\pm\sqrt{b^2-4ac}}{2a} - \frac{b}{2a}$ $x = \frac{-b+\sqrt{b^2-4ac}}{2a} \text{ atau } x = \frac{-b-\sqrt{b^2-4ac}}{2a}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	K1 K1 K1 N1 N1	5	8
	(b) $x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(5)(9)}}{2(5)}$ $x = \frac{6 \pm \sqrt{-144}}{10}$ $x = \frac{6 \pm (\sqrt{144})(\sqrt{-1})}{10}$ $x = \frac{6 \pm 12i}{10}$ $x = \frac{3 \pm 6i}{5}$ $x = \frac{3+6i}{5}, \quad x = \frac{3-6i}{5}$	K1 K1 N1	3	

**MODUL PINTAS
TINGKATAN 5**

3472/2

**MATEMATIK TAMBAHAN
Kertas 2**

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

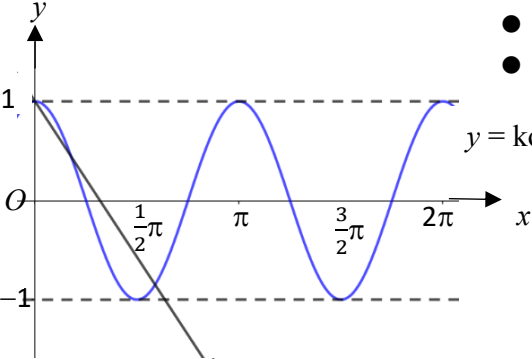
Dua jam tiga puluh minit

**PERATURAN PEMARKAHAN
MATEMATIK TAMBAHAN K2
3472/2**

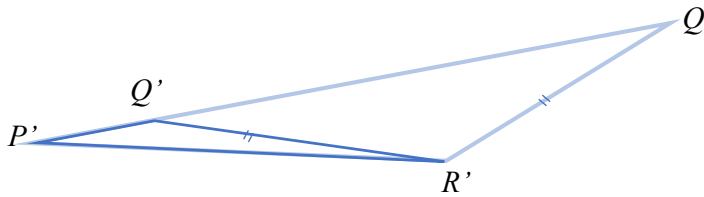
NO.	PENYELESAIAN	MARKAH		
1.	$(a) (i) 3(i + 4j) \text{ ATAU } 3\begin{pmatrix} 1 \\ 4 \end{pmatrix}$ $3i + 12j \text{ ATAU } \begin{pmatrix} 3 \\ 12 \end{pmatrix}$ $(3, 12)$ $(ii) \overrightarrow{OS} = \overrightarrow{OP} + \frac{3}{4}\overrightarrow{PQ} \text{ ATAU } \overrightarrow{OS} = \overrightarrow{OQ} + \frac{1}{4}\overrightarrow{QP}$ $= 6i + \frac{3}{4}(-6i + (3i + 12j)) \text{ ATAU}$ $= 3i + 12j + \frac{1}{4}(-3i - 12j + 6i) \text{ ATAU}$ $\begin{pmatrix} 6 \\ 0 \end{pmatrix} + \frac{3}{4}\begin{pmatrix} -6 + 3 \\ 12 \end{pmatrix} \text{ ATAU } \begin{pmatrix} 3 \\ 12 \end{pmatrix} + \frac{1}{4}\begin{pmatrix} -3 + 6 \\ -12 \end{pmatrix}$ $\begin{pmatrix} 15 \\ 4 \end{pmatrix}, 9)$	K1	4	
	$(b) \begin{pmatrix} 15 \\ 4 \end{pmatrix} i + 9j) - (i + 4j) \text{ ATAU } \begin{pmatrix} 15 \\ 4 \\ 9 \end{pmatrix} - \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ $\frac{11}{4}i + 5j \text{ ATAU } \begin{pmatrix} 11 \\ 4 \\ 5 \end{pmatrix}$ $\sqrt{\left(\frac{11}{4}\right)^2 + (5)^2}$ $\frac{\sqrt{521}}{4}$ $\frac{1}{\frac{\sqrt{521}}{4}}\left(\frac{11}{4}i + 5j\right) \text{ ATAU } \frac{1}{\frac{\sqrt{521}}{4}}\begin{pmatrix} 11 \\ 4 \\ 5 \end{pmatrix}$ $\frac{11\sqrt{521}}{521}i + \frac{20\sqrt{521}}{521}j \text{ ATAU } \frac{4\sqrt{521}}{521}\left(\frac{11}{4}i + 5j\right) \text{ ATAU}$ $\begin{pmatrix} \frac{11\sqrt{521}}{521} \\ \frac{20\sqrt{521}}{521} \\ 521 \end{pmatrix} \text{ ATAU } \frac{4\sqrt{521}}{521}\begin{pmatrix} 11 \\ 4 \\ 5 \end{pmatrix}$	K1		
		K1	4	8
		K1		
		N1		

NO.	PENYELESAIAN	MARKAH		
2.	(a) $\frac{1}{2}(5 + \sqrt{3})(2 + \sqrt{27})$ $\frac{1}{2}(10 + 2\sqrt{3} + 5\sqrt{27} + \sqrt{81})$ $\frac{19}{2} + \frac{17}{2}\sqrt{3}$	K1 K1 N1	3	7
	(b) $\frac{1}{2}\log_a 9xy$ ATAU $(x - y)^2 = x^2 + y^2 - 2xy$ $= \frac{1}{2}\log_a(x^2 + y^2 - 2xy)$ ATAU $\log_a(x - y)^2 = \log_a 9xy$ $= \frac{1}{2}\log_a(x - y)^2$ ATAU $2\log_a(x - y) = \log_a 9 + \log_a x + \log_a y$ $= \log_a(x - y)$ ATAU $\log_a(x - y) = \frac{1}{2}\log_a x + \frac{1}{2}\log_a y + \log_a 3$	K1 K1 K1 N1	4	
3.	$x + y + z = 12$, $x + 3z = 5y$ $100z + 10y + x = 3(100x + 10y + z) - 96$ $97z = 299x + 20y - 96$ (tertunjuk) Hapus satu pemboleh ubah $(5y - 3z) + y + z = 12$ ATAU cara lain yang setara $2x + 8y = 36$ atau $6y - 2z = 12$ atau $6x + 8z = 60$ $x = \frac{36-8y}{2}$ atau $y = \frac{2z+12}{6}$ atau $z = \frac{60-6x}{8}$ ATAU $y = \frac{36-2x}{8}$ atau $z = \frac{6y-12}{2}$ atau $x = \frac{60-8z}{6}$ Hapus dua pemboleh ubah $299(18 - 4y) + 20y - 97(3y - 6) = 96$ atau setara $x = 2$ atau $y = 4$ atau $z = 6$ 246	P1, P1 K1 K1 K1 N1 N1	7	7
4.	(a) ..., $a + d, a + 3d, a + 10d, \dots$ $\frac{a + 3d}{a + d} = \frac{a + 10d}{a + 3d}$ $d = -5a$ $r = \frac{7}{2}$	K1 K1 K1 N1	4	7
	(b) $\frac{n}{2}[2(3) + (n - 1)4] = 55$ $n = 5$ $T_5 = 3 + 4(4)$ $= 19$	K1 K1 N1	3	

NO.	PENYELESAIAN	MARKAH		
5.	(a) $\frac{360^\circ}{6} \times \frac{3.142}{180}$ 1.047	N1	1	7
	(b) $\angle AOC = 2\left(\frac{360}{6}\right)^\circ = 120^\circ // 2.095 \text{ rad.}$ $(5) \sin\left(\frac{120^\circ}{2}\right)$ atau $(5)(1.047)$ ATAU $5^2 + 5^2 - 2(5)(5) \cos 120^\circ$ $6 \left[2(5) \sin\left(\frac{120^\circ}{2}\right)\right] + 3(5)(1.047)$ ATAU $6 \times \sqrt{5^2 + 5^2 - 2(5)(5) \cos 120^\circ} + 3(5)(1.047)$ $= 67.67 \text{ cm}$ $67.67 \text{ cm dan cukup}$ $67.67 \text{ cm and enough}$	P1 K1 K1 N1	4	
	(c) $3 \left[\frac{1}{2} (5)^2 \left(1.047 - \sin\left(\frac{360}{6}\right)^\circ \right) \right]$ 6.787 cm^2	K1 N1	2	
6.	(a) $x = 4 - x$ $x = 2$ $\therefore y = -\sqrt{2}$	K1 N1	2	8
	(b) $\int_{-2}^{-\sqrt{2}} 4 - y^2 dy + \int_{-\sqrt{2}}^0 y^2 dy$ $= \left[4y - \frac{y^3}{3} \right]_{-2}^{-\sqrt{2}} + \left[\frac{y^3}{3} \right]_{-\sqrt{2}}^0$ $= \left[4(-\sqrt{2}) - \left(\frac{(-\sqrt{2})^3}{3} \right) - \left(4(-2) - \frac{(-2)^3}{3} \right) \right] + \left[0 - \left(\frac{(-\sqrt{2})^3}{3} \right) \right]$ $= \frac{16 - 8\sqrt{2}}{3} = 1.562$	K1 K1 N1	3	
	(c) $\pi \left[4x - \frac{x^2}{2} \right]_2^4 + \pi \left[\frac{x^2}{2} \right]_0^2$ $= \pi \left[\left(4(4) - \frac{4^2}{2} \right) - \left(4(2) - \frac{2^2}{2} \right) \right] + \pi \left[\frac{2^2}{2} - 0 \right]$ $= 4\pi \text{ unit}^3$	K1 K1 N1	3	

NO.	PENYELESAIAN	MARKAH		
7.	(a) $\frac{1 - \frac{\sin^2 x}{\cos^2 x}}{1 + \frac{\sin^2 x}{\cos^2 x}}$ $\frac{\cos^2 x - \sin^2 x}{\cos^2 x + \sin^2 x} = \cos 2x$	K1	2	6
	(b)(i)  ● bentuk kos x ● 2 kitaran dalam 2π ● $-1 \leq y \leq 1$ $y = \cos 2x$	P1 P1 P1		
	(ii) $y = 1 - x$, 3 penyelesaian	N1	4	
8.	(a)(i) $np = 630$ atau $\sqrt{npq} = 21$ $\sqrt{630q} = 21$ Peratus guru perempuan = 70% % of female teachers = 70%	K1	5	10
	(ii) $1 - [{}^{10}C_0(0.3)^0(0.7)^{10} + {}^{10}C_1(0.3)^1(0.7)^9 + {}^{10}C_2(0.3)^2(0.7)^8]$ $= 0.6172$	K1 N1		
	(b)(i) $P\left(Z > \frac{35 - 38}{5}\right)$ $P(Z > -0.6)$ $= 0.7257$ (ii) $P\left(Z < \frac{n - 38}{5}\right) = 0.2$ $\frac{n - 38}{5} = -0.842$ $n \approx 33.79$	K1 N1 K1 K1 N1	5	

NO	PENYELESAIAN						MARKAH															
9.	(a)	<table><tr><td>$\sqrt{y}$</td><td>1.02</td><td>1.16</td><td>1.44</td><td>1.72</td><td>2</td><td>2.14</td></tr></table>						$\sqrt{y}$	1.02	1.16	1.44	1.72	2	2.14	N1	4	10					
		$\sqrt{y}$	1.02	1.16	1.44	1.72	2	2.14														
		Plot paksi- $\sqrt{y}$ melawan paksi- x dengan skala seragam yang betul dan satu titik diplot dengan betul.						K1														
		Keenam-enam titik diplot dengan betul.						N1														
Garis lurus penyuaian terbaik.						N1																
(b)(i)	$\sqrt{y} = \frac{6}{p}x - \frac{2}{q}$ $\frac{6}{p} = \frac{2.14^* - 0.6^*}{5.5^* - 0^*}$ * bagi mana-mana dua pasangan titik di atas garis penyuaian terbaik $p = 21.05 \sim 21.82$ $-\frac{2}{q} = 0.6^*$ * merujuk pintasan- y dalam graf $q = -3.08 \sim -3.64$						P1	6														
							K1															
							N1															
							K1															
						N1																
(ii)						2.69	N1															
10.	(a)	$\frac{5-(-4)}{p-(-2)} = -\frac{1}{\frac{3-(-5)}{(-1)-5}}$ atau $\sqrt{[p-(-1)]^2 + (5-3)^2} = \sqrt{(p-5)^2 + [5-(-5)]^2}$ $p = 10$						K1	2	10												
								N1														
	(b)	$y - (-4) = \frac{3}{4}(x - (-2))$ $y = \frac{3}{4}x - \frac{5}{2}$ $q = -1$						K1	3													
								N1														
	(c)	$\frac{1}{2} (-1)(-4) + (-2)(-5) + 5(5) + 10(3) - 3(-2) - (-4)(5) - (-5)(10) - 5(-1) $ 75						K1	2													
								N1														
	(d)	$\sqrt{(x-(-1))^2 + (y-3)^2}$ atau $\sqrt{(x-5)^2 + (y-(-5))^2}$ $\sqrt{(x-(-1))^2 + (y-3)^2} = 3\sqrt{(x-5)^2 + (y-(-5))^2}$ $2x^2 + 2y^2 - 23x + 24y + 110 = 0$						P1	3													
								K1														
						N1																
11.	(a)(i)	tidak tertakrif // tiada jawapan <i>undefined // no solution</i>						N1	4	10												
		(ii)	<table><tr><td>x</td><td>-0.1</td><td>-0.01</td><td>-0.001</td><td>-0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-15.9750</td><td>-15.9975</td><td>-15.9997</td><td>-16.0000</td><td>-</td></tr></table>								x	-0.1	-0.01	-0.001	-0.0001	0	$f(x)$	-15.9750	-15.9975	-15.9997	-16.0000	-
	x		-0.1	-0.01	-0.001	-0.0001	0															
	$f(x)$	-15.9750	-15.9975	-15.9997	-16.0000	-																
							N1															
	<table><tr><td>x</td><td>0.1</td><td>0.01</td><td>0.001</td><td>0.0001</td><td>0</td></tr><tr><td>$f(x)$</td><td>-16.0250</td><td>-16.0025</td><td>-16.0002</td><td>-16.0000</td><td>-</td></tr></table> SS-1 jika nilai dalam jadual tidak tepat kepada 4 tempat perpuluhan							x			0.1	0.01	0.001	0.0001	0	$f(x)$	-16.0250	-16.0025	-16.0002	-16.0000	-	
x	0.1	0.01	0.001	0.0001	0																	
$f(x)$	-16.0250	-16.0025	-16.0002	-16.0000	-																	
(iii)						-16	N1															

NO	PENYELESAIAN	MARKAH		
	(b) $\frac{dy}{dx} = (2)(x + 3) + 2x$ $= 4x + 6$ $\frac{d^2y}{dx^2} = 4$ $\frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 4 + x(4x + 6) + 2x(x + 3)$ $= 6x^2 + 12x + 4$ $6x^2 + 12x + 4 = -2$ $x^2 + 2x + 1 = 0$ $(x + 1)(x + 1) = 0$ $x = -1$	K1 N1 N1 N1 K1 N1	6	
12.	(a) $\frac{1}{2}(8 \cdot 2 + 5 \cdot 32 + 3 \cdot 6)$ $\sqrt{(8 \cdot 56)(8 \cdot 56 - 8 \cdot 2)(8 \cdot 56 - 5 \cdot 32)(8 \cdot 56 - 3 \cdot 6)}$ $7 \cdot 037$ SS-1 jika mencari luas dengan sudut P, Q atau R.	P1 K1 N1	3	10
	(b) $\cos P = \frac{8 \cdot 2^2 + 5 \cdot 32^2 - 3 \cdot 6^2}{2(8 \cdot 2)(5 \cdot 32)}$ ATAU $\frac{1}{2}(8 \cdot 2)(5 \cdot 32) \sin P = 7 \cdot 037$ atau setara 18.82°	K1 N1	2	
	(c)(i)  $\angle Q'R'P'$ mesti sudut tirus	N1	5	
	(ii) $\frac{\sin Q'}{5.32} = \frac{\sin 18.82^\circ}{3.6}$ atau setara 151.53°	K1 N1		
	(iii) $\sin 9.65^\circ = \frac{t}{3.6}$ (t boleh diganti oleh mana-mana simbol atau huruf) 0.6035	K1 N1		
13.	(a) I : $x + y \leq 85$ II : $y \geq 20$ III : $y \leq \frac{11}{6}x$	N1 N1 N1	3	

NO	PENYELESAIAN	MARKAH		
	(b) Satu garis lurus dan kedua-dua paksi dilukis dengan skala yang betul. Semua garis dilukis dengan betul. Rantau R dilorek dengan tepat.	K1 N1 N1	3	10
	(c)(i) Bilangan minimum murid lelaki = 11 <i>Minimum number of boys = 11</i> (ii) Titik maksimum = (30, 55) Kos maksimum / <i>Maximum cost</i> = $600(30) + 800(55)$ = RM62 000	N1 N1 K1 N1	4	
14.	(a) $a = -2$	N1	1	10
	(b) Bila zarah berhenti, $v = 0$ $4 - 2t = 0$ $t = 2$ $s = 4t - t^2$ bila $t = 2$, $s = 4(2) - (2)^2$ $s = 4$ Di B, $s = 3$, $3 = 4t - t^2$ $(t - 1)(t - 3) = 0$ bila $t = 1$, $v = 4 - 2(1)$ $v = 2$	K1 K1 K1 K1 N1	5	
	(c) Di A, $s = -12$ $-12 = 4t - t^2$ $(t - 6)(t + 2) = 0$ $t = 6$	K1 N1	2	
	(d) Jumlah jarak / <i>Total distance</i> $= 4 + 4 + 12$ $= 20$	K1 N1	2	

NO	PENYELESAIAN	MARKAH		
15.	(a) $\frac{32}{P_{2019}} \times 100 = 128$ RM25	K1 N1	2	10
	(b) $\frac{(128 \times 30) + (10 \times h) + (135 \times 40) + (133 \times 20)}{100} = 128.5$ $h = 95$	P1 K1 N1	3	
	(c)(i) $95 \times \frac{112}{100}$ atau $135 \times \frac{90}{100}$ ATAU $\frac{(100 \times 30) + (112 \times 10) + (90 \times 40) + (100 \times 20)}{100}$ $\frac{(128 \times 30) + (106.4 \times 10) + (121.5 \times 40) + (133 \times 20)}{100}$ ATAU $128.5 \times \frac{97.2}{100}$ 124.24 ATAU 124.90	K1 K1 N1	5	
	(ii) $\frac{P_{2025}}{116} \times 100 = 124.24^*$ (*Jawapan daripada (b)(i)) RM144.12 ATAU RM144.88	K1 N1		

TAMAT PERATURAN PEMARKAHAN

Graf 9(a)

