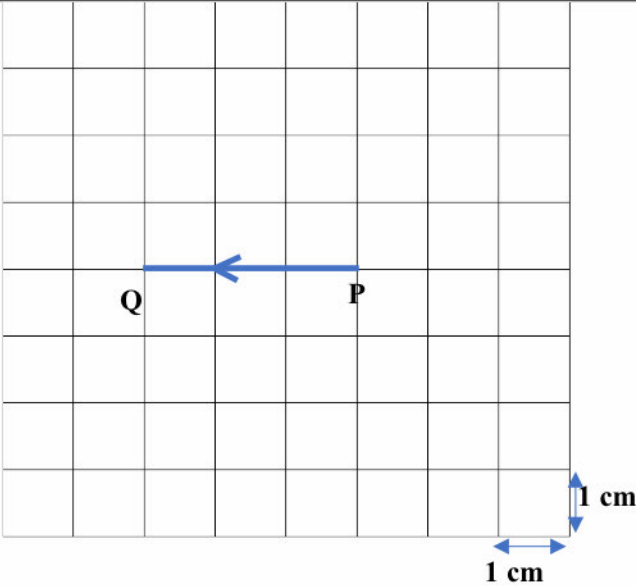
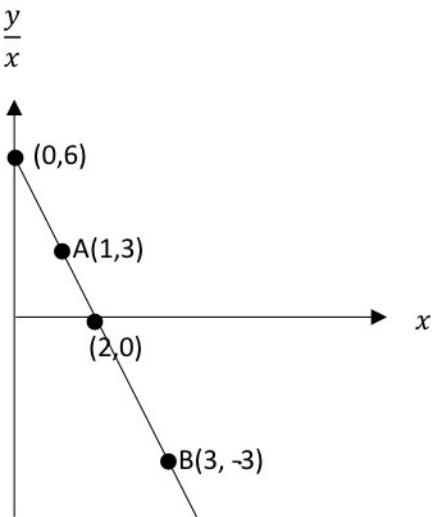


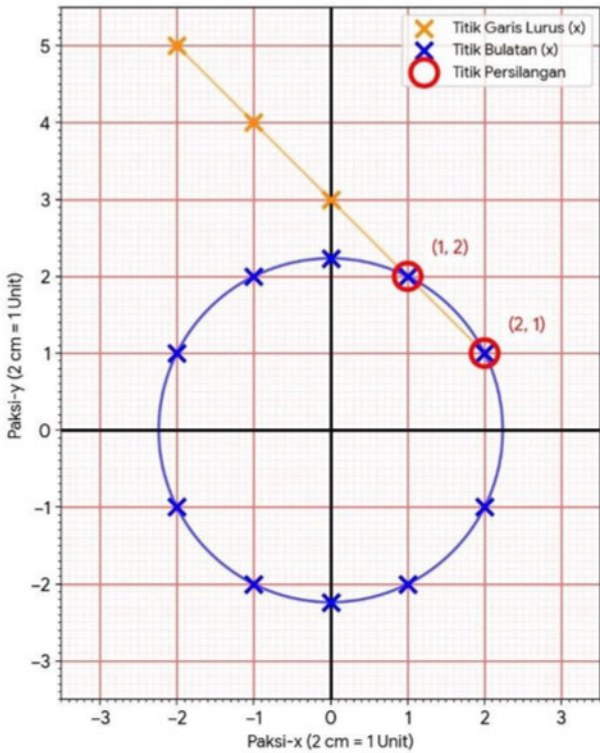
PANDUAN PENSKORAN
PEPERIKSAAN PERCUBAAN SPM 2026
MATEMATIK TAMBAHAN
KERTAS 1

SOALAN			RUBIK	MARKAH	JUMLAH MARKAH
1	(a)		$h = \frac{1(2k)+3(4h)}{3+1}$ or $g = \frac{1(k)+3(3g)}{3+1}$ $8h-10g=0$ or any equivalent (solving the simultaneous eqn) $h = \frac{5}{4}g$	K1 K1 N1	5
	(b)		CARA 1: $\left(\frac{y-3}{x-(-2)}\right)\left(\frac{y-5}{x-4}\right) = -1$ $y^2 - 8y + 15 = -(x^2 - 2x - 8)$ $x^2 + y^2 - 2x - 8y + 7 = 0$ CARA 2: Titik tengah, M = (1,4) PM = MB $\sqrt{(x-1)^2 + (y-4)^2} = \sqrt{(5-4)^2 + (4-1)^2}$ $x^2 + y^2 - 2x - 8y + 7 = 0$	K1 N1 K1 N1	

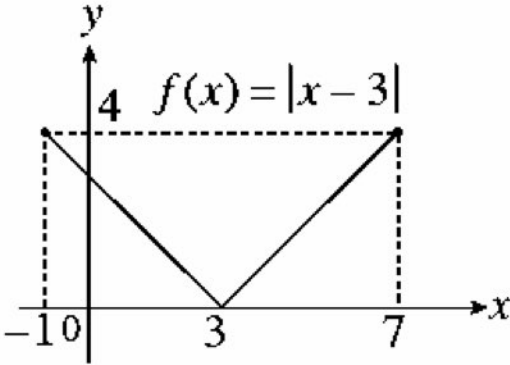
2	(a)	Jisim & Sesaran	N1	6
	(b)	 Lukis 3 kotak Lukis Anak panah ke kiri	P1	
	(c)	$\vec{CD} = -3\vec{i} - 3\vec{j}$ $\sqrt{(-3)^2 + (-3)^2}$ $3\sqrt{2} / 4.243$ Barat daya / 225°	N1 K1 N1 P1	
3	(a)	(i) $p = 0$	P1	5
		(ii) $T_1 = \frac{2}{3}$	N1	
	(b)	Cara 1 $\frac{0.00036}{0.036}$ or 0.01 seen $2\frac{1}{2} + \frac{0.036}{1 - 0.01}$ $2\frac{59}{110}$ Cara 2 $10N = 0.363636 \dots & 1000N = 36.363636 \dots$ $990N = 36$ $2\frac{1}{2} + \frac{36}{990}$ $2\frac{59}{110}$	P1 K1 N1 K1 K1 N1	



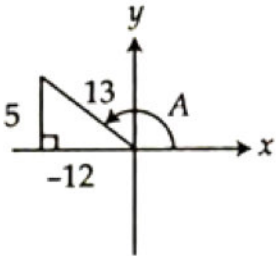
4		 $y = -3x^2 + 6x$ $\frac{y}{x} = -3x + 6$ Pintasan-x, (2,0) & Pintasan-y, (0,6) A'(1,3) & B'(3,-3) $m = -3$	P1 N1 N1 N1	4
5	(a)	$3x^2 - 2kx + k + 4 = 0$ $\alpha + \beta = \frac{2k}{3} \quad \& \quad \alpha\beta = \frac{k+4}{3}$ $(\alpha + \beta)^2 - 2\alpha\beta = \frac{4}{9}$ $\left(\frac{2k}{3}\right)^2 - 2\left(\frac{k+4}{3}\right) = \frac{4}{9}$ $4k^2 - 6k - 24 = 4$ $2k^2 - 3k - 14 = 0$ $(k+2)(2k-7) = 0$ $k = -2, \quad k = \frac{7}{2}$	P1 K1 N1	6
	(b)	$3x^2 - 5x + 1 = 0$ $p + q = \frac{5}{3}, \quad \& \quad pq = \frac{1}{3}$ hasil tambah punca = $3p + 3q$, atau hasil darab punca = $3p(3q)$ $= 3\left(\frac{5}{3}\right) \quad \quad \quad = 9\left(\frac{1}{3}\right)$ $x^2 - 5x + 3 = 0$	K1 K1 N1	

6		<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>Nilai y (x + y = 3)</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td></tr><tr><td>Nilai y (x² + y² = 5)</td><td>±1</td><td>±2</td><td>±2.24</td><td>±2</td><td>±1</td></tr></table>  Bentuk bulatan sekata dan licin (menyentuh semua titik) dan pusat bulatan terletak pada asalan (0,0) Garis lurus menyentuh semua titik Koordinat titik persilangan (1,2) dan (2,1)	x	-2	-1	0	1	2	Nilai y (x + y = 3)	5	4	3	2	1	Nilai y (x ² + y ² = 5)	±1	±2	±2.24	±2	±1	N1 N1
x	-2	-1	0	1	2																
Nilai y (x + y = 3)	5	4	3	2	1																
Nilai y (x ² + y ² = 5)	±1	±2	±2.24	±2	±1																

	(b)	(ii)	$\text{panjang lengkok } MN = x \left(\frac{\pi}{3} \right)$ $= \frac{24}{6 + \pi} \left(\frac{\pi}{3} \right)$ $= \frac{8\pi}{6 + \pi}$	K1 N1	
8	(a)		9	N1	4
	(b)		$y + \delta y = 2(x + \delta x)^2 + 1$ $\delta y = 2x^2 + 4x\delta x + 2\delta x^2 + 1 - 2x^2 - 1$ $\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} (4x + 2\delta x). \text{ atau } \frac{dy}{dx} = 4x + 2(0)$ $\frac{dy}{dx} = 4x$	K1 K1 N1	
9	(a)		$-\frac{5}{4}$	P1	4
	(b)		0	P1	
	(c)		$\int_k^h f(y) dy + \int_k^m \frac{7}{3} f(y) dy$ $\frac{5}{4} + \frac{7}{3} \left(\frac{5}{4} \right)$ $= \frac{25}{6}$	K1 N1	
10	(a)		$3^{2x} - 4(3^x)(3^1) + 27 = 0$ $3^x = 3 \quad \text{atau} \quad 3^x = 9$ $x = 1, x = 2$	K1 K1 N1	7
	(b)		$(82 - 12\sqrt{3}) = (5 - \sqrt{3})t$ $t = \frac{(82 - 12\sqrt{3})}{(5 - \sqrt{3})} \times \frac{(5 + \sqrt{3})}{(5 + \sqrt{3})}$ $\frac{410 + 82\sqrt{3} - 60\sqrt{3} - 36}{25 - 3}$ $(17 + \sqrt{3})$	K1 K1 K1 N1	
11	(a)		Pemboleh ubah rawak diskret & boleh dihitung/ dibilang/dikira	P1	6
	(b)		$P(X < 45) = 0.4 \text{ or } P(X > 65) = 0.2$ $P\left(Z < \frac{45 - \mu}{\sigma}\right) = 0.4 \text{ or } P\left(Z > \frac{65 - \mu}{\sigma}\right) = 0.2$ $\frac{45 - \mu}{\sigma} = -0.253 \text{ or } \frac{65 - \mu}{\sigma} = 0.842$ $45 + 0.253\sigma = \mu, \quad 65 - 0.842\sigma = \mu$ $20 = 1.095\sigma (\text{selesaikan persamaan serentak})$	K1 K1 K1	

			$\sigma = 18.26$ and $\mu = 49.62$	N1 N1	
12	(a)	(i)	$4! \times (5-1)!$ 576	N1	
		(ii)	$\frac{5! 3!}{2! 3!}$ 60	K1 N1	
	(b)	(i)	${}^6C_1 \times {}^7C_4 = 210$	N1	
		(ii)	${}^7C_3 \times {}^6C_2 + {}^7C_4 \times {}^6C_1 + {}^7C_5 \times {}^6C_0$ $= 756$	K1 N1	
13	(a)	(i)	$f^2(x) = p^2x + pq + q$ atau $f^3(x) = p^3x + p^2q + pq + q$ $p^3 = 8$ or $p^2q + pq + q = 14$ $p = 2$ dan $q = 2$	K1 K1 N1	8
		(ii)	 Bentuk V & menyentuh paksi-x titik-titik (-10, 4), (3, 0), (7, 4) ditandakan pada graf dengan betul Julat $f(x) = 0 \leq f(x) \leq 4$	N1 N1	
	(b)		$f(x) \leq 2$ $ x - 3 \leq 2$ $-2 \leq x - 3 \leq 2$ $1 \leq x \leq 5$	K1 N1	



14	(a)	(i)	$\overrightarrow{PO} + \overrightarrow{OQ}$ $\overrightarrow{PQ} = 9\underset{\sim}{i} + 9\underset{\sim}{j}$	K1 N1	8
		(ii)	$\frac{1}{\sqrt{9^2 + 9^2}} \times (9\underset{\sim}{i} + 9\underset{\sim}{j})$ $\frac{1}{\sqrt{2}}\underset{\sim}{i} + \frac{1}{\sqrt{2}}\underset{\sim}{j}$	K1 N1	
	(b)		$\begin{pmatrix} 0 \\ 0 \end{pmatrix} + t \begin{pmatrix} 6 \\ 8 \end{pmatrix}$ atau $\begin{pmatrix} 100 \\ 40 \end{pmatrix} + t \begin{pmatrix} -4 \\ 4 \end{pmatrix}$ ATAU $\overrightarrow{OA} = t(6\underset{\sim}{i} + 8\underset{\sim}{j})$ atau $\overrightarrow{OB} = 100\underset{\sim}{i} + 40\underset{\sim}{j} + t(-4\underset{\sim}{i} + 4\underset{\sim}{j})$ $\begin{pmatrix} 0 \\ 0 \end{pmatrix} + t \begin{pmatrix} 6 \\ 8 \end{pmatrix} = \begin{pmatrix} 100 \\ 40 \end{pmatrix} + t \begin{pmatrix} -4 \\ 4 \end{pmatrix}$ ATAU $6t\underset{\sim}{i} + 8t\underset{\sim}{j} = (100 - 4t)\underset{\sim}{i} + (40 + 4t)\underset{\sim}{j}$ $6t = 100 - 4t$ atau $8t = 40 + 4t$ $t = 10$ dan $t = 10$ Selepas 10 jam / After 10 hours	K1 K1 K1 N1	
15	(a)	(i)	 $\tan A = -\frac{5}{12}$	K1 N1	8
		(ii)	$\left(-\frac{12}{13}\right)\left(\frac{4}{5}\right) + \left(\frac{5}{13}\right)\left(\frac{3}{5}\right)$ $-\frac{33}{65}$	K1 N1	
	(b)		$\cos p \cos 45 - \sin p \sin 45$ Atau $\cos p \cos 45 + \sin p \sin 45$	K1	



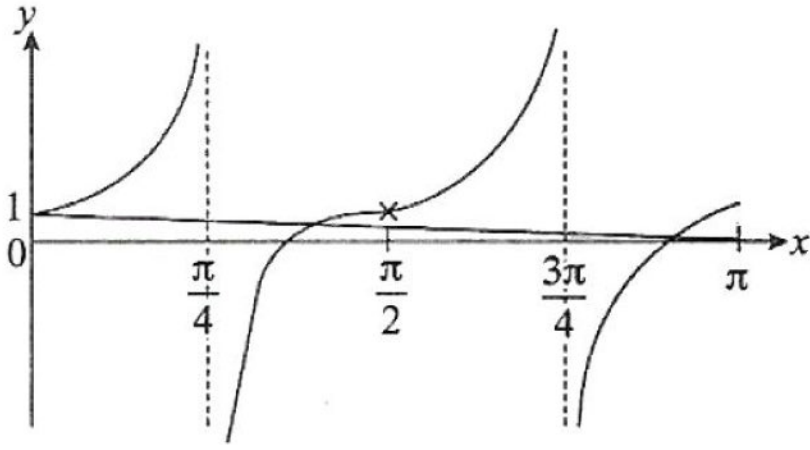
		$\frac{1}{\sqrt{2}} \cos p - \frac{1}{\sqrt{2}} \sin p$ atau $\frac{1}{\sqrt{2}} \cos p + \frac{1}{\sqrt{2}} \sin p$	K1	
		$\frac{1}{2} \cos^2 p - \frac{1}{2} \sin^2 p$	K1	
		$\cos^2 p - \sin^2 p$ DAN $\cos 2p$	N1	

SKEMA JAWAPAN
PPC MATEMATIK TAMBAHAN K2 2026

SOALAN			RUBIK	MARKAH	JUMLAH MARKAH
1.	(a)		$x + y + z = 45$ $20x + 50y + 30z = 1650$ $x + y = 2z$ Betul mana-mana dua persamaan Betul ketiga-tiga persamaan	N1 N1	7
	(b)		Ungkapkan x dalam sebutan y dan z @ Ungkapkan y dalam sebutan x dan z @ Ungkapkan z dalam sebutan x dan y OR Hasil darab semua sebutan untuk menghapuskan satu anu Hapus anu pertama dengan penggantian @ penghapusan Hapus anu kedua dengan penggantian @ penghapusan $x = 10 @ y = 20 @ z = 15$ $x = 10$ dan $y = 20$ dan $z = 15$	P1 K1 K1 N1 N1	
2.	(a)		$f(x) = 3 \left[x^2 - 4x + \left(\frac{-4}{2}\right)^2 - \left(\frac{-4}{2}\right)^2 + \frac{p}{3} \right] @$ $f(x) = 3 \left[x^2 - 4x + \left(\frac{-4}{2}\right)^2 - \left(\frac{-4}{2}\right)^2 \right] + p$ $f(x) = 3(x - 2)^2 - 12 + p$ and $x = 2$ $p = -5$	K1 N1 N1	6
	(b) (c)		Bentuk U Titik minimum $(2, -17)$ DAN $(-2, 31)$ dan $(4, -5)$ DAN $(-0.3805, 0)$ dan $(0, -5)$ Graf $g(x)$	P1 P1 P1	

3.	(a)	(i)	Tulis hukum segitiga atau hukum polygon dalam (i) atau (ii). $\vec{AD} = \vec{AB} + \vec{BC} + \vec{CD} @ \vec{QP} = \vec{QC} + \vec{CP}$ Guna hukum segitiga atau hukum poligon dalam (i) atau (ii). $\vec{6x} + \vec{8y} + (-\vec{8x}) @ (1 - \lambda)(-\vec{8x}) + \vec{6y}$ $-2\vec{x} + 8\vec{y}$	P1	8
				K1	
		(ii)	$(-8 + 8\lambda)\vec{x} + 6\vec{y} \quad [\text{Panduan: } \vec{CP} = (1 - \lambda)\vec{CD}]$	N1	
	(b)		$\vec{AD} = k\vec{QP}$ (guna apa-apa huruf @ simbol selain λ) $-2\vec{x} + 8\vec{y} = k(-8 + 8\lambda)\vec{x} + 6k\vec{y}$ Bandingkan: $-2 = k(-8 + 8\lambda) \text{ \& } 8 = 6k \text{ dan selesaikan persamaan serentak}$ $\lambda = \frac{13}{16}$	P1 K1 K1 N1	
4.	(a)	(i)	$x^2y = 216 \text{ \textit{atau} } L = 2x^2 + 4xy$ $L = 2x^2 + 4x\left(\frac{216}{x^2}\right)$ $L = 2x^2 + \frac{864}{x} \text{ (shown)}$	P1 K1 N1	6
	(b)		$\frac{dL}{dx} = 4x - \frac{864}{x^2}$ $4x - \frac{864}{x^2} = 0$ $x = 6$	K1	
			$\frac{d^2L}{dx^2} = 4 + \frac{1728}{x^3} = 4 + \frac{1728}{(6)^3} = 12 > 0$ Luas permukaan minimum pada $x = 6$	K1 N1	

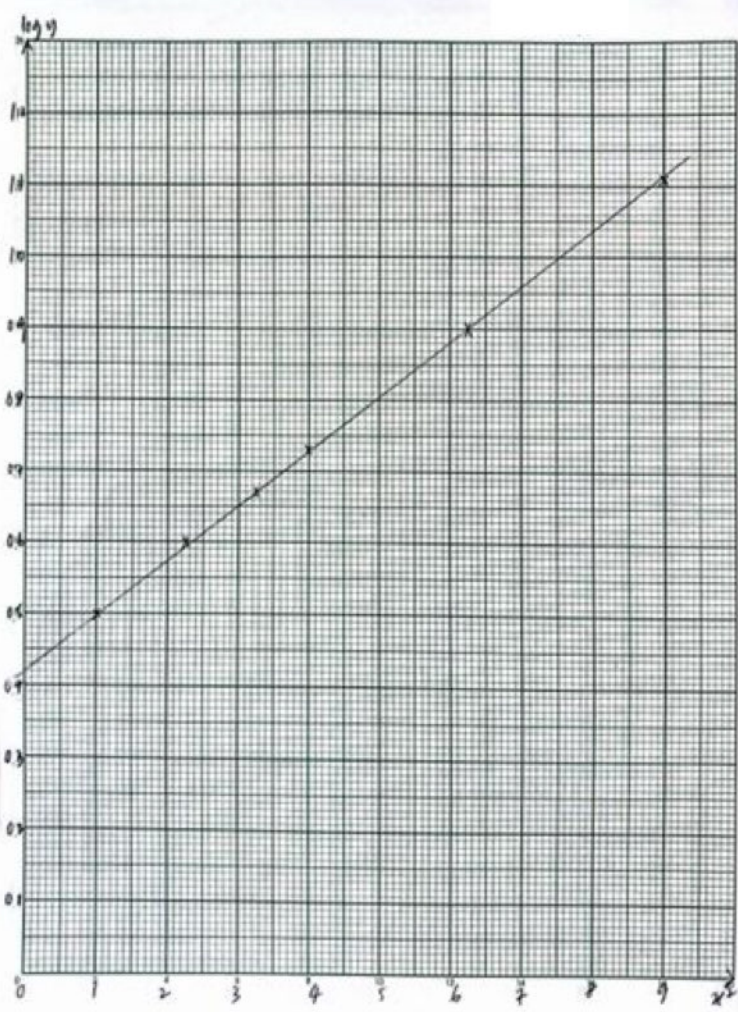


5.	(a)	$\tan 2x = \tan (x + x)$ $= \frac{\tan x + \tan x}{1 - \tan x \tan x}$ $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$	K1	8
			K1	
			N1	
	(b) (i)	 Bentuk graf $\tan x$ 1 kitaran Anjakan 1 unit ke atas	P1 P1 P1	
	(ii)	$y = 1 - \frac{x}{\pi}$ Garis lurus melalui titik $(0, 1)$, $(\pi, 0)$ dan kecerunan negatif dilukis DAN Bilangan penyelesaian = 3	K1 N1	
6.	(a)	$\frac{\text{panjang lengkok}}{\text{lilitan bulatan}} = \frac{\text{sudut yang dicangkum di pusat}}{360^\circ}$ $\frac{s}{2\pi r} = \frac{\theta \text{ rad}}{2\pi \text{ rad}}$ $s = r\theta$	K1 N1	9
	(b)	$\frac{2}{3}\pi \text{ atau } \frac{4}{3}\pi$ Luas tasik $= \frac{1}{2}(15^2)\left(\frac{2}{3}\pi\right)$ $= 75\pi \text{ atau } 235.62$ Luas laluan pejalan kaki $= \frac{1}{2}(15^2)\left(\frac{4}{3}\pi\right) - \frac{1}{2}(9^2)\left(\frac{4}{3}\pi\right)$ $= \frac{2}{3}\pi(15^2 - 9^2)$ $= 96\pi \text{ atau } 301.59$	P1 K1 K1	

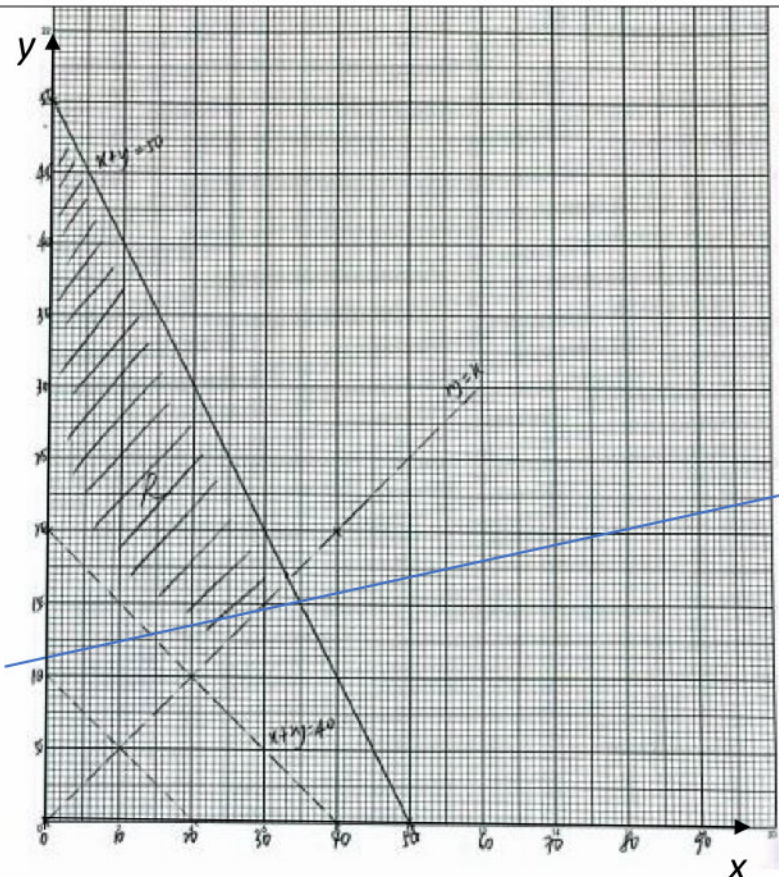
		Luas taman bunga $= \frac{1}{2}(9^2)\left(\frac{4}{3}\pi\right)$ $= 54\pi \text{ atau } 169.65$ $75\pi / 235.62 \text{ atau } 96\pi / 301.59 \text{ atau } 54\pi \quad 169.65$ Jumlah kos = $(235.62 \times 12) + (169.65 \times 5) + (301.59 \times 18)$ $= RM9104.31$ Hasil jualan tiket = $9104.31(1.20) \quad *jumlah \text{ kos} \times \frac{120}{100}$ $= RM10925.17$	K1 N1 K1 N1	
7.	(a)	$d_1 = \frac{5m}{3} - \frac{m}{3} = \frac{4}{3} \text{ DAN } d_2 = 3m - \frac{5m}{3} = \frac{4}{3} \text{ DAN } d_3 = 4\frac{1}{3}m - 3m = \frac{4}{3}$ DAN $d_1 = d_2 = d_3 = \frac{4}{3}$	N1	6
	(b)	$S_n = a + (a + d) + (a + 2d) + \dots + [a + (n - 1)d]$ $S_n = [a + (n - 1)d] + [a + (n - 2)d] + \dots + (a + d) + a$ $2S_n = [2a + (n - 1)d] + [2a + (n - 1)d] + [2a + (n - 1)d]$ $S_n = \frac{n}{2}[2a + (n - 1)d]$	K1 K1 N1	
	(c)	$T_n = S_n - S_{n-1}$ $T_n = \frac{n}{2}(4n + 5) - \left(\frac{n-1}{2}\right)(4n + 1)$ $T_n = \frac{8n+1}{2}$	K1 NI	
8.	(a)	$\frac{dy}{dx} = -2x \text{ DAN } m_1 = -4$ $y - 6 = -4(x - 2)$ $y = -4x + 14$	K1 K1 N1	8
	(b)	$\frac{1}{2}(14 + 6)(2) \text{ ATAU } -\frac{x^3}{3} + 10x$ $\left[\left(-\frac{2^3}{3} + 10(2) \right) - 0 \right]$ $= 20 - \left[\left(-\frac{2^3}{3} + 10(2) \right) - 0 \right]$ $= \frac{8}{3} \text{ units}$	K1 K1 K1 N1	
	(c)	$\frac{\pi}{2} \int_4^{10} (10 - y) dy$ $\frac{\pi}{2} \left[10y - \frac{y^2}{2} \right]_4^{10}$ $\frac{\pi}{2} \left[\left(10(10) - \frac{(10)^2}{2} \right) - \left(10(4) - \frac{(4)^2}{2} \right) \right]$ 9π	K1 K1 N1	



9.	(a)	$1 - P(X = 0) > 0.90$ ATAU $P(X = 0) < 0.10$ ${}^nC_0(0.08)^0(0.92)^n < 0.10$ $n \log(0.92) < \log(0.10)$ DAN $n > \frac{\log(0.10)}{\log(0.92)}$ $n > 27.62$ DAN $n = 28$	P1 K1 K1 N1	10
	(b) (i)	$P(68 < X < 90) = P\left(\frac{68-75}{12} < z < \frac{90-75}{12}\right)$ $= P(-0.583 < Z < 1.25)$ $= 1 - P(z \geq -0.583) - P(z \geq 1.25)$ $= 1 - 0.2800 - 0.1056$ DAN $= 0.6144$	K1 K1 N1	
	(b) (ii)	$P(X > k) = 0.20$ $P\left(z > \frac{k-75}{12}\right) = 0.20$ $\frac{x-75}{12} = 0.842$ $X = 85.10$ minit	K1 K1 N1	
	(b) (i)	$m_{AC} = \frac{4 - (-2)}{2 - 6} = \frac{-3}{2}$ $m_{DE} \times \left(\frac{-3}{2}\right) = -1$ $y - (-2) = \frac{2}{3}(x - 6)$ $y = \frac{2}{3}x - 6$ ATAU SETARA	K1 K1 N1	10
10.	(ii)	$D(0,-6)$ $\text{Luas ADE} = \frac{1}{2} \begin{vmatrix} 0 & 6 & 2 & 0 \\ -6 & -2 & 4 & -6 \end{vmatrix}$ $= \frac{1}{2} (0 \times -2 + 6 \times 4 + 2 \times -6) - (-6 \times 6 + -2 \times 2 + 4 \times 0) $ $= \frac{1}{2} (12 - (-40)) $ $= 26$	P1 K1 N1	
	(b)	PB=2PD $\sqrt{(x-6)^2 + (y-(-2))^2}$ <i>atau</i> $\sqrt{(x-0)^2 + (y-(-6))^2}$ $\sqrt{(x-6)^2 + (y-(-2))^2} = 2\sqrt{(x-0)^2 + (y-(-6))^2}$ $3x^2 + 3y^2 + 12x + 44y + 104 = 0$	P1 K1 K1 N1	

11.	(a)	<table><tr><td>x^2</td><td>1.00</td><td>2.25</td><td>3.24</td><td>4.00</td><td>6.25</td><td>9.00</td></tr><tr><td>$\log_{10} y$</td><td>0.50</td><td>0.60</td><td>0.67</td><td>0.73</td><td>0.90</td><td>1.11</td></tr></table>	x^2	1.00	2.25	3.24	4.00	6.25	9.00	$\log_{10} y$	0.50	0.60	0.67	0.73	0.90	1.11	N1 N1
	x^2	1.00	2.25	3.24	4.00	6.25	9.00										
	$\log_{10} y$	0.50	0.60	0.67	0.73	0.90	1.11										
	(b)	Rujuk Graf Skala betul dan memplot satu *titik dengan betul Semua titik diplotkan dengan betul Garis penyuaian yang terbaik 	N1 N1 N1														
(b)	(i)	$\log_{10} y = \log_{10} a (x^2) - \log_{10} b$ Kecerunan = $\log_{10} a$ $\log_{10} a = \frac{1.11-0.5}{9-1}$ = 0.07625 $a = 1.192$	P1 K1 N1														
(c)	(ii)	$-\log_{10} b = 0.42$ $b = 0.3802$	K1 N1														

		$\angle GEA = 17.12^\circ$ $\frac{AG}{\sin 17.12^\circ} = \frac{11}{\sin 18^\circ}$ $AG = 10.48 \text{ cm}$ ATAU ALTERNATIF II $\frac{\sin \angle AGE}{20.47} = \frac{\sin 18^\circ}{11}$ $\sin \angle AGE = 0.5751$ $\angle AGE = 144.88^\circ$ (sudut perlu menjadi cakak untuk panjang kayu menjadi minimum) $20.48^2 = 11^2 + AG^2 - 2(11)(AG) \cos 144.88^\circ$ $AG = 10.48 \text{ cm}$	K1 N1 K1 N1 K1 N1	
13.	(a)	$\frac{RM7.20}{x} \times 100 = 120 \quad \text{atau} \quad \frac{y}{RM5.00} \times 100 = 110 \quad \text{atau} \quad z = \frac{RM9.10}{RM7.00} \times 100$ $x = RM6.00$ $y = RM5.50$ $z = 130$	K1 N1 N1 N1	10
	(b)	$\frac{120 \times I_{2024}}{\frac{2022}{100}} = 160 \text{ atau setara}$ $I_{2024} = 133.33$	K1 N1	
	(c)	$\frac{120(m) + 110(90) + 130(n) + 130(70)}{m + 90 + n + 70} = 115$ $m = -120 - 3n$	K1 N1	
	(d)	$\frac{RM5.50}{RM4.00} \times 100$ 137.50	K1 N1	

14.	(a)	$x + y \leq 50$ $1000x + 2000y > 40000$ $x < 2y$	N1 N1 N1	
	(b)	 Satu garis lurus dilukis dengan betul. Semua garis lurus dilukis dengan betul. Rantau R dilorek dengan betul.	K1 N1 N1	
	(c)	(i)	16	N1
		(ii)	$k = 1000x + 2000y$ $1000 * (33) + 2000 * (17)$ <i>*fungsi objektif dilukis dengan betul</i> $67000 \times 4 \%$ 2680	K1 K1 N1

15.	(a)	$\frac{dv}{dt} = 2 - 2t$ DAN $a = 2 - 2(0)$ 2	K1 N1	10
	(b)	$8 + 2t - t^2 = 0$ DAN $(t - 4)(t + 2) = 0$ *pemfaktoran mesti betul $t = 4$ atau $t = -2$ (abaikan) & Maka, $t = 4$	K1 N1	
	(c)	$s = 8t + t^2 - \frac{t^3}{3} + c$ & $c = -4$ $s_B = 8(4) + (4)^2 - \frac{(4)^3}{3} - 4$ $Jumlah\ jarak = -4 + \frac{80}{3}$ $= \frac{80}{3}$	K1 K1 K1 N1	
	(d)	$\frac{80}{3} + \left -\frac{10}{3} \right $ 30	K1 N1	