

KERTAS MODEL SPM

MATEMATIK TAMBAHAN Dwibahasa

KERTAS MODEL SIJIL PELAJARAN MALAYSIA SET 1

KERTAS 1

Bahagian A

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
1	<p>(a)</p> <p> $\sin 2\alpha = 2 \sin \alpha \cos \alpha$ $= 2 \left(\frac{3}{\sqrt{10}}\right) \left(\frac{1}{\sqrt{10}}\right)$ $= \frac{3}{5}$ </p>	1 1	5
	<p>(b) $\cos \alpha = \frac{1}{\sqrt{10}}$, $\cos \beta = -\frac{2}{\sqrt{29}}$, $\sin \alpha = \frac{3}{\sqrt{10}}$, $\sin \beta = -\frac{5}{\sqrt{29}}$</p> <p> $\cos(\beta - \alpha) = \cos \beta \cos \alpha + \sin \beta \sin \alpha$ $= \left(-\frac{2}{\sqrt{29}}\right) \left(\frac{1}{\sqrt{10}}\right) + \left(-\frac{5}{\sqrt{29}}\right) \left(\frac{3}{\sqrt{10}}\right)$ $= -\frac{17}{\sqrt{290}}$ </p>	1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
2	(a) $\frac{SR}{PQ} = \frac{5}{4}$ $SR = \frac{5}{4}PQ$ $\vec{SR} = \frac{5}{4}\underline{a}$	1 1	5
	(b) $\frac{5}{4}\underline{a} + \underline{a} = \frac{9}{4}\underline{a}$	1	
	(c) $\frac{5}{4}\underline{a} - \underline{a} = \frac{1}{4}\underline{a}$ $ \vec{SR} - \vec{PQ} = \frac{1}{4} (24)$ $= 6 \text{ unit / units}$	1 1	
3	$x = 10^{a(2-y)}$ $\log x = \log 10^{a(2-y)}$ $\log x = a(2-y)$ $\log x = 2a - ay$ $ay = -\log x + 2a$ $y = -\frac{1}{a} \log x + 2$ Kecerunan / Gradient = $\frac{-1-8}{4-(-8)}$ $= -\frac{3}{4}$ $-\frac{1}{a} = -\frac{3}{4}$ $a = \frac{4}{3}$	1 1 1 1	4
4	$(x-3)(30x-8.2) = 103.4$ $30x^2 - 98.2x + 24.6 - 103.4 = 0$ $30x^2 - 98.2x - 78.8 = 0$ $x = \frac{-(-98.2) \pm \sqrt{(-98.2)^2 - 4(30)(-78.8)}}{2(30)}$ $= 3.94 \text{ cm}$	1 1 1 1	4
5	$f(x) = -3x^2 + ax + b$ $= -3\left(x^2 - \frac{a}{3}x - \frac{b}{3}\right)$ $= -3\left[x^2 - \frac{a}{3}x + \left(-\frac{a}{3}\right)^2 - \left(-\frac{a}{3}\right)^2 - \frac{b}{3}\right]$ $= -3\left[\left(x - \frac{a}{6}\right)^2 - \left(-\frac{a}{6}\right)^2 - \frac{b}{3}\right]$ $= -3\left[\left(x - \frac{a}{6}\right)^2 - \frac{a^2}{36} - \frac{b}{3}\right]$ $= -3\left[\left(x - \frac{a}{6}\right)^2 - \frac{a^2 + 12b}{36}\right]$	1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(ii) Pusat bulatan / <i>Centre of circle</i> $= \left(\frac{7+19}{2} + \frac{14+(-2)}{2} \right)$ $= (13, 6)$ Jarak pusat ke Q / <i>Distance of centre to Q</i> $= \sqrt{(13-7)^2 + (6-14)^2}$ $= 10$ $\sqrt{(x-13)^2 + (y-6)^2} = 10$ $(x-13)^2 + (y-6)^2 = 100$ $x^2 - 26x + 169 + y^2 - 12y + 36 = 100$ $x^2 + y^2 - 26x - 12y + 105 = 0$	 1 1 1	 9
8	(a) $\frac{n!}{(n-3)!} = \frac{n(n-1)(n-2)(n-3)!}{(n-3)!}$ $72n = \frac{n(n-1)(n-2)(n-3)!}{(n-3)!}$ $72n = n(n-1)(n-2)$ $72 = (n-1)(n-2)$ $72 = n^2 - 3n + 2$ $0 = n^2 - 3n + 70$ $0 = (n+7)(n-10)$ $n = 10$ (b) ${}^{10}P_4 \times {}^6P_2 = 151\,200$ atau / <i>or</i> ${}^{10}P_6 = 151\,200$	 1 1 1	 4
9	(a) $\frac{dy}{dx} \times \left(-\frac{1}{ax^3 - b} \right) = -1$ $\frac{dy}{dx} = ax^3 - b$ $28 = a(2)^3 - b$, $0 = a(1)^3 - b$ $28 = 8a - b \dots \textcircled{1}$, $0 = a - b \dots \textcircled{2}$ Dari / <i>From</i> $\textcircled{2}$, $a = b$ $28 = 8a - a$ $28 = 7a$ $a = 4, b = 4$ (b) $\int \frac{dy}{dx} dx = \int 4x^3 - 4 dx$ $y = x^4 - 4x + c$ Pada / <i>At</i> $(2, -1)$; $-1 = 2^4 - 4(2) + c$ $c = -9$ $\therefore y = x^4 - 4x - 9$	 1 1 1 1 1 1	 8

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
10	<p>(a) $AP = AQ = 10.47 - 6$ $= 4.47$ $BC = x + 6$ $BA = x + 4.47$</p> $BC^2 = AC^2 + BA^2 - 2(AC)(BA) \cos A$ $(x + 6)^2 = (x + 4.47)^2 + 10.47^2 - 2(x + 4.47)(10.47) \cos 62.70^\circ$ $x^2 + 12x + 36 = x^2 + 8.94x + 19.9809 + 109.6209 - 42.9304 - 9.6041x$ $12x - 8.94x + 9.6041x = -36 + 19.9809 + 109.6209 - 42.9304$ $12.6641x = 50.6714$ $x = 4$ <p>(b) $\frac{\sin 62.70^\circ}{10} = \frac{\sin \angle C}{8.47}$ $\angle C = 48.82^\circ$ $\angle B = 68.48^\circ$</p> <p>Jumlah luas sektor / Total area of sectors</p> $= \frac{1}{2} (4.47)^2 \left(\frac{62.70^\circ}{180^\circ} \times \pi \right) + \frac{1}{2} (6)^2 \left(\frac{48.82^\circ}{180^\circ} \times \pi \right) + \frac{1}{2} (4)^2 \left(\frac{68.82^\circ}{180^\circ} \times \pi \right)$ $= 35.8363$ <p>Luas segi tiga / Area of triangle</p> $= \frac{1}{2} (8.47)(10.47) \sin 62.70^\circ$ $= 39.4017$ <p>Luas kawasan berlorek / Area of the shaded region</p> $= 39.4017 - 35.8363$ $= 3.5654$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>
11	$T_n + T_{n+1} = 27a + 75$ $[a + (n - 1)(a + 3)] + [a + ((n + 1) - 1)(a + 3)] = 27a + 75$ $(a + an + 3n - a - 3) + [a + n(a + 3)] = 27a + 75$ $an + 3n - 3 + (a + an + 3n) = 27a + 75$ $a + 2an + 6n - 3 = 27a + 75$ $(1 + 2n)a + 6n - 3 = 27a + 75$ <p>Bandungkan / Comparing:</p> $1 + 2n = 27 \quad , \quad 6n - 3 = 75$ $n = 13 \quad \quad \quad n = 13$ <p>Oleh sebab itu / Hence, $T_{13} + T_{14} = 27a + 75$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
12	$T_2 = 288$, $T_4 = 184.32$ $ar = 288$ $ar^3 = 184.32$ $\frac{ar^3}{ar} = \frac{184.32}{288}$ $r^2 = \frac{16}{25}$ $r = \frac{4}{5}$ $a\left(\frac{4}{5}\right) = 288$ $a = 360$ $S_\infty = \frac{360}{1 - \frac{4}{5}}$ $S_\infty = 1800$	1 1 1 1	4

Bahagian B

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
13	(a) (i) 2 (ii) -5 (b) (i) $g(4 - 5x) = 25x^2 - 40x + 14$ Anggap / Let, $4 - 5x = u$ $x = \frac{4 - u}{5}$ $g(u) = 25\left(\frac{4 - u}{5}\right)^2 - 40\left(\frac{4 - u}{5}\right) + 14$ $g(u) = 25\left(\frac{16 - 8u + u^2}{25}\right) - 8(4 - u) + 14$ $g(u) = 16 - 8u + u^2 - 32 + 8u + 14$ $g(u) = u^2 - 2$ $g(x) = x^2 - 2$ (ii) $hg(x) = 2(x^2 - 2) + 3$ $hg(x) = 2x^2 - 1$ $a = 2, b = 1$	1 1 1 1 1 1 1 1 1	8
14	(a) $\frac{p \times p^2 \times p^3 \times p^4 \times \dots \times p^n}{p^5 \times p^6 \times p^7 \dots \times p^m} = p^k$ $\frac{p \times p^2 \times p^3 \times p^4 \times (p^5 \times p^6 \dots \times p^{m-2})}{(p^5 \times p^6 \dots \times p^{m-2}) \times p^{m-1} \times p^m} = p^k$ $\frac{p \times p^2 \times p^3 \times p^4}{p^{m-1} \times p^m} = p^k$ $p^{10 - [(m-1) + m]} = p^k$ $p^{11 - 2m} = p^k$ $k = 11 - 2m$	1 1 1 1 1	

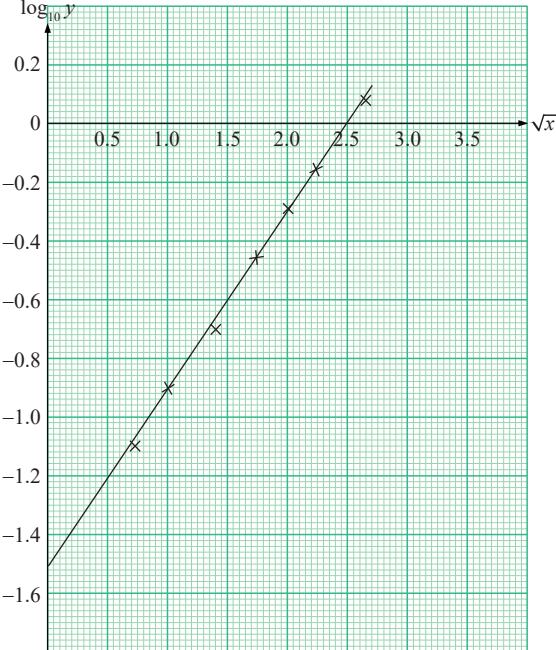
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) $5^{2x} = (a^4 \times 2^{3x})^2$ $5^{2x} = a^8 \times 2^{6x}$ $a^8 = \frac{5^{2x}}{2^{6x}}$ $a^8 = \left(\frac{5}{2^3}\right)^{2x}$ $\log_a a^8 = \log_a \left(\frac{5}{8}\right)^{2x}$ $8 \log_a a = 2x \log_a \left(\frac{5}{8}\right)$ $x = \frac{8}{2 \log_a \left(\frac{5}{8}\right)}$ $x = \frac{4}{\log_a \left(\frac{5}{8}\right)}$</p>	<p>1 1 1 1</p>	<p>8</p>
15	<p>(a) $\frac{dy}{dx} = \frac{d}{dx} \left(x^3 + \frac{5}{2}x^2 - 2x - 4\right)$ $\frac{dy}{dx} = 3x^2 + 5x - 2$</p> <p>(b) $0 = (3x - 1)(x + 2)$ $x = \frac{1}{3}, x = -2$ Pada / At $x = \frac{1}{3}, y = \left(\frac{1}{3}\right)^3 + \frac{5}{2} \left(\frac{1}{3}\right)^2 - 2 \left(\frac{1}{3}\right) - 2 = -\frac{235}{64}$ Pada / At $x = -2, y = (-2)^3 + \frac{5}{2} (-2)^2 - 2(-2) - 4 = 2$ $\frac{d^2y}{dx^2} = 6x + 5$ Pada / At $x = \frac{1}{3}, \frac{d^2y}{dx^2} = 7$ Oleh sebab itu, $\left(\frac{1}{3}, -\frac{235}{64}\right)$ ialah titik minimum. <i>Therefore, $\left(\frac{1}{3}, -\frac{235}{64}\right)$ is a minimum point.</i> Pada / At $x = -2, \frac{d^2y}{dx^2} = -7$ Oleh sebab itu, $(-2, 2)$ ialah titik maksimum. <i>Therefore, $(-2, 2)$ is a maximum point.</i></p>	<p>1 1 1 1 1</p>	<p>8</p>
	<p>(c) $\delta x = 2.03 - 2 = 0.03$ $\frac{dy}{dx} = 3(2)^2 + 5(2) - 2$ $= 20$ $\frac{\delta y}{\delta x} \approx \frac{dy}{dx}$ $\delta y = \frac{dy}{dx} \times \delta x$ $= 20 \times 0.03$ $= 0.6$</p>	<p>1 1 1 1</p>	<p>8</p>

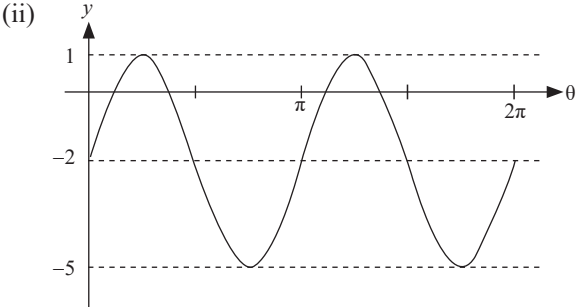
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
3	<p>A: $x + y + (x + 2) + z + 2 + (y - 3) = 47.5$ $2x + 2y + z = 46.5 \dots \textcircled{1}$</p> <p>B: $x + y + 12 + 3z = 46.5$ $x + y + 3z = 34.5 \dots \textcircled{2}$</p> <p>C: $2x + 2z + x + 6 + y = 52$ $3x + y + 2z = 46 \dots \textcircled{3}$</p> <p>$\textcircled{2} - \textcircled{3}$: $x + y + 3z = 34.5$ $\underline{- 3x + y + 2z = 46}$ $-2x + z = 11.5 \dots \textcircled{4}$</p> <p>$2 \times \textcircled{3} - \textcircled{1}$: $6x + 2y + 4z = 92$ $\underline{- 2x + 2y + z = 46.5}$ $4x + 3z = 45.5 \dots \textcircled{5}$</p> <p>$2 \times \textcircled{4} + \textcircled{5}$: $-4x + 2z = -23$ $\underline{+ 4x + 3z = 45.5}$ $5z = 22.5$ $z = 4.5$</p> <p>Gantikan $z = 4.5$ ke dalam / Substitute $z = 4.5$ into $\textcircled{4}$: $-2x + 4.5 = -11.5$ $-2x = -16$ $x = 8$</p> <p>Gantikan $z = 4.5$ dan $x = 8$ ke dalam / Substitute $z = 4.5$ and $x = 8$ into $\textcircled{2}$: $7.8 + y + 3(4.5) = 34.5$ $y = 13.2$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
4	<p>(a) (i) $\vec{OB} = \vec{OA} + \vec{AB}$ $= 2p\hat{i} + q\hat{j} + [-p\hat{i} + (q - 1)\hat{j}]$ $= p\hat{i} + (2q - 1)\hat{j}$</p> <p>(ii) $\sqrt{p^2 + (2q - 1)^2} = 1$ $p^2 + 4q^2 - 4q + 1 = 1$ $p^2 = 1 - 4q^2 + 4q - 1$ $p^2 = 4q - 4q^2$ $p = \sqrt{4q - 4q^2}$ $p = 2\sqrt{q - q^2}$</p> <p>(b) (i) $(8\hat{i} - 10\hat{j}) + 3(3\hat{i} + 4\hat{j})$ $= 17\hat{i} + 2\hat{j}$</p> <p>(ii) $(33\hat{i} - 18\hat{j}) = (8\hat{i} - 10\hat{j}) + t(3\hat{i} + 4\hat{j})$ $(33\hat{i} - 18\hat{j}) = (8 + 3t)\hat{i} - (10 - 4t)\hat{j}$</p> <p>Bandingkan pekali bagi \hat{i} dan \hat{j} / Compare the coefficient of \hat{i} and \hat{j}: $33 = 8 + 3t$, $18 = -(10 - 4t)$ $t = \frac{25}{3}$, $18 = -10 + 4t$ $t = 7$</p> <p>Oleh kerana kedua-dua t tidak sama, maka bot tersebut tidak melalui titik A. Since both t is not equal, hence the boat does not pass through point A.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>9</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
5	(a) (i) $P(X \geq 85) = P\left(Z \geq \frac{85 - 70.2}{15.5}\right)$ $= P(Z \geq 0.955)$ $= 0.1698$	1 1	7
	(ii) $\frac{75}{100} \times 198 \times 0.1698 = 25.22$ ≈ 25 orang murid / pupils	1 1	
	(b) $P(X < k) = 0.0963$ $P\left(Z < \frac{k - 70.2}{15.5}\right) = P\left(Z > -\frac{k - 70.2}{15.5}\right) = 0.0963$ $-\frac{k - 70.2}{15.5} = 1.303$ $\frac{k - 70.2}{15.5} = -1.303$ $k = 50$	1 1 1	
6	(a) $\frac{1}{2} \begin{vmatrix} -1 & 2m & 7 & -1 \\ 2 & 3m & -2 & 2 \end{vmatrix} = 42$ $\frac{1}{2} \begin{vmatrix} [-1(3m) + 2m(-2) + 7(2)] - \\ [2(2m) + 3m(7) + (-2)(-1)] \end{vmatrix} = 42$ $ -32m + 12 = 84$ $-32m + 12 = 84, \quad -32m + 12 = -84$ $m = -\frac{9}{4}, \quad m = 3$	1 1 1	7
	(b) $B(6, 9)$ $m_{AC} = \frac{2 - (-2)}{-1 - 7} = -\frac{1}{2}$ $m_{BD} = 2$ $\frac{9 - y}{6 - x} = 2$ $9 - y = 2(6 - x)$ $9 - y = 12 - 2x$ $-y = 3 - 2x$ $y = -3 + 2x$ <pintasan-x x-intercept="<math">\frac{3}{2}</pintasan-x>	1 1 1 1	
7	(a) ${}^{11}C_4 \times {}^8C_4$ $= 23\ 100$	1 1	7
	(b) ${}^3C_1 \times {}^4C_1 \times {}^{12}C_6$ $= 11\ 088$	1 1	
	(c) ${}^3C_2 \times {}^4C_2 \times {}^5C_2 \times {}^7C_2$ $= 3\ 780$	2 1	

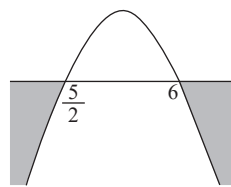
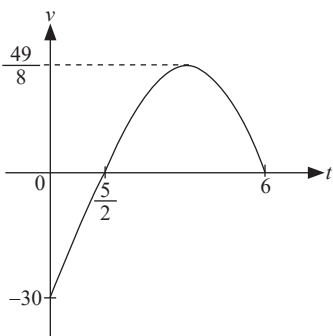
Bahagian B

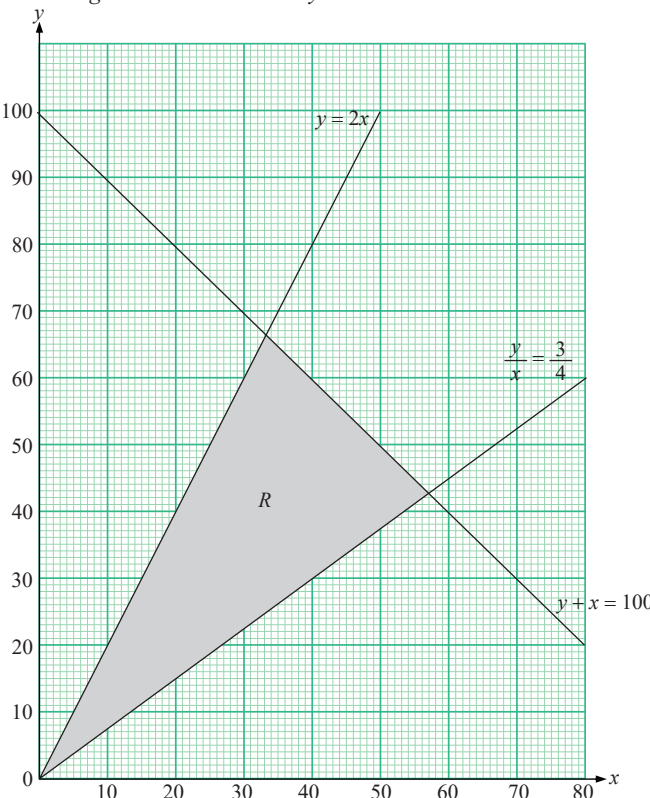
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks															
8	(a) (i) Koordinat- x / x -coordinate: $T_1 = 4(1) - 7 = -3$ Koordinat- y / y -coordinate: $T_1 = -11(1) + 104 = 93$ Koordinat kedudukan pertama titik J : $(-3, 93)$ <i>Coordinate of the first location of point J</i>	1 1	10															
	(ii) Beza sepunya koordinat- x / <i>Common difference of x-coordinate</i> $= T_2 - T_1$ $= [4(2) - 7] - [4(1) - 7]$ $= 4$ Beza sepunya koordinat- y / <i>Common difference of y-coordinate</i> $= T_2 - T_1$ $= [-11(2) + 104] - [-11(1) + 104]$ $= -11$	1 1 1 1																
9	(b) T_8 bagi koordinat- x / T_8 for x -coordinate: $4(8) - 7 = 25$ T_8 bagi koordinat- y / T_8 for y -coordinate: $-11(8) + 104 = 16$ Jarak mengufuk / <i>Horizontal distance</i> : $25 - (-3) = 28$ Jarak mencancang / <i>Vertical distance</i> : $16 - 93 = -77$ $\sqrt{28^2 + (-77)^2}$ $= 81.93$	1 1 1 1	10															
	(a)	<table border="1"> <tr> <td>\sqrt{x}</td> <td>0.71</td> <td>1</td> <td>1.41</td> <td>1.73</td> <td>2.00</td> <td>2.24</td> <td>2.65</td> </tr> <tr> <td>$\log_{10} y$</td> <td>-1.10</td> <td>-0.89</td> <td>-0.70</td> <td>-0.46</td> <td>-0.28</td> <td>-0.15</td> <td>0.08</td> </tr> </table>		\sqrt{x}	0.71	1	1.41	1.73	2.00	2.24	2.65	$\log_{10} y$	-1.10	-0.89	-0.70	-0.46	-0.28	-0.15
\sqrt{x}	0.71	1	1.41	1.73	2.00	2.24	2.65											
$\log_{10} y$	-1.10	-0.89	-0.70	-0.46	-0.28	-0.15	0.08											

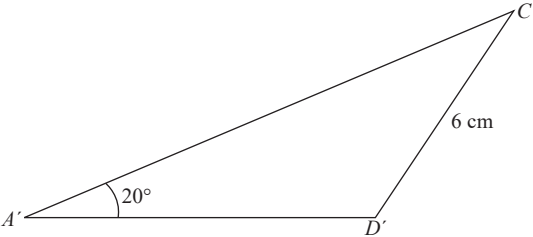
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) • Sekurang-kurangnya 5 – 6 titik diplot dengan betul At least 5 – 6 points are plotted correctly</p> <p>• Semua titik diplot dengan betul / All points are plotted correctly</p> <p>• Garis penyesuaian terbaik / Line of best fit</p> 	<p>1</p> <p>1</p> <p>1</p>	
	<p>(c) (i) $y = 10^{p\sqrt{x} + q}$</p> $\log_{10} y = \log_{10} 10^{p\sqrt{x} + q}$ $\log_{10} y = (p\sqrt{x} + q) \log_{10} 10$ $\log_{10} y = p\sqrt{x} + q$ $Y = mX + c$ $p = m = \frac{-0.46 - (-0.89)}{1.73 - 1}$ $= \frac{43}{73}$ <p>(ii) $q = \text{pintasan-}y / y\text{-intercept} = -1.50$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
<p>10</p>	<p>(a) $\left(\frac{x+50}{7}\right)^2 = 100 - x^2$</p> $\frac{x^2 + 100x + 2\,500}{49} = 100 - x^2$ $x^2 + 100x + 2\,500 = 4\,900 - 49x^2$ $50x^2 + 100x - 2\,400 = 0$ $50(x+8)(x-6) = 0$ $x = -8, x = 6$ <p>Apabila / When $x = -8$, $7y = (-8) + 50$</p> $y = 6$ <p>Apabila / When $x = 6$, $7y = (6) + 50$</p> $y = 8$	<p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
(ii)	 <ul style="list-style-type: none"> • Bentuk $\sin x$ / Shape of $\sin x$ • 2 kitaran / 2 cycles • Maksimum 1 dan minimum -5 / Maximum 1 and minimum -5 • Translasi / Translation $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$ 	1 1 1 1	10

Bahagian C

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
12	<p>(a) (i) -30</p> <p>(ii) $-2t^2 + 17t - 30 < 0$ $-(2t - 5)(t - 6) < 0$</p>  <p>$t < \frac{5}{2}, t > 6$</p> <p>(iii) $a = \frac{d}{dt} (-2t^2 + 17t - 30)$ $0 = -4t + 17$ $t = \frac{17}{4} \text{ s}$</p>	1 1 1 1	
(b)	 <p>Bentuk kuadratik dengan pintasan-y ialah -30. <i>Quadratic shape with y-intercept is -30.</i></p> <p>Maksimum / Maximum = $\frac{49}{8}$</p>	1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(c) $\left \int_0^{\frac{5}{2}} -2t^2 + 17t - 30 \, dt \right + \int_{\frac{5}{2}}^6 -2t^2 + 17t - 30 \, dt$</p> $= \left -\frac{2t^3}{3} + \frac{17t^2}{2} - 30t \right _0^{\frac{5}{2}} + \left[-\frac{2t^3}{3} + \frac{17t^2}{2} - 30t \right]_{\frac{5}{2}}^6$ $= \left[-\frac{2\left(\frac{5}{2}\right)^3}{3} + \frac{17\left(\frac{5}{2}\right)^2}{2} - 30\left(\frac{5}{2}\right) \right] - \left[-\frac{2(0)^3}{3} + \frac{17(0)^2}{2} - 30(0) \right]$ $+ \left[-\frac{2(6)^3}{3} + \frac{17(6)^2}{2} - 30(6) \right] - \left[-\frac{2\left(\frac{5}{2}\right)^3}{3} + \frac{17\left(\frac{5}{2}\right)^2}{2} - 30\left(\frac{5}{2}\right) \right]$ $= \left -\frac{775}{24} \right + \frac{343}{24}$ $= \frac{559}{12}$	<p>1</p> <p>1</p> <p>1</p>	<p>10</p>
13	<p>(a) I: $y \leq 2x$ II: $y + x \leq 100$ III: $\frac{y}{x} \geq \frac{3}{4}$</p>	<p>1</p> <p>1</p> <p>1</p>	
	<p>(b) • Sekurang-kurangnya satu garis lurus dilukis dengan betul. <i>At least one straight line is drawn correctly.</i></p> <p>• Semua garis lurus dilukis dengan betul. <i>All straight lines are drawn correctly.</i></p> <p>• Rantau dilorek dengan betul. <i>Region is shaded correctly.</i></p>  <p>The graph shows a coordinate system with x and y axes ranging from 0 to 80. Three lines are plotted: $y = 2x$, $y + x = 100$, and $\frac{y}{x} = \frac{3}{4}$. The region bounded by these three lines is shaded and labeled 'R'.</p>	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
(b)		1	10

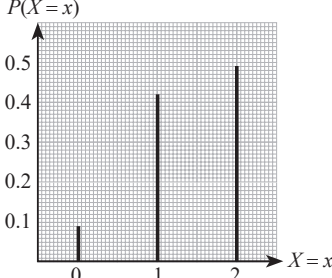
KERTAS MODEL SIJIL PELAJARAN MALAYSIA SET 2

KERTAS 1

Bahagian A

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
1	(a) (i) {1, 2, 3, 4, 5} (ii) 2, 4, 8	1 1	
	(b) (i) $f(0) = h$ $ 5 - 0 = h$ $h = 5$ $f\left(\frac{8}{5}\right) = 0$ $\left 5 - \frac{8}{5}k\right = 0$ $5 - \frac{8}{5}k = 0$ $-\frac{8}{5}k = -5$ $k = 8$ (ii) $0 \leq f(x) \leq 13$ (iii) $f(x)$ mempunyai fungsi songsang kerana fungsi ini mempunyai hubungan satu kepada satu. <i>$f(x)$ has an inverse function because it is one-to-one relation.</i>	1 1 1 1 1	
2	(a) $1 - 6x = 0$ $x = \frac{1}{6}$	1	
	(b) Anggap / Let $y = f^{-1}(x)$ $f(y) = x$ $\frac{p}{1 - 6y} = x$ $p = x(1 - 6y)$ $p = x - 6xy$ $6xy = x - p$ $y = \frac{x - p}{6x}$ $y = \frac{1}{6} - \frac{p}{6x}$ $f^{-1}(x) = \frac{1}{6} - \frac{p}{6x}$	1 1	

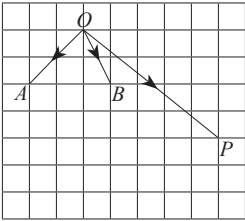
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	Maka / Then, $-\frac{p}{6} = -\frac{2}{q}$ $\frac{p}{6} = \frac{2}{q}$ $p = \frac{12}{q}$	1	4
3	$y = 3(x - b)^2 + a$ $y = 3(x - b)(x - b) + a$ $y = 3(x^2 - bx - bx + b^2) + a$ $y = 3(x^2 - 2bx + 3b^2) + a$ $y = 3x^2 - 6bx + 3b^2 + a$ Guna / Use $b^2 - 4ac > 0$ $(-6b)^2 - 4(3)(3b^2 + a) > 0$ $36b^2 - 36b^2 - 12a > 0$ $-12a > 0$ $a < \frac{0}{-12}$ $a < 0$; tertunjuk / shown	1 1 1	3
4	(a) $(x - 3)^2 = x - 5$ $x^2 - 6x + 9 - x + 5 = 0$ $x^2 - 7x + 14 = 0$ $b^2 - 4ac = (-7)^2 - 4(1)(14)$ $= -7 < 0$ $\therefore b^2 - 4ac < 0$ (Tiada punca nyata / No real roots) (b) $x(x - m) = 3 - k$ $x^2 - mx + k - 3 = 0$ Punca / Roots: $\alpha, \alpha + 8$ HTP / SOR: $\alpha + (\alpha + 8) = -\left(-\frac{m}{1}\right)$ $2\alpha + 8 = m$ $\alpha = \frac{m - 8}{2}$ HDP / POR: $\alpha(\alpha + 8) = \frac{k - 3}{1}$ $\alpha^2 + 8\alpha = k - 3$ $\left(\frac{m - 8}{2}\right)^2 + 8\left(\frac{m - 8}{2}\right) - k + 3 = 0$ $\frac{m^2 - 16m + 64}{4} + 4m - 32 - k + 3 = 0$ $m^2 - 4k - 52 = 0$ $m = \pm \sqrt{52 + 4k}$	1 1 1 1 1	6
5	(a) $x \log_{27} p = \log_3 p$ $\log_{27} p^x = \log_3 p$ $\frac{\log_3 p^x}{\log_3 27} = \log_3 p$ $\frac{\log_3 p^x}{\log_3 3^3} = \log_3 p$	1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) (i) Katakan / Let $u = 12\,000t$, Katakan / Let $v = 1 + t^3$</p> $\frac{du}{dt} = 12\,000 \qquad \frac{dv}{dt} = 3t^2$ $\frac{dP}{dt} = \frac{v \frac{du}{dt} - u \frac{dv}{dt}}{v^2}$ $\frac{dP}{dt} = \frac{(1 + t^3)(12\,000) - 12\,000t(3t^2)}{(1 + t^3)^2}$ $\frac{dP}{dt} = \frac{12\,000 + 12\,000t^3 - 36\,000t^3}{(1 + t^3)^2}$ $\frac{dP}{dt} = \frac{12\,000 + 24\,000t^3}{(1 + t^3)^2}$ $0 = \frac{12\,000 + 24\,000t^3}{(1 + t^3)^2}$ $0 = 12\,000 + 24\,000t^3$ $24\,000t^3 = 12\,000$ $t^3 = \frac{12\,000}{24\,000}$ $t^3 = 0.5$ $t = 0.7937 \text{ jam / hours}$ $t \approx 48 \text{ minit / minutes}$ <p>(ii) $P = \frac{12\,000(0.7937)}{1 + 0.7937^3}$ $P = 6\,349.6 \approx 6\,350$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>7</p>
9	<p>(a) $X = \{0, 1, 2\}$</p> <p>(b) $P(X=0) = {}^2C_0(0.7)^0(0.3)^{2-0} = 0.09$ $P(X=1) = {}^2C_1(0.7)^1(0.3)^{2-1} = 0.42$ $P(X=2) = {}^2C_2(0.7)^2(0.3)^{2-2} = 0.49$</p> <p>$P(X=x)$</p> 	<p>1</p> <p>2</p> <p>2</p>	<p>5</p>
10	$P(m < Z < 0) = 2P(0 < Z < k)$ $0.5 - 0.14 = 2[0.5 - P(Z > k)]$ $0.18 = 0.5 - P(Z > k)$ $P(Z > k) = 0.5 - 0.18$ $P(Z < k) = 0.32$ $k = 0.468$ $P(Z < m) = P(Z < -m)$ $= 0.14$ $\therefore m = -1.081$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
11	<p>(a) $\int_p^1 \frac{1}{2} [f(x) - x] dx = 20$</p> $\frac{1}{2} \int_p^1 f(x) dx - \frac{1}{2} \int_p^1 x dx = 20$ $\frac{1}{2} (36) - \frac{1}{2} \left[\frac{x^2}{2} \right]_p^1 = 20$ $18 - \frac{1}{2} \left[\frac{1^2}{2} - \frac{p^2}{2} \right] = 20$ $-\frac{1}{2} \left[\frac{1^2}{2} - \frac{p^2}{2} \right] = 2$ $\frac{1}{2} - \frac{p^2}{2} = -4$ $-\frac{p^2}{2} = -\frac{9}{2}$ $p^2 = 9$ $p = \pm 3$ <p>Oleh sebab / Since $p < 0$, $p = -3$</p> <p>(b) $\int -\frac{r}{(2-qx)^4} dx = -\int (2-qx)^{-4} dx$</p> $= -r \frac{(2-qx)^{-3}}{(-3)(-q)} + c$ $= -\frac{r}{3q} (2-qx)^{-3} + c$ $-\frac{r}{3q} = -3$ $\frac{r}{3q} = 3$ $\frac{r}{q} = 9$ <p>Maka / Thus, $r : q = 9 : 1$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>7</p>
12	<p>(a) $\sin A = \frac{a}{c}$, $\cos A = \frac{b}{c}$, $\tan A = \frac{a}{b}$</p> <p>Diketahui bahawa / It is known that, $a^2 + b^2 = c^2$</p> <p>Bahagi kedua-dua belah dengan b^2 / Divide both sides by b^2:</p> $\frac{a^2}{b^2} + \frac{b^2}{b^2} = \frac{c^2}{b^2}$ $\frac{a^2}{b^2} + 1 = \frac{c^2}{b^2}$ $\left(\frac{a}{b}\right)^2 + 1 = \left(\frac{c}{b}\right)^2$ <p>$\therefore \tan^2 A + 1 = \sec^2 A$</p> <p>(b) $(1 + \tan A)^2 = (1 + \tan A)(1 + \tan A)$</p> $= 1 + 2 \tan A + \tan^2 A$ $= 1 + \tan^2 A + 2 \tan A$ $= \sec^2 A + 2 \frac{\sin A}{\cos A}$ $= \sec^2 A + 2 \frac{\sin A}{\cos A} \cdot \frac{\cos A}{\cos A}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	$= \sec^2 A + 2 \frac{\sin A \cos A}{\cos^2 A}$ $= \sec^2 A + 2 \sin A \cos A \left(\frac{1}{\cos^2 A} \right)$ $= \sec^2 A + \sin 2A \sec^2 A$ $= \sec^2 A(1 + \sin 2A)$	1	6

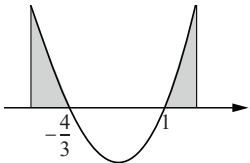
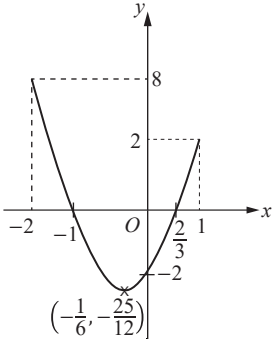
Bahagian B

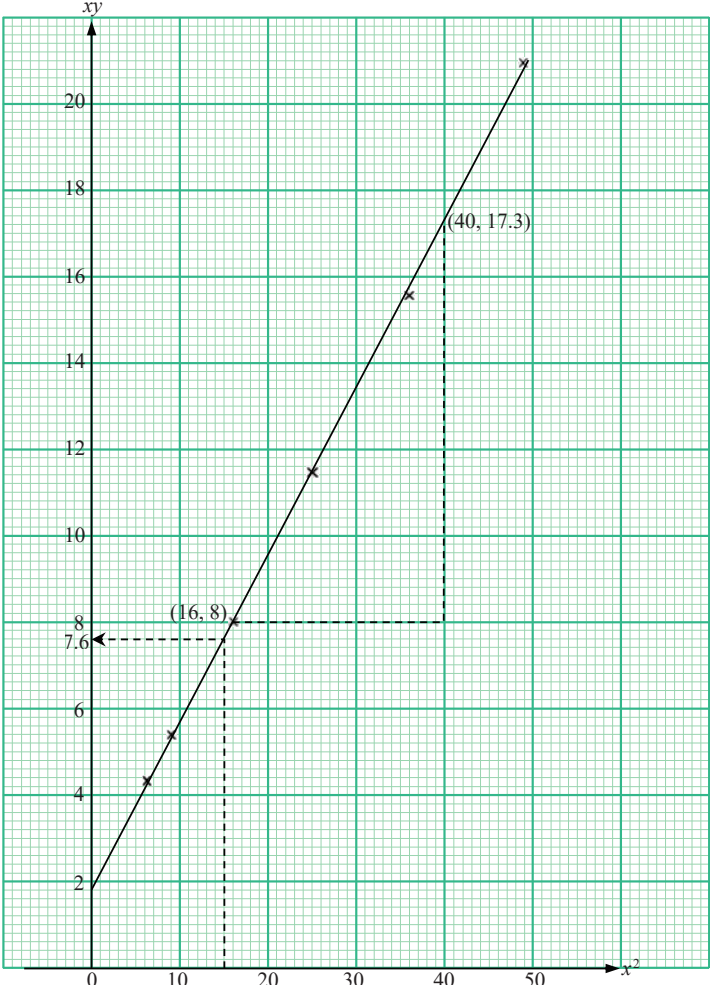
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
13	<p>(a) (i) </p> <p>(ii) $\vec{OP} = 3\begin{pmatrix} -1 \\ -4 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ $\vec{OP} = \begin{pmatrix} -5 \\ -16 \end{pmatrix}$ $\vec{OP} = \sqrt{(-5)^2 + (-16)^2}$ $\vec{OP} = \sqrt{281}$</p>	2 1 1 1	8
	<p>(b) $\lambda\left(-\frac{1}{4}h\underline{p} - 2\underline{q}\right) = (1-k)\underline{p} + 2h\underline{q}$ $-\frac{1}{4}h\underline{\lambda p} - 2\underline{\lambda q} = (1-k)\underline{p} + 2h\underline{q}$ $-\frac{1}{4}h\underline{\lambda} = 1-k \quad , \quad -2\underline{\lambda} = 2h$ $\lambda = -h$ $-\frac{1}{4}h(-h) = 1-k$ $h^2 = 4(1-k)$ $h = 2\sqrt{1-k}$</p>	1 1 1	
14	<p>(a) $P(0, -20)$ dan / and $R(0, 20)$</p>	1 1	8
	<p>(b) (i) $\frac{1}{2}(20)^2(\pi) = 200\pi$ (ii) Diameter semi bulatan OQR / Diameter of semicircle OQR $= \sqrt{20^2 + 20^2} = 20\sqrt{2}$ Jejari semi bulatan OQR / Radius of semicircle OQR $= 10\sqrt{2}$ Luas semi bulatan OQR / Area of semicircle OQR $= \frac{1}{2}(10\sqrt{2})^2(\pi)$ $= 100\pi$</p>	1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
2	<p>(a) $\sqrt{320} - \sqrt{45} = \sqrt{64 \cdot 5} - \sqrt{9 \cdot 5}$ $= 8\sqrt{5} - 3\sqrt{5}$ $= 5\sqrt{5}$</p> <p>Maka / Thus, $a = 5$</p> <p>(b) $2^2 = 3^2 + (2 + \sqrt{3})^2 - 2(3)(2 + \sqrt{3}) \cos \theta$ $2^2 - 3^2 - (2 + \sqrt{3})^2 = -2(3)(2 + \sqrt{3}) \cos \theta$ $4 - 9 - (4 + 2\sqrt{3} + 2\sqrt{3} + 3) = -(12 + 6\sqrt{3}) \cos \theta$ $-12 - 4\sqrt{3} = -(12 + 6\sqrt{3}) \cos \theta$ $(12 + 6\sqrt{3}) \cos \theta = 12 + 4\sqrt{3}$ $\cos \theta = \frac{12 + 4\sqrt{3}}{12 + 6\sqrt{3}}$</p> <p>Menisbahkan penyebut / Rationalising the denominator: $\cos \theta = \frac{12 + 4\sqrt{3}}{12 + 6\sqrt{3}} \cdot \frac{12 - 6\sqrt{3}}{12 - 6\sqrt{3}}$ $= \frac{144 - 72\sqrt{3} + 48\sqrt{3} - 24(3)}{144 - 72\sqrt{3} + 72\sqrt{3} - 36(3)}$ $= \frac{72 - 24\sqrt{3}}{36}$ $= \frac{6 - 2\sqrt{3}}{3}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
3	<p>(a) $\frac{dy}{dx} = 3ax^2 + b$</p> <p>Pada / At $x = 3$, Kecerunan lengkung / Gradient of curve: $-15 = \frac{dy}{dx}$ $-15 = 3a(3)^2 + b$ $-15 = 27a + b \dots \textcircled{1}$</p> <p>Pada / At $(-2, -11)$ $-11 = a(-2)^3 + b(-2) + 5$ $-16 = -8a - 2b$ $-8 = -4a - b \dots \textcircled{2}$</p> <p>$\textcircled{1} + \textcircled{2}$: $-15 = 27a + b$ $+ \quad -8 = -4a - b$ $-23 = 23a$ $a = -1$</p> <p>$-15 = 27(-1) + b$ $b = 12$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	

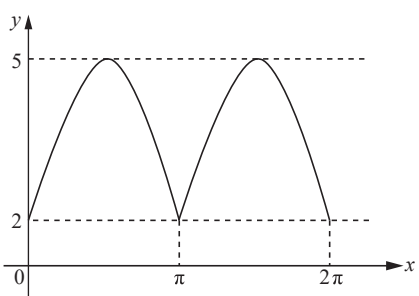
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) $\frac{dy}{dx} = 3(-1)x^2 + 12$ $0 = -3x^2 + 12$ $3x^2 = 12$ $x^2 = 4$ $x = \pm 2$</p> <p>Nilai maksimum / <i>Maximum value</i> = 2</p> <p>$y = -1(2)^3 + 12(2) + 5$ $y = 21$</p> <p>Titik maksimum / <i>Maximum point</i> = (2, 21)</p>	<p>1</p> <p>1</p>	<p>7</p>
4	<p>(a) (i) $\vec{QT} = \vec{QO} + \vec{OT}$ $= -8\mathbf{a} + 2\mathbf{b}$</p> <p>(ii) $\vec{PS} = \vec{PO} + \vec{OS}$ $= -4\mathbf{a} + 5\mathbf{b}$</p> <p>(b) (i) $\vec{OR} = \vec{OQ} + \vec{QR}$ $= 8\mathbf{a} + m(-8\mathbf{a} + 2\mathbf{b})$ $= (8 - 8m)\mathbf{a} + 2m\mathbf{b}$</p> <p>(ii) $\vec{OR} = \vec{OS} + \vec{SR}$ $\vec{OR} = \vec{OS} - \vec{RS}$ $= 5\mathbf{b} - n(-4\mathbf{a} + 5\mathbf{b})$ $= 4n + (5 - 5n)\mathbf{b}$</p> <p>(c) Diketahui / <i>It is known that</i> $8 - 8m = 4n$, $2m = 5 - 5n$ $8m = 20 - 20n$</p> <p>$8 - (20 - 20n) = 4n$ $2m = 5 - 5\left(\frac{3}{4}\right)$ $-12 + 20n = 4n$ $m = \frac{5}{8}$ $16n = 12$ $n = \frac{3}{4}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>
5	<p>(a) $\theta = \frac{1}{5}\pi$</p> <p>Perimeter = $2r + r\left(\frac{1}{5}\pi\right)$, Luas / <i>Area</i> = $\frac{1}{2}r^2\left(\frac{1}{5}\pi\right)$</p> <p>$2r + r\left(\frac{1}{5}\pi\right) = \frac{1}{2}r^2\left(\frac{1}{5}\pi\right)$</p> <p>$\left(2 + \frac{1}{5}\pi\right)r = \left(\frac{1}{10}\pi\right)r^2$</p> <p>$r = \frac{\left(2 + \frac{1}{5}\pi\right)}{\left(\frac{1}{10}\pi\right)}$</p> <p>$r = 8.365 \text{ cm}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) Isi padu sepotong kek / <i>Volume per slice of cake</i> $= \pi(8.365)^2(12) \div 10$ $= 263.79 \text{ cm}^3$</p> <p>Jisim sepotong kek / <i>Mass per slice of cake</i> $= 263.79 \div 0.916$ $= 287.98 \text{ g}$</p> <p>Harga sepotong kek / <i>Price per slice of cake</i> $= \frac{287.98 \text{ g}}{100 \text{ g}} \times \text{RM}4.90$ $= \text{RM}14.11 \text{ sepotong / per slice}$</p> <p>Bilangan sepotong kek / <i>Number of slice of cake</i> $= \frac{\text{RM}180}{\text{RM}14.11}$ $= 112.76$ $\approx 12 \text{ potong / slices}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>
6	<p>(a) $T_1 = \frac{1}{2}(b)(h)$ $= \frac{bh}{2}$</p> <p>$T_2 = \frac{1}{2}(b)(h+1)$ $= \frac{b(h+1)}{2}$ $= \frac{bh+b}{2}$</p> <p>$T_3 = \frac{1}{2}(b)(h+2)$ $= \frac{b(h+2)}{2}$ $= \frac{bh+2b}{2}$</p> <p>$T_3 - T_2 = T_2 - T_1$ $\frac{bh+2b}{2} - \frac{bh+b}{2} = \frac{bh+b}{2} - \frac{bh}{2}$ $\frac{b}{2} = \frac{b}{2}$</p> <p>Beza sepunya / <i>Common difference</i> $= \frac{b}{2}$</p> <p>(b) $S_9 = \frac{9}{2} \left[2\left(\frac{bh}{2}\right) + (9-1)\left(\frac{b}{2}\right) \right]$ $S_9 = \frac{9}{2} bh + 18b$</p> <p>(c) $T_1 = \frac{1}{3}(b^2)(h)$ $= \frac{b^2h}{3}$</p> <p>$T_2 = \frac{1}{3}(b^2)(h+1)$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) (i) $3x^2 + x - 2 > 2$ $3x^2 + x - 4 > 0$ $(3x + 4)(x - 1) > 0$</p>  <p>$x < -\frac{4}{3}, x > 1$</p> <p>(ii) $f(x) = 3\left(x^2 + \frac{x}{3} - \frac{2}{3}\right)$ $= 3\left[x^2 + \frac{x}{3} + \left(\frac{1}{6}\right)^2 - \left(\frac{1}{6}\right)^2 - \frac{2}{3}\right]$ $= 3\left[\left(x + \frac{1}{6}\right)^2 - \frac{25}{36}\right]$ $= 3\left(x + \frac{1}{6}\right)^2 - \frac{25}{12}$</p> <p>Titik minimum / <i>Minimum point</i> = $\left(-\frac{1}{6}, -\frac{25}{12}\right)$</p> <p>$3x^2 + x - 2 = 0$ $(3x - 2)(x + 1) = 0$ $x = \frac{2}{3}, x = -1$ Pintasan-x / <i>x-intercepts</i> = $\left(\frac{2}{3}, 0\right)$ dan / <i>and</i> $(-1, 0)$</p> <p>Pada / <i>At</i> $x = -2, y = 3(-2)^2 + (-2) - 2$ $= 8$</p> <p>Pada / <i>At</i> $x = 1, y = 3(1)^2 + (1) - 2$ $= 2$</p>  <p>Pintasan-x dan pintasan-y / <i>x-intercept and y-intercept</i>: $(-1, 0), \left(\frac{2}{3}, 0\right), (0, -2)$</p> <p>Titik minimum / <i>Minimum point</i> = $\left(-\frac{1}{6}, -\frac{25}{12}\right)$</p> <p>Titik / <i>Points</i> $(-2, 8)$ dan / <i>and</i> $(1, 2)$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks														
	<p>(c) $-2 + p = -2 - \frac{2}{3}$ dan / and $3q = 3(1)$</p> $= -\frac{8}{3} \qquad = 3$ <p>HTP / SOR = $-\frac{8}{3} + 3$ HDP / POR = $-\frac{8}{3}(3)$</p> $= \frac{1}{3} \qquad = -8$ <p>$\therefore x^2 - \frac{1}{3}x - 8 = 0$</p>	<p>1</p> <p>1</p>	<p>10</p>														
<p>9</p>	<p>(a)</p> <table border="1" data-bbox="247 515 993 584"> <tr> <td>x^2</td> <td>6.25</td> <td>9</td> <td>16</td> <td>25</td> <td>36</td> <td>49</td> </tr> <tr> <td>xy</td> <td>4.38</td> <td>5.4</td> <td>8</td> <td>11.5</td> <td>15.6</td> <td>21</td> </tr> </table> <p>- Semua titik diplot dengan betul. <i>All points are plotted correctly.</i></p> <p>- Garis penyuaiian terbaik. <i>The line of best fit.</i></p> 	x^2	6.25	9	16	25	36	49	xy	4.38	5.4	8	11.5	15.6	21	<p>2</p> <p>1</p> <p>1</p>	
x^2	6.25	9	16	25	36	49											
xy	4.38	5.4	8	11.5	15.6	21											

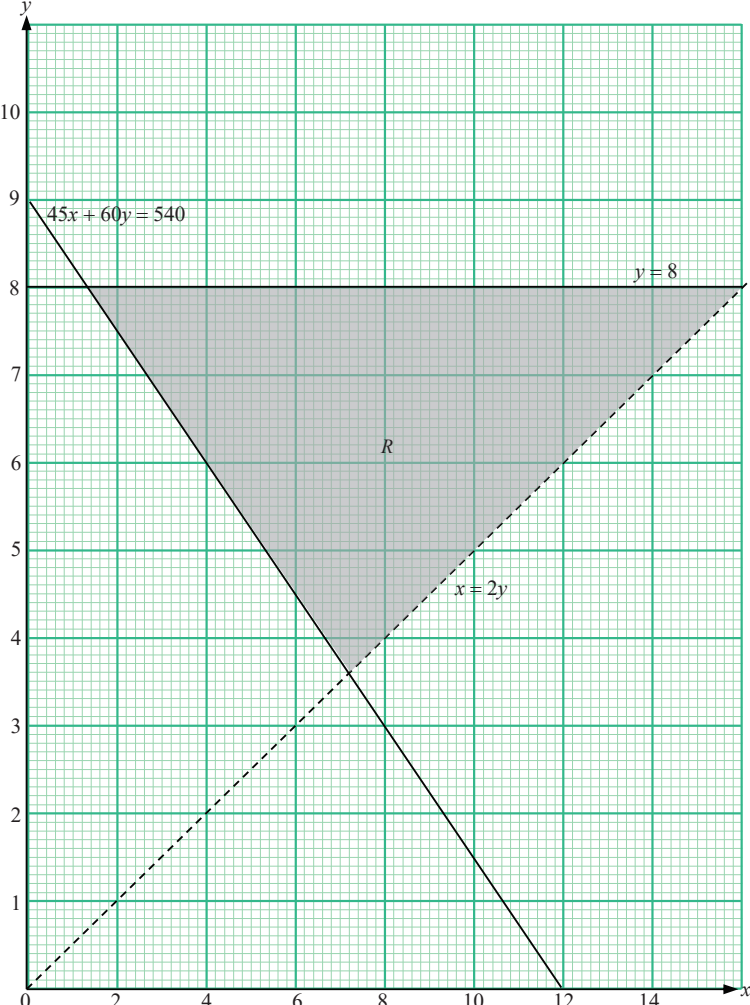
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) (i) $xy = \frac{b}{a}x^2 + a$</p> <p>Apabila / When $x^2 = 15$, $xy = 7.6$</p> $y = \frac{7.6}{\sqrt{15}}$ $y = 1.962$ <p>(ii) $a = 1.9$</p> $m: \frac{b}{a} = \frac{17.3 - 8}{40 - 16}$ $\frac{b}{1.9} = \frac{17.3 - 8}{40 - 16}$ $\frac{b}{1.9} = \frac{31}{80}$ $b = 0.7363$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
10	<p>(a) $\int \frac{dy}{dx} dx = \int 2x dx$</p> $y = \frac{2x^2}{2} + c$ <p>Pada / At (3, 12),</p> $12 = \frac{2(3)^2}{2} + c$ $c = 3$ $\therefore y = x^2 + 3$	<p>1</p> <p>1</p> <p>1</p>	
	<p>(b) Luas trapezium = $\frac{1}{2}(3)(3 + 12)$ Area of trapezium</p> <p>Luas di bawah graf = $\int_0^3 x^2 + 3 dx$ Area under the graph</p> $\frac{1}{2}(3)(3 + 12) - \int_0^3 x^2 + 3 dx$ $= \frac{45}{2} - \left[\frac{x^3}{3} + 3x \right]_0^3$ $= \frac{45}{2} - \left[\left(\frac{3^3}{3} + 3(3) \right) - \left(\frac{0^3}{3} + 3(0) \right) \right]$ $= \frac{9}{2}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
	<p>(c) $\pi \int_3^t y - 3 dy = \pi \left[\frac{y^2}{2} - 3y \right]_3^t$</p> $= \pi \left[\left(\frac{t^2}{2} - 3t \right) - \left(\frac{3^2}{2} - 3(3) \right) \right]$ $= \pi \left(\frac{t^2}{2} - 3t + \frac{9}{2} \right)$	<p>1</p> <p>1</p> <p>1</p>	<p>10</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
11	(a) $3 \sin x + 2 = \cos 2x$ $3 \sin x + 2 = 1 - 2 \sin^2 x$ $2 \sin^2 x + 3 \sin x + 1 = 0$ $(2 \sin x + 1)(\sin x + 1) = 0$ $\sin x = -\frac{1}{2}, \sin x = -1$ Sudut asas / Basic angle = $30^\circ, 90^\circ$ $x = (270^\circ - 30^\circ), 270^\circ, (360^\circ - 30^\circ)$ $\therefore x = 240^\circ, 270^\circ, 330^\circ$	1 1 1 1	10
	(b)  – Bentuk / Shape of $\sin x$ – $ \sin x $ – Translasi / Translation $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ – Nilai maksimum / Maximum value = 5	1 1 1 1	
	(c) $t < 2, t > 5$	2	

Bahagian C

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
12	(a) $\angle ADC = 115^\circ$ $AC^2 = 7^2 + 10^2 - 2(7)(10) \cos 115^\circ$ $AC^2 = 208.1666$ $AC = 14.4280$	1 1 1	10
	(b) $\frac{\sin \angle ACB}{12.32} = \frac{\sin 75^\circ}{14.4280}$ $\sin \angle ACB = 0.8248$ $\angle ACB = 55.5681^\circ$ $\angle CAB = 180^\circ - 75^\circ - 55.5681^\circ$ $= 49.4319^\circ$	1 1 1 1	
	(c) $\frac{1}{2}(12.32)(14.4280) \sin 49.4319^\circ$ dan / and $\frac{1}{2}(7)(10) \sin 115^\circ$ $\frac{1}{2}(12.32)(14.4280) \sin 49.4319^\circ + \frac{1}{2}(7)(10) \sin 115^\circ$ $= 67.51^\circ + 31.72^\circ$ $= 99.23^\circ$	1 1 1	

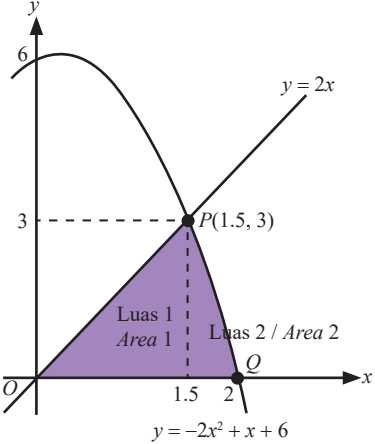
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks																
13	(a) (i) $\frac{6.30}{P_{2018}} \times 100 = 120$ $P_{2018} = \text{RM}5.25$ (ii) $\frac{P_{2021}}{3.50} \times 100 = 140$ $P_{2021} = \text{RM}4.90$	1 1 1	10																
	(b) $\frac{120(2) + 110(3) + 3x + 140(2)}{10} = 122.2$ $\frac{850 + 3x}{10} = 122.2$ $x = 124$	2 1																	
	(c) $I_{\frac{2023}{2021}} = \frac{120(2) + 100(3) + 95(3) + 100(2)}{10}$ $= 102.5$ <table border="1" data-bbox="339 682 911 872" style="margin: 10px auto;"> <tr> <td style="text-align: center;">$P_0 \backslash P_1$</td> <td style="text-align: center;">2018</td> <td style="text-align: center;">2021</td> <td style="text-align: center;">2023</td> </tr> <tr> <td style="text-align: center;">2013</td> <td></td> <td style="text-align: center;">122.2</td> <td style="text-align: center;">x</td> </tr> <tr> <td style="text-align: center;">2016</td> <td></td> <td style="text-align: center;">100</td> <td style="text-align: center;">102.5</td> </tr> <tr> <td style="text-align: center;">2018</td> <td></td> <td></td> <td></td> </tr> </table> $\frac{122.3}{100} = \frac{x}{102.5}$ $x = 125.87$	$P_0 \backslash P_1$		2018	2021	2023	2013		122.2	x	2016		100	102.5	2018				1 1
	$P_0 \backslash P_1$	2018		2021	2023														
	2013			122.2	x														
2016		100	102.5																
2018																			
(d) $\frac{P_{2023}}{20} \times 100 = 125.87$ $P_{2023} = \text{RM}25.17$	1 1																		
14	(a) $45x + 60y \geq 540$ $x < 2y$ $y \leq 8$	1 1 1																	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) – Semua garis lurus dilukis dengan betul. <i>All straight lines are drawn correctly.</i></p> <p>– Kawasan berlorek yang betul. <i>Correct shaded region.</i></p> 	<p>1</p> <p>2</p>	
	<p>(c) (i) $4 < y \leq 8$</p> <p>(ii) Titik maksimum / <i>Maximum point</i> = (15, 8)</p> <p>Bilangan maksimum minuman kopi = 23×18 <i>Maximum number of coffee drink</i> = 414</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
5	$\begin{aligned} \cos 2\theta &= \sin \theta \\ \cos^2 \theta - \sin^2 \theta &= \sin \theta \\ (1 - \sin^2 \theta) - \sin^2 \theta - \sin \theta &= 0 \\ -2 \sin^2 \theta - \sin \theta + 1 &= 0 \\ 2 \sin^2 \theta + \sin \theta - 1 &= 0 \\ (2 \sin \theta - 1)(\sin \theta + 1) &= 0 \end{aligned}$ $2 \sin \theta - 1 = 0, \quad \sin \theta + 1 = 0$ $\sin \theta = \frac{1}{2} \text{ (I dan / and II)} \quad \sin \theta = -1 \text{ (III dan / and IV)}$ <p>Sudut asas / <i>Basic angle</i>: 30° Sudut asas / <i>Basic angle</i>: 90° $\therefore \theta = 30^\circ, 150^\circ, 270^\circ$</p>	<p>1 1 1 1 1</p>	<p>5</p>
6	<p>(a) $\frac{dx}{dy} = (2x - 1)^2; A(-1, 3)$</p> $\begin{aligned} &= [2(-1) - 1]^2 \\ &= (-3)^2 \\ &= 9 \end{aligned}$ $\begin{aligned} m_1 m_2 &= -1 \\ 9 \times m_2 &= -1 \\ m_2 &= -\frac{1}{9} \end{aligned}$ <p>Persamaan normal di $A(-1, 3)$ / <i>Equation of normal at $A(-1, 3)$</i>:</p> $\begin{aligned} y - y_1 &= m(x - x_1) \\ y - 3 &= -\frac{1}{9} [x - (-1)] \\ y - 3 &= -\frac{1}{9} (x + 1) \\ y &= -\frac{1}{9} x - \frac{1}{9} + 3 \\ y &= -\frac{1}{9} x + \frac{26}{9} \text{ atau / or } 9y + x = 26 \end{aligned}$ <p>(b) $\int dy = \int (2x - 1)^2 dx$</p> $\begin{aligned} y &= \frac{(2x - 1)^3}{(3)(2)} + c \\ y &= \frac{(2x - 1)^3}{6} + c; A(-1, 3) \\ 3 &= \frac{[2(-1) - 1]^3}{6} + c \\ 3 &= -\frac{9}{2} + c \\ \frac{15}{2} &= c \\ \therefore y &= \frac{(2x - 1)^3}{6} + \frac{15}{2} \text{ atau / or } 6y = (2x - 1)^3 + 45 \end{aligned}$	<p>1 1 1</p>	<p>6</p>

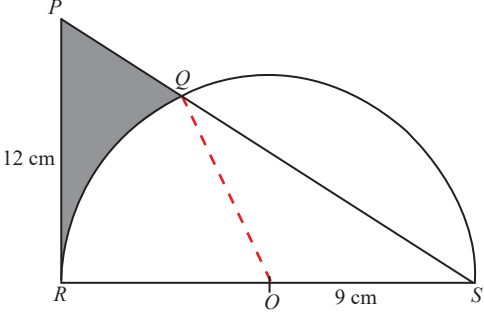
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
7	$2^{x+1} \cdot 5^{x+2} = 10^{2x-1}$ $(2^x)(2^1)(5^x)(5^2) = \frac{10^{2x}}{10^1}$ $(10^x)(50) = \frac{10^{2x}}{10}$ $500 = \frac{10^{2x}}{10^x}$ $500 = 10^x$ $\log_{10} 500 = x$ $2.6990 = x$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
8	$(a) Q(x, y) = \left(\frac{(3)(-1) + (1)(8)}{1 + 3}, \frac{(3)(4) + (1)(2)}{1 + 3} \right)$ $= \left(\frac{5}{4}, \frac{7}{2} \right)$	<p>1</p> <p>1</p>	8
	$(b) m_{AB} = \frac{4 - 2}{-1 - 8}$ $= -\frac{2}{9}$ $m_1 m_2 = -1$ $-\frac{2}{9} m_2 = -1$ $m_2 = \frac{9}{2}$ <p>Persamaan garis lurus / Equation of the straight line:</p> $y - y_1 = m(x - x_1)$ $y - \frac{7}{2} = \frac{9}{2} \left(x - \frac{5}{4} \right)$ $y = \frac{9}{2} x - \frac{45}{8} + \frac{7}{2}$ $y = \frac{9}{2} x - \frac{17}{8} \text{ atau / or } 8y = 36x - 17$	<p>1</p> <p>1</p>	
	$(c) \quad AP = PB$ $\sqrt{[x - (-1)]^2 + (y - 4)^2} = \sqrt{(x - 8)^2 + (y - 2)^2}$ $(x + 1)^2 + (y - 4)^2 = (x - 8)^2 + (y - 2)^2$ $x^2 + 2x + 1 + y^2 - 8y + 16 = x^2 - 16x + 64 + y^2 - 4y + 4$ $18x - 4y - 51 = 0$	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) (i) $f(x) = 3x^2 - 2x - 5$ $= 3\left(x^2 - \frac{2}{3}x - \frac{5}{3}\right)$ $= 3\left[x^2 - \frac{2}{3}x + \left(\frac{-\frac{2}{3}}{2}\right)^2 - \left(\frac{-\frac{2}{3}}{2}\right)^2 - \frac{5}{3}\right]$ $= 3\left[x^2 - \frac{2}{3}x + \left(-\frac{1}{3}\right)^2 - \left(-\frac{1}{3}\right)^2 - \frac{5}{3}\right]$ $= 3\left[\left(x - \frac{1}{3}\right)^2 - \frac{1}{9} - \frac{5}{3}\right]$ $= 3\left[\left(x - \frac{1}{3}\right)^2 - \frac{16}{9}\right]$ $= 3\left(x - \frac{1}{3}\right)^2 - \frac{16}{3}$</p> <p>(ii) $a = 3 > 0$ $\therefore f(x)$ mempunyai titik pusingan minimum pada titik $\left(\frac{1}{3}, -\frac{16}{3}\right)$ $f(x)$ has a minimum turning point at $\left(\frac{1}{3}, -\frac{16}{3}\right)$.</p>	<p>1</p> <p>1</p> <p>2</p>	<p>8</p>
14	<p>(a) $\theta = \frac{(360^\circ - 240^\circ)}{180^\circ} \times \pi$ $= 2.095 \text{ rad}$</p>	<p>1</p> <p>1</p>	
	<p>(b) $s = r\theta$ $20 = r(2.095)$ $\frac{20}{2.095} = r$ $9.5465 \text{ cm} = r$</p>	<p>1</p> <p>1</p>	
	<p>(c) Luas sektor DOC / Area of sector $DOC = \frac{1}{2} r^2\theta$ $= \frac{1}{2} (9.4565 + 3)^2(2.095)$ $= 162.5347 \text{ cm}^2$</p> <p>Luas segi tiga BOA / Area of triangle $BOA = \frac{1}{2} ab \sin C$ $= \frac{1}{2} (9.4565)(9.4565) \sin 120^\circ$ $= 38.7223 \text{ cm}^2$</p> <p>Luas kawasan berlerek / Area of the shaded region $= 162.5347 \text{ cm}^2 - 38.7223 \text{ cm}^2$ $= 123.8124 \text{ cm}^2$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
15	<p>(a) Q adalah pintasan-x / Q is x-intercept $\rightarrow y = 0$</p> $-2x^2 + x + 6 = 0$ $2x^2 - x - 6 = 0$ $(2x + 3)(x - 2) = 0$ $x - 2 = 0 \quad , \quad 2x + 3 = 0$ $x = 2 \quad \quad \quad x = -\frac{3}{2} \text{ (Abaikan / Ignore)}$ <p>$\therefore Q(2, 0)$</p>	1 1 1	
	<p>(b)</p>  <p>Luas / Area 1 = Luas segi tiga / Area of triangle</p> $= \frac{1}{2} \times 1.5 \times 3$ $= 2 \frac{1}{4} \text{ unit}^2$ <p>Luas / Area 2 = $\int_{1.5}^2 (-2x^2 + x + 6) dx$</p> $= \left[-\frac{2x^3}{3} + \frac{x^2}{2} + 6x \right]_{1.5}^2$ $= \left[-\frac{2(2)^3}{3} + \frac{(2)^2}{2} + 6(2) \right] - \left[-\frac{2(1.5)^3}{3} + \frac{(1.5)^2}{2} + 6(1.5) \right]$ $= 8 \frac{2}{3} - 7 \frac{7}{8}$ $= \frac{19}{24} \text{ unit}^2$ <p>Luas kawasan berlorek = Luas 1 + Luas 2 Area of the shaded region = Area 1 + Area 2</p> $= 2 \frac{1}{4} + \frac{19}{24}$ $= 3 \frac{1}{24} \text{ unit}^2$	1 1 1 1	8

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	$\frac{x+5}{2} = \frac{3}{2}$ $2x+10=6$ $2x=-4$ $x=-2$ <p>$\therefore h(x) < 0$ apabila $x < -2$ atau $x > 5$ $h(x) < 0$ when $x < -2$ or $x > 5$</p>	1 1	
	<p>(c) $h(x) = -x^2 + px + 10$ $= -(x^2 - px - 10)$ $= -\left[x^2 - px + \left(-\frac{p}{2}\right)^2 - \left(-\frac{p}{2}\right)^2 - 10\right]$ $= -\left[\left(x - \frac{p}{2}\right)^2 - \frac{p^2}{4} - 10\right]$ $= -\left(x - \frac{p}{2}\right)^2 + \frac{p^2}{4} + 10$</p> $x - \frac{p}{2} = 0$ $x = \frac{p}{2}$ $\frac{3}{2} = \frac{p}{2}$ $p = 3$	1 1 1 1	
	<p>(d) $\frac{p^2}{4} + 10 = \frac{(3)^2}{4} + 10$ $= 12\frac{1}{4}$</p> <p>$\therefore Q\left(1\frac{1}{2}, 12\frac{1}{4}\right)$</p>	1 1	9
3	<p>(a) $\frac{\sqrt{5}}{\sqrt{3}+2} = \frac{\sqrt{5}}{\sqrt{3}+2} \times \frac{-\sqrt{3}+2}{-\sqrt{3}+2}$ $= \frac{-\sqrt{15}+2\sqrt{5}}{-3+4}$ $= -\sqrt{15}+2\sqrt{5}$</p> <p>(b) $3^{x+2} - 3^x + 45(3^{x-2}) = (3^x)(3^2) - 3^x + 45(3^x)\left(\frac{1}{3^2}\right)$ $= (3^x)\left[3^2 - 1 + 45\left(\frac{1}{3^2}\right)\right]$ $= (3^x)(9 - 1 + 5)$ $= 13(3^x)$</p> <p>$3^{x+2} - 3^x + 45(3^{x-2})$ boleh ditulis dalam bentuk $13(3^x)$, maka ianya boleh dibahagikan dengan 13. Ditunjukkan. $3^{x+2} - 3^x + 45(3^{x-2})$ can be written in the form of $13(3^x)$, thus it is divisible by 13. Shown.</p>	1 1 1 1 1	6

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
4	(a) (i) $\vec{AC} = \vec{AB} + \vec{BC}$ $\vec{AC} = 10\vec{a} - 6\vec{b}$ (ii) $\vec{FA} = \vec{FC} + \vec{CA}$ $\vec{FA} = \frac{1}{3}\vec{BC} + \vec{CA}$ $\vec{FA} = \frac{1}{3}(-6\vec{b}) + (-10\vec{a} + 6\vec{b})$ $\vec{FA} = -2\vec{b} - 10\vec{a} + 6\vec{b}$ $\vec{FA} = -10\vec{a} + 4\vec{b}$	1 1 1 1	
	(b) $\vec{AE} = \vec{AB} + \vec{BE}$ $= 10\vec{a} + m\vec{BD}$ $= 10\vec{a} + m(\vec{BA} + \vec{AD})$ $= 10\vec{a} + m\left(-10\vec{a} + \frac{1}{2}\vec{AC}\right)$ $= 10\vec{a} + m\left[-10\vec{a} + \frac{1}{2}(10\vec{a} - 6\vec{b})\right]$ $= 10\vec{a} + m(-10\vec{a} + 5\vec{a} - 3\vec{b})$ $= 10\vec{a} + m(-5\vec{a} - 3\vec{b})$ $= (10 - 5m)\vec{a} - 3m\vec{b}$	 1 1	
	(c) $\vec{AE} = \lambda\vec{AF}$ $(10 - 5m)\vec{a} - 3m\vec{b} = \lambda(10\vec{a} - 4\vec{b})$ Bandingkan kedua-dua belah / Compare both sides: \vec{a} : $10 - 5m = 10\lambda \dots \textcircled{1}$ \vec{b} : $-3m = -4\lambda$ $\frac{3m}{4} = \lambda \dots \textcircled{2}$ Ganti / Substitute $\textcircled{2}$ ke dalam / into $\textcircled{1}$: $10 - 5m = 10\left(\frac{3m}{4}\right)$ $10 = \frac{15m}{2} + 5m$ $10 = \frac{25m}{2}$ $\frac{4}{5} = m$	1 1 1	 9

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
5	 <p> $\angle PSR = \tan^{-1}\left(\frac{12}{18}\right)$ $= 33.69^\circ$ $= 0.5881 \text{ rad}$ </p> <p> $\angle QOS = 180^\circ - 33.69^\circ - 33.69^\circ$ $= 112.62^\circ$ </p> <p> $\angle QOR = 180^\circ - 112.62^\circ$ $= 67.38^\circ$ $= 1.1762 \text{ rad}$ </p> <p> <i>Lengkuk RQ / Arc of RQ</i> $= (9)(1.1762)$ $= 10.5858 \text{ cm}$ </p> <p> $SQ^2 = 9^2 + 9^2 - 2(9)(9) \cos 112.62^\circ$ $SQ = \sqrt{224.3080}$ $SQ = 14.9769 \text{ cm}$ </p> <p> $PS^2 = 12^2 + 18^2$ $PS = \sqrt{468}$ $PS = 21.6333 \text{ cm}$ </p> <p> Perimeter $= 12 + (21.6333 - 14.9769) + 10.5858$ $= 29.2422 \text{ cm}$ </p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>7</p>
6	<p>(a) $r = \frac{\frac{1}{2}}{\frac{1}{4}}$</p> <p>$= 2$</p> <p>$T_n = 512$</p> <p>$\left(\frac{1}{4}\right)(2)^{n-1} = 512$</p> <p>$(2)^{n-1} = 2\ 048$</p> <p>$(2)^{n-1} = 2^{11}$</p> <p>$n - 1 = 11$</p> <p>$n = 12$</p>	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) Janjang geometri / Geometric progression: a, ar, ar^2, ar^3, \dots</p> $8S_3 = S_{4 \rightarrow 6}$ $8(a + ar + ar^2) = ar^3 + ar^4 + ar^5$ $8(a + ar + ar^2) = ar^3(1 + r + r^2)$ $\frac{8a(1 + r + r^2)}{a(1 + r + r^2)} = r^3$ $8 = r^3$ $\sqrt[3]{8} = r$ $r = 2$	<p>1</p> <p>1</p> <p>1</p>	<p>6</p>
7	<p>(a) $\frac{1}{2} \left \begin{array}{ccc} 1 & 8 & p \\ 3 & 2 & -1 \\ 1 & 3 & 1 \end{array} \right = 13$</p> $\frac{1}{2} [(1)(2) + (8)(-1) + (p)(3)] - [(3)(8) + (p)(2) + (1)(-1)] = 13$ $ (2 - 8 + 3p) - (24 + 2p - 1) = 26$ $-29 + p = 26, \quad -29 + p = -26$ $p = 55 \text{ (Abaikan / Ignore)}, \quad p = 3$ $\therefore p = 3$	<p>1</p> <p>1</p> <p>1</p>	
	<p>(b) Katakan $P(x, y)$ ialah koordinat bagi bola. Let $P(x, y)$ be the coordinates of the ball.</p> $P(x, y) = \left(\frac{(2)(3) + (1)(8)}{1 + 2}, \frac{(2)(-1) + (1)(2)}{1 + 2} \right)$ $= \left(\frac{14}{3}, 0 \right)$	<p>1</p> <p>1</p>	
	<p>(c) Katakan $D(x, y)$ ialah koordinat pemain. Let $D(x, y)$ be the coordinates of the player.</p> $DB = DP$ $\sqrt{(x - 3)^2 + [y - (-1)]^2} = \sqrt{\left(x - \frac{14}{3}\right)^2 + (y - 0)^2}$ $\sqrt{x^2 - 6x + 9 + y^2 + 2y + 1} = \sqrt{x^2 - \frac{28}{3}x + \frac{196}{9} + y^2}$ $\frac{10}{3}x + 2y = \frac{106}{9}$ $15x + 9y = 53$	<p>1</p> <p>1</p> <p>1</p>	<p>8</p>

Bahagian B

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
8	<p>(a) (i) Min / Mean = 120 $(n)(0.3) = 120$ $n = 400$</p> <p>(ii) $n = 15, p = 0.3, q = 0.7$ $P(X \geq 2) = 1 - P(X \leq 1)$ $= 1 - P(X = 0) - P(X = 1)$ $= 1 - {}^{15}C_0(0.3)^0(0.7)^{15-0} - {}^{15}C_1(0.3)^1(0.7)^{15-1}$ $= 1 - {}^{15}C_0(0.3)^0(0.7)^{15} - {}^{15}C_1(0.3)^1(0.7)^{14}$ $= 1 - 0.004748 - 0.03052$ $= 0.9647$</p>	<p>1</p> <p>1</p> <p>2</p> <p>1</p>	
	<p>(b) (i) $X \sim N(55, 14^2)$ $P(X > 65) = P\left(Z > \frac{65 - 55}{14}\right)$ $= P(Z > 0.714)$ $= 0.2377$</p> <p>(ii) $P(X \leq m) = 0.44$ $P\left(Z \leq \frac{m - 55}{14}\right) = 0.44$ $\frac{m - 55}{14} = -0.151$ $m - 55 = -2.114$ $m = 52.886 \text{ kg}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>

No.

Skema Pemarkahan
Marking Scheme

Markah
Marks

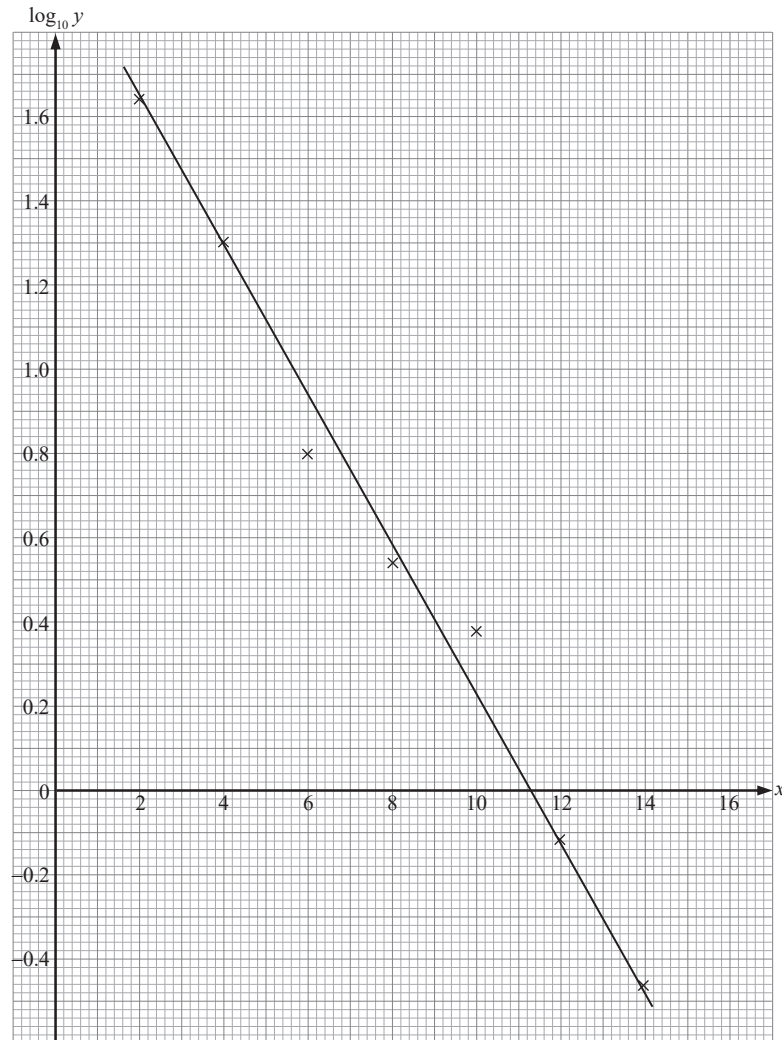
Markah Total
Total Marks

9

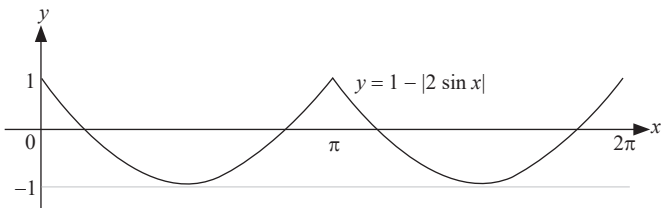
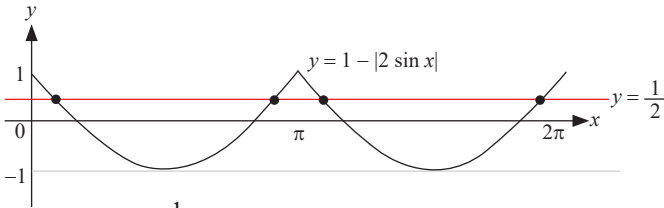
(a)

x	2	4	6	8	10	12	14
y	44.44	19.75	6.31	3.47	1.91	0.77	0.34
$\log_{10} y$	1.65	1.30	0.80	0.54	0.28	-0.11	-0.47

1



3

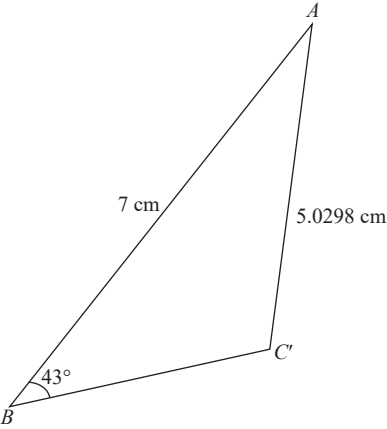
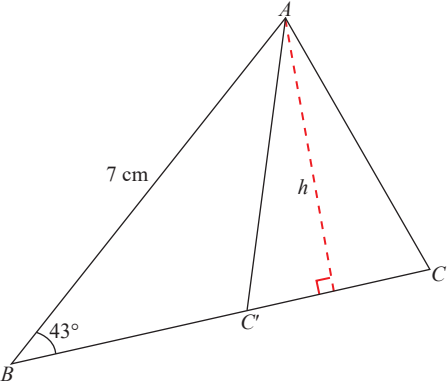
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(b) Salah catat di / <i>Wrongly recorded at</i> (6, 0.8) Koordinat betul / <i>Correct coordinates:</i> (6, 0.94) $\log_{10} y = 0.94$ $y = 10^{0.94}$ $y = 8.7096$</p> <p>(c) (i) $y = \frac{p}{q^x}$ $y = pq^{-x}$ $\log_{10} y = \log_{10} p + \log_{10} q^{-x}$ $\log_{10} y = \log_{10} p - x \log_{10} q$ $\log_{10} y = (-\log_{10} q)x + \log_{10} p$ $Y = m X + C$ $\log_{10} p = 2.0$ $p = 10^{2.0}$ $p = 100$</p> <p>(ii) $m = \frac{1.65 - 1.3}{2 - 4}$ $m = -0.175$ $-\log_{10} q = m$ $-\log_{10} q = -0.175$ $-\log_{10} q = m$ $q = 10^{0.175}$ $q = 1.4962$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
10	<p>(a) $\frac{1 + \cos 2x}{\sin 2x} = \frac{1 + \cos^2 x - \sin^2 x}{2 \sin x \cos x}$ $= \frac{\cos^2 x + \sin^2 x + \cos^2 x - \sin^2 x}{2 \sin x \cos x}$ $= \frac{2 \cos^2 x}{2 \sin x \cos x}$ $= \frac{\cos x}{\sin x}$ $= \cot x$ (Ditunjukkan / <i>Shown</i>)</p> <p>(b) (i) </p> <p>(ii) </p> <p>$2 \sin x + \frac{1}{2} = 1$ $\frac{1}{2} = 1 - 2 \sin x$ $\frac{1}{2} = y$</p> <p>Bilangan penyelesaian / <i>Number of solutions:</i> 4</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
11	<p>(a) $y = x^3 + x^2 - x + 5$ $\frac{dy}{dx} = 3x^2 + 2x - 1$ Fungsi kecerunan pada $S(-2, 3)$ / <i>Gradient function at $S(-2, 3)$</i> $\frac{dy}{dx} = 3(-2)^2 + 2(-2) - 1$ $= 7$</p>	1 1 1	
	<p>(b) Kecerunan garisan normal / <i>Gradient of the normal line</i> $m_1 m_2 = -1$ $7 \times m_2 = -1$ $m_2 = -\frac{1}{7}$ Persamaan normal pada $S(-2, 3)$ / <i>Equation of normal at $S(-2, 3)$</i> $y - y_2 = m(x - x_1)$ $y - 3 = -\frac{1}{7} [x - (-2)]$ $y = -\frac{1}{7}x - \frac{2}{7} + 3$ $y = -\frac{1}{7}x + \frac{19}{7}$ atau / <i>or $7y + x = 19$</i></p>	1 1 1	
	<p>(c) $\frac{dy}{dx} = 0$ $3x^2 + 2x - 1 = 0$ $(3x - 1)(x + 1) = 0$ $x = \frac{1}{3}$ (Abaikan / <i>Ignore</i>) , $x = -1$ (Abaikan / <i>Ignore</i>) Apabila / <i>When $x = \frac{1}{3}$</i>; $y = \left(\frac{1}{3}\right)^3 + \left(\frac{1}{3}\right)^2 - \left(\frac{1}{3}\right) + 5$ $= 44\frac{22}{27}$ $\therefore B\left(\frac{1}{3}, 44\frac{22}{27}\right)$ $\frac{d^2y}{dx^2} = 6x + 2$ $= 6\left(\frac{1}{3}\right) + 2$ $= 4 > 0$ $\therefore B\left(\frac{1}{3}, 44\frac{22}{27}\right)$ ialah titik minimum / <i>is a minimum point.</i></p>	1 1 1 1	10

Bahagian C

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
12	<p>(a) Halaju maksimum / <i>Maximum velocity</i>:</p> $a_p = 0$ $\frac{dv_p}{dt} = 0$ $2t - 1 = 0$ $t = \frac{1}{2}$ <p>Apabila / <i>When</i> $t = \frac{1}{2}$;</p> $v_p = \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right) - 6$ $= -6\frac{1}{4} \text{ m s}^{-1}$	<p>1</p> <p>1</p> <p>1</p>	
	<p>(b) Halaju maksimum / <i>Maximum velocity</i>:</p> $v_p = 0$ $t^2 - t - 6 = 0$ $(t + 2)(t - 3) = 0$ $t + 2 = 0, \quad t - 3 = 0$ $t = -2 \text{ (Abaikan / Ignore)} \quad t = 3$ $s_p = \int (t^2 - t - 6) dt$ $= \frac{t^3}{3} - \frac{t^2}{2} - 6t + c$ <p>Apabila / <i>When</i> $t = 0, s_p = 0$;</p> $s_p = \frac{t^3}{3} - \frac{t^2}{2} - 6t + c$ $0 = \frac{(0)^3}{3} - \frac{(0)^2}{2} - 6(0) + c$ $0 = c$ $\therefore s_p = \frac{t^3}{3} - \frac{t^2}{2} - 6t$ <p>Apabila / <i>When</i> $t = 3$;</p> $s_p = \frac{(3)^3}{3} - \frac{(3)^2}{2} - 6(3)$ $s_p = -13\frac{1}{2} \text{ m}$	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	<p>(c) $s_Q = \int v_Q dt$ $= \int (-7) dt$ $= -7t + c$</p> <p>Apabila / When $t = 0, s_Q = 0$; $s_Q = -7t + c$ $0 = -7(0) + c$ $0 = c$ $\therefore s_Q = -7t$</p> <p>Apabila / When $t = 3$; $s_Q = -7(3)$ $s_Q = -21$ m (Q berada 21 m dari titik B / Q is 21 m from point B)</p> <p>Kedudukan Q dari A / Position of Q from A: $25 \text{ m} - 21 \text{ m} = 4 \text{ m}$</p> <p>$\therefore$ Bola Q berada 4 m di sebelah kanan titik A. <i>Ball Q is 4 m to the right of point A.</i></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
13	<p>(a) $P: I_{22/19} = 150$ $\frac{x}{9.10} \times 100 = 150$ $x = 13.65$</p> <p>$Q: I_{22/19} = \frac{2.50}{1.50} \times 100$ $y = 166.67$</p> <p>$R: I_{22/19} = 165$ $\frac{21}{z} \times 100 = 165$ $z = 12.73$</p> <p>(b) $I_{22/19} = \frac{(55)(150) + (166.67)(30) + (15)(165)}{55 + 15 + 30}$ $= 157.25$</p> <p>(c) $I_{23/22} = 130$ $I_{23/19} = \frac{157.25 \times 130}{100}$ $= 204.43$ $\frac{P_{2023}}{P_{2019}} \times 100 = 204.43$ $\frac{45 - 12}{P_{2019}} \times 100 = 204.43$ $P_{2019} = \text{RM}16.14$</p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>

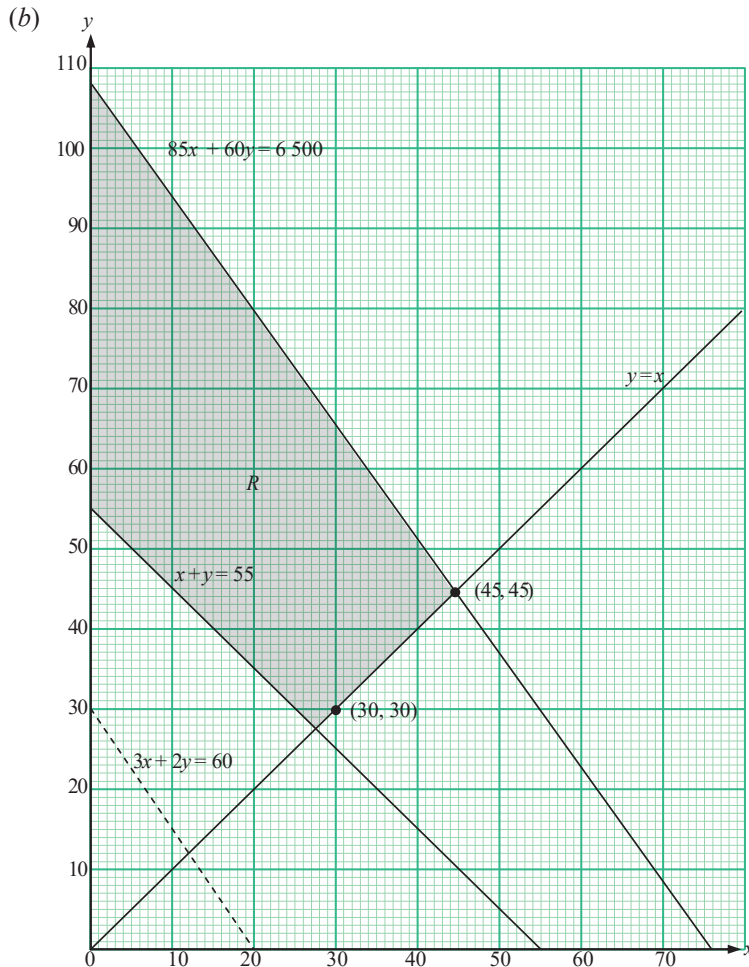
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
14	<p>(a) (i) $\frac{1}{2} (7)(BC) \sin 43^\circ = 16 \text{ unit}^2$ $BC = 6.703$</p> <p>(ii) $AC^2 = 7^2 + (6.703)^2 - 2(7)(6.703) \cos 43^\circ$ $AC^2 = 25.2985$ $AC = \sqrt{25.2985}$ $AC = 5.0298 \text{ cm}$</p> <p>(iii) $\frac{\sin \angle ACB}{7} = \frac{\sin 43^\circ}{5.0298}$ $\sin \angle ACB = 0.9491$ $\angle ACB = \sin^{-1} 0.9491$ $\angle ACB = 71.64^\circ$</p>	1 1 1 1 1	
	<p>(b) (i)</p>  <p>(ii) $\angle AC'B = 180^\circ - 71.64^\circ$ $= 108.36^\circ$</p> <p>(iii)</p>  <p>$\sin 43^\circ = \frac{h}{7}$ $h = 7 \sin 43^\circ$ $h = 4.774 \text{ cm}$</p>	1 1 1 1	10
15	<p>(a) I $85x + 60y \leq 6\,500$ II $x + y \geq 55$ III $y \geq x$</p>	1 1 1	

No.

Skema Pemarkahan
Marking Scheme

Markah
Marks

Markah Total
Total Marks



4

- (c) (i) Bila $x = 30$, nilai minimum bagi $y = 30$.
Maka, bilangan minimum rak kasut yang dibuat jika 30 buah rak buku yang dihasilkan ialah 30.

When $x = 30$, the minimum value of $y = 30$.

Hence, the minimum number of shoe rack made if 30 of bookshelves made is 30.

- (ii) Keuntungan / Profit = $30x + 20y$

Katakan / Let $30x + 20y = 600$

$$3x + 2y = 60$$

Untuk melukis garis lurus / To draw straight line $3x + 2y = 60$

x	0	20
y	30	0

Titik optimum ialah / The optimal point is $(45, 45)$.

Keuntungan maksimum / Maximum profit

$$= \text{RM}30(45) + \text{RM}20(45)$$

$$= \text{RM}2\,250$$

1

1

1

10