

KERTAS MODEL SPM

MATEMATIK TAMBAHAN

Dwibahasa

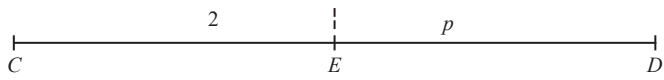
KERTAS MODEL SIJIL PELAJARAN MALAYSIA SET 1

KERTAS 1

Bahagian A

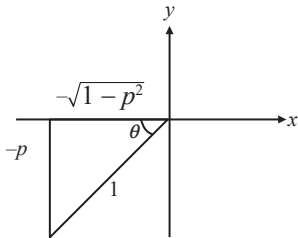
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
1	$64(4^{2x+1}) = 1$ $2^6(2^{4x+2}) = 2^0$ $2^{4x+8} = 2^0$ $4x + 8 = 0$ $4x = -8$ $x = -2$	 1 1 1	3
2	$(\sqrt{48} \times \sqrt{20}) - (\sqrt{5} \times \sqrt{3}) = \sqrt{m}$ $(\sqrt{16} \times 3 \times \sqrt{4} \times 5) - \sqrt{5} \times 3 = \sqrt{m}$ $(4\sqrt{3} \times 2\sqrt{5}) - \sqrt{15} = \sqrt{m}$ $8\sqrt{15} - \sqrt{15} = \sqrt{m}$ $7\sqrt{15} = \sqrt{m}$ $\sqrt{735} = \sqrt{m}$ $m = 735$	 1 1 1	3
3	(a) $f(x) = 2x^2 + 5x - 1$ $f(h) = -3$ $2h^2 + 5h - 1 = -3$ $2h^2 + 5h + 2 = 0$ $(2h + 1)(h + 2) = 0$ $2h + 1 = 0$; $h + 2 = 0$ $h = -\frac{1}{2}$; $h = -2$ $\therefore h = -\frac{1}{2}$ (b) Katakan / Let $3x - 4 = y$ $x = \frac{y + 4}{3}$ $\therefore m^{-1}(x) = \frac{x + 4}{3}$	 1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	$\frac{1}{k} = \frac{3-1}{12-8}$ $\frac{1}{k} = \frac{1}{2}$ $k = 2$ $y = \frac{1}{k}\left(\frac{x}{y}\right) + \frac{p}{k^2}$ $1 = \frac{1}{2}(8) + \frac{p}{(2)^2}$ $-3 = \frac{p}{4}$ $p = -12$	<p>1</p> <p>1</p> <p>1</p>	<p>4</p>
7	<p>(a) $L = \frac{1}{2}r^2\theta$</p> $57 \text{ cm}^2 = \frac{1}{2}(12)^2\theta$ $\theta = 0.7917 \text{ radian}$ <p>(b) $\theta = 2(3.142) - 3(0.7917)$</p> $\theta = 3.9089 \text{ rad}$ $s = r\theta$ $= (12)(3.9089)$ $= 46.91 \text{ cm}$ $\text{Perimeter} = 12 \text{ cm} + 12 \text{ cm} + 46.91 \text{ cm}$ $= 70.91 \text{ cm}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>
8	<p>(a) ${}^{12}C_6 = 924$</p> <p>(b) ${}^3C_2 \times {}^4C_3 \times {}^5C_1 = 3 \times 4 \times 5$</p> $= 60$ <p>(c) 2 orang pengawas, 2 orang pengerusi kelab, 2 orang ketua kelas 2 prefects, 2 club presidents, 2 class leaders</p> ${}^5C_2 \times {}^4C_2 \times {}^3C_2$ <p>2 orang pengawas, 3 orang pengerusi kelab, 1 orang ketua kelas 2 prefects, 3 club presidents, 1 class leaders</p> ${}^5C_2 \times {}^4C_3 \times {}^3C_1$ <p>2 orang pengawas, 4 orang pengerusi kelab 2 prefects, 4 club presidents</p> ${}^5C_2 \times {}^4C_4 \times {}^3C_0$ $({}^5C_2 \times {}^4C_2 \times {}^3C_2) + ({}^5C_2 \times {}^4C_3 \times {}^3C_1) + ({}^5C_2 \times {}^4C_4 \times {}^3C_0)$ $= (10 \times 6 \times 3) + (10 \times 4 \times 3) + (10 \times 1 \times 1)$ $= 180 + 120 + 10$ $= 310$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
9	<p>(a) Jumlah luas permukaan kubus / Total surface area of cube:</p> $A = 6x^2$ $\frac{dA}{dx} = 12x$	<p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>Isi padu kubus / <i>Volume of cube:</i> $x^3 = 343$ $x = \sqrt[3]{343}$ $= 7 \text{ cm}$</p> <p>$\frac{dx}{dt} = \frac{dx}{dA} \times \frac{dA}{dt}$ $\frac{dx}{dt} = \frac{1}{12x} \times 10$ $= \frac{5}{6x}$ $= \frac{5}{6(7)}$; apabila / <i>when</i> $x = 7$ $= \frac{5}{42} \text{ cm s}^{-1}$</p> <p>(b) $y = mx^2 + kx - 5$; pada / <i>at</i> $(-1,6)$ $6 = m(-1)^2 + k(-1) - 5$ $6 = m - k - 5$ $6 + 5 + k = m$ $11 + k = m$ ①</p> <p>Di titik pegun / <i>At stationary point</i> : $\frac{dy}{dx} = 0$ $2mx + k = 0$ $2m(-1) + k = 0$; apabila / <i>when</i> $x = -1$ $-2m + k = 0$ ②</p> <p>Gantikan ① ke dalam ② / <i>Substitute ① into ②</i> : $-2(11 + k) + k = 0$ $-22 - 2k + k = 0$ $-22 - k = 0$ $k = -22$</p> <p>Dari / <i>From</i> ①; $m = 11 + (-22)$ $m = 11 - 22$ $m = -11$</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>8</p>
10	<p>(a) (i) $\vec{DC} = \vec{DA} + \vec{AB} + \vec{BC}$ $= -3\tilde{x} + 3\tilde{y} + 6\tilde{x}$ $= 3\tilde{x} + 3\tilde{y}$</p> <p>(ii) </p> <p>$\vec{BE} = \vec{BC} + \vec{CE}$ $= 6\tilde{x} + \frac{2}{2+p} \vec{CD}$ $= 6\tilde{x} + \frac{2}{2+p} (-3\tilde{x} - 3\tilde{y})$ $= \left(6 - \frac{6}{2+p}\right)\tilde{x} - \frac{6}{2+p}\tilde{y}$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

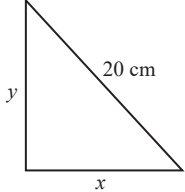
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
(b)	$\int_{-1}^2 f(x) dx = \int_{-1}^2 \frac{d}{dx} \left(\frac{x^2}{2x-1} \right) dx$ $= \left[\frac{x^2}{2x-1} \right]_{-1}^2$ $= \left[\frac{(2)^2}{2(2)-1} \right] - \left[\frac{(-1)^2}{2(-1)-1} \right]$ $= \frac{4}{3} - \left(-\frac{1}{3} \right)$ $= \frac{5}{3}$	1 1 1	6

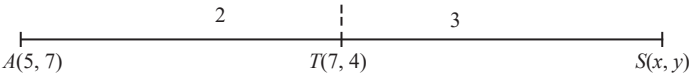
Bahagian B

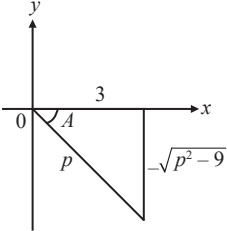
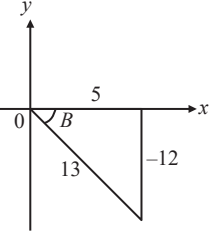
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
13	<p>(a)</p> $g(x) = \frac{2}{3}$ $\frac{2}{6x-1} = \frac{2}{3}$ $12x - 2 = 6$ $x = \frac{2}{3}$ <p>(b) (i)</p> $f^2(x) = 5px + 10$ $f(5x + 2h) = 5px + 10$ $5(5x + 2h) + 2h = 5px + 10$ $25x + 10h + 2h = 5px + 10$ $25x + 12h = 5px + 10$ $5px = 25x$ $p = \frac{25x}{5x}$ $p = 5$ $12h = 10$ $h = \frac{5}{6}$ <p>(ii)</p> $f^2 g(x) = f^2 \left(\frac{2}{6x-1} \right)$ $= 25 \left(\frac{2}{6x-1} \right) + 10$ $= \frac{50}{6x-1} + 10; x \neq \frac{1}{6}$	1 1 1 1 1 1 1 1	8
14	<p>(a)</p> 		

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(i) $\frac{1}{\sin 2\theta} = \frac{1}{2 \sin \theta \cos \theta}$ $= \frac{1}{2(-p)(-\sqrt{1-p^2})}$ $= \frac{1}{2p\sqrt{1-p^2}}$</p> <p>(ii) $\cos \theta \cos 90^\circ - \sin \theta \sin 90^\circ = (-\sqrt{1-p^2})(0) - (-p)(1)$ $= p$</p> <p>(b) $3 \sec^2 \theta = 5(1 - \tan \theta)$ $3(\tan^2 \theta + 1) = 5 - 5 \tan \theta$ $3 \tan^2 \theta + 3 - 5 + 5 \tan \theta = 0$ $3 \tan^2 \theta + 5 \tan \theta - 2 = 0$ $(3 \tan \theta - 1)(\tan \theta + 2) = 0$ $3 \tan \theta - 1 = 0 \quad \left \quad \tan \theta + 2 = 0 \right.$ $\tan \theta = \frac{1}{3} \quad \left \quad \tan \theta = -2 \right.$</p> <p>Sudut rujukan : 18.43° (I, III) Sudut rujukan : 63.43° (II, IV) <i>Reference angle</i> <i>Reference angle</i></p> <p>$\theta = 18.43^\circ, 180^\circ - 63.43^\circ, 180^\circ + 18.43^\circ, 360^\circ - 63.43^\circ$ $\theta = 18.43^\circ, 116.57^\circ, 198.43^\circ, 296.57^\circ$</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>
15	<p>(a) (i) $\frac{3}{20} + m + 0.2 + 0.375 + \frac{3}{20} + m = 1$ $\frac{7}{8} + 2m = 1$ $m = \frac{1}{16}$</p> <p>(ii) $P(X \geq 3) = P(X=3) + P(X=4) + P(X=5)$ $= 0.375 + \frac{3}{20} + \frac{1}{16}$ $= \frac{47}{80}$</p> <p>(b) (i) $P(k < Z < 0.75) = 0.6546$ $1 - P(Z < k) - P(Z > 0.75) = 0.6546$ $1 - P(Z < k) - 0.2266 = 0.6546$ $P(Z < k) = 0.1188$</p> <p>(ii) $P(Z < -k) = 0.1188$ $-k = 1.181$ $k = -1.181$</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>

Bahagian A

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
1	 <p>Perimeter : $x + y + 20 = 48$ $x + y = 28$ $x = 28 - y$ ①</p> <p>Teorem Pythagoras : $x^2 + y^2 = 20^2$ ② ① \rightarrow ②; $(28 - y)^2 + y^2 = 400$ $784 - 56y + y^2 + y^2 - 400 = 0$ $2y^2 - 56y + 384 = 0$ $y^2 - 28y + 192 = 0$ $(y - 16)(y - 12) = 0$ $y = 16, y = 12$ \therefore Panjang sisi yang lain ialah 12 cm dan 16 cm \therefore <i>The length of the other two sides are 12 cm and 16 cm</i></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>
2	<p>(a) Luas $\Delta = \frac{1}{2} \times \text{tapak} \times \text{tinggi}$ $\text{Area } \Delta = \frac{1}{2} \times \text{base} \times \text{height}$ $\frac{1}{2} \times (\sqrt{5} - 1) \times x = 2 + \sqrt{5}$ $x = \frac{2(2 + \sqrt{5})}{\sqrt{5} - 1}$ $x = \frac{4 + 2 + \sqrt{5}}{\sqrt{5} - 1} \times \frac{-\sqrt{5} - 1}{-\sqrt{5} - 1}$ $x = \frac{-4\sqrt{5} - 4 - 2(5) - 2\sqrt{5}}{-5 + 1}$ $x = \frac{-14 - 6\sqrt{5}}{-4}$ $x = \frac{7}{2} + \frac{3}{2}\sqrt{5}$</p> <p>(b) $\log_2 4x - \log_2 (2x - 4) = 2$ $\log_2 \frac{4x}{2x - 4} = 2 \log_2 2$ $\frac{4x}{2x - 4} = 2^2$ $\frac{4x}{2x - 4} = 4$ $8x - 16 = 4x$ $4x = 16$ $x = 4$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
3	<p>(a)</p> $m_{BT} = \frac{4-0}{7-1} = \frac{2}{3}$ $AT \perp BT \rightarrow m_{AT} \times m_{BT} = -1$ $m_{AT} = -\frac{1}{m_{BT}}$ $m_{AT} = -\frac{1}{\frac{2}{3}}$ $m_{AT} = -\frac{3}{2}$ $\frac{p-4}{5-7} = -\frac{3}{2}$ $2p - 8 = 6$ $p = 7$ <p>(b)</p> $y - 4 = -\frac{3}{2}(x - 7)$ $y = -\frac{3}{2}x + \frac{21}{2} + 4$ $y = -\frac{3}{2}x + \frac{29}{2}$ $2y = -3x + 29$ <p>(c)</p>  $T(7, 4) = \left(\frac{(3)(5) + (2)(x)}{2+3}, \frac{(3)(7) + (2)(y)}{2+3} \right)$ $T(7, 4) = \left(\frac{15+2x}{5}, \frac{21+2y}{5} \right)$ $\frac{15+2x}{5} = 7 \qquad \frac{21+2y}{5} = 4$ $15+2x = 35 \qquad 21+2y = 20$ $2x = 20 \qquad 2y = -1$ $x = 10 \qquad y = -0.5$ <p>$\therefore (10, -0.5)$</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>
4	<p>(a)</p> $p(x) = -3x^2 + 9x - h$ $= -3\left(x^2 - 3x + \frac{h}{3}\right)$ $= -3\left[x^2 - 3x + \left(-\frac{3}{2}\right)^2 - \left(-\frac{3}{2}\right)^2 + \frac{h}{3}\right]$ $= -3\left[\left(x - \frac{3}{2}\right)^2 - \left(-\frac{3}{2}\right)^2 + \frac{h}{3}\right]$ $= -3\left[\left(x - \frac{3}{2}\right)^2 - \frac{9}{4} + \frac{h}{3}\right]$ $= -3\left(x - \frac{3}{2}\right)^2 + \frac{27}{4} - h \dots\dots\dots \textcircled{1}$ $p(x) = -3(x+k)^2 + \frac{1}{2}(k+1) \dots\dots\dots \textcircled{2}$	<p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(c) Luas sektor MON / <i>Area of sector MON</i> $= \frac{1}{2}(36)^2(0.7672)$ $= 497.15 \text{ cm}^2$</p> <p>Luas / <i>Area $\triangle NOP$</i> $= \frac{1}{2}(25)(25)(\sin 43.95^\circ)$ $= 216.88 \text{ cm}^2$</p> <p>Luas lorekan / <i>Area shaded</i> $= 497.15 \text{ cm}^2 - 216.88 \text{ cm}^2$ $= 280.27 \text{ cm}^2$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>9</p>
6	<p>(a) Bilangan batang mancis / <i>Number of matchsticks</i> : 3, 5, 7, 9, ... $d_1 = 5 - 3 = 2$ $d_2 = 7 - 5 = 2$ $d_3 = 9 - 7 = 2$</p> <p>$\therefore d_1 = d_2 = d_3 = 2$ \therefore Janjang aritmetik dengan beza sepunya ialah 2 \therefore <i>Arithmetic progression with common difference of 2</i></p> <p>(b) $S_n = 575$</p> <p>$\frac{n}{2}[(2)(3) + (n-1)(2)] = 575$ $\leftarrow S_n = \frac{n}{2} [2a + (n-1)d]$</p> <p>$n(4 + 2n) = 1150$ $2n^2 + 4n - 1150 = 0$ $n^2 + 2n - 575 = 0$ $(n-23)(n+25) = 0$</p> <p>$n - 23 = 0$ $n + 25 = 0$ $n = 23$ $n = -25$ (Abai / Ignore)</p> <p>Bilangan maksimum segi tiga ialah 23 <i>Maximum number of triangles is 23</i></p> <p>(c) Luas / <i>Area \triangle</i> $= \frac{1}{2}(4)(4)(\sin 60^\circ)$ $\leftarrow \Delta L = \frac{1}{2} ab \sin C$ $= 6.928 \text{ cm}^2$</p> <p>Jumlah luas / <i>Total area</i> $= 23 \times 6.928 \text{ cm}^2$ $= 159.34 \text{ cm}^2$</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>8</p>
7	<p>(a)</p> <div style="display: flex; justify-content: space-around;">   </div> <p>$\cos(A - B) = \cos A \cos B - \sin A \sin B$ $\cos(A - B) = \cos A \cos B - \sin A \sin B$</p> <p>$= \left(\frac{3}{p}\right)\left(\frac{5}{13}\right) - \left(\frac{-\sqrt{p^2-9}}{p}\right)\left(-\frac{12}{13}\right)$</p> <p>$= \frac{15 - 12\sqrt{p^2-9}}{13p}$</p>	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
(b)	$2\sin^2 x - \cos 2x = 0$ $2\sin^2 x - (\cos^2 x - \sin^2 x) = 0$ $3\sin^2 x - \cos^2 x = 0$ $3\sin^2 x - (1 - \sin^2 x) = 0$ $4\sin^2 x - 1 = 0$ $(2\sin x + 1)(2\sin x - 1) = 0$ $\sin x = \frac{1}{2}, \quad \sin x = -\frac{1}{2}$ Sudut rujukan / Reference angle : $x = \sin^{-1}\left(\frac{1}{2}\right)$ $= 30^\circ$ $x = 30^\circ, 180^\circ - 30^\circ, 180^\circ + 30^\circ, 360^\circ - 30^\circ$ $\therefore x = 30^\circ, 150^\circ, 210^\circ, 330^\circ$	 1 1 1 1	7

Bahagian B

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
8	(a) $A : y = x + 2$ $y = 0 + 2$ $y = 2$ \therefore Koordinat titik A / Coordinates of points A (0, 2) $B : 4 - y^2 = x$ $4 - (0)^2 = x$ $4 = x$ \therefore Koordinat titik B / Coordinates of points B (4, 0) (b) $x = 4 - y^2$ $y^2 = 4 - x$ $y = \sqrt{4 - x}$ $y = (4 - x)^{\frac{1}{2}}$ Luas rantau berlorek / Area of shaded region $= \int_0^6 (x + 2)dx - \int_0^4 (4 - x)^{\frac{1}{2}}dx$ $= \left[\frac{x^2}{2} + 2x \right]_0^6 - \left[-\frac{2(4 - x)^{\frac{3}{2}}}{3} \right]_0^4$ $= \left\{ \left[\frac{(6)^2}{2} + 2(6) \right] - \left[\frac{(0)^2}{2} + 2(0) \right] \right\} - \left\{ \left[-\frac{2(4 - 4)^{\frac{3}{2}}}{3} \right] - \left[-\frac{2(4 - 0)^{\frac{3}{2}}}{3} \right] \right\}$ $= (30 - 0) - \left[0 - \left(-5\frac{1}{3} \right) \right]$ $= 24\frac{2}{3} \text{ unit}^2$	 1 1 1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(c) Isi padu janaan / The generated volume</p> $= \pi \int_0^6 (x+2)^2 dx - \pi \int_0^4 (4-x) dx$ $= \pi \left[\frac{(x+2)^3}{3} \right]_0^6 - \pi \left[4x - \frac{x^2}{2} \right]_0^4$ $= \pi \left[\frac{(6+2)^3}{3} - \frac{(0+2)^3}{3} \right] - \pi \left\{ \left[4(4) - \frac{(4)^2}{2} \right] - \left[4(0) - \frac{(0)^2}{2} \right] \right\}$ $= \pi \left(170\frac{2}{3} - 2\frac{2}{3} \right) - \pi(8-0)$ $= 160\pi \text{ unit}^3$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
9	<p>(a) (i) $\vec{AP} = \vec{AQ} + \vec{QP}$</p> $\vec{AP} = 4\tilde{x} - 6\tilde{y}$ <p>(ii) $\vec{CP} = \frac{1}{3}\vec{RP}$</p> $= \frac{1}{3}(\vec{RQ} + \vec{QP})$ $= \frac{1}{3}(3\vec{AQ} + \vec{QP})$ $= \frac{1}{3}(12\tilde{x} - 6\tilde{y})$ $= 4\tilde{x} - 2\tilde{y}$ <p>(b) $\vec{CP} = 4\tilde{x} - 2\tilde{y}$</p> $\vec{CP} = 4(2\tilde{i}) - 2(\tilde{i} + 3\tilde{j})$ $= 8\tilde{i} - 2\tilde{i} - 6\tilde{j}$ $= 6\tilde{i} - 6\tilde{j}$ $ \vec{CP} = \sqrt{6^2 + (-6)^2}$ $= \sqrt{72} \text{ unit}$ <p>(c) $\vec{AB} = k\vec{AP}$</p> $\vec{AB} = k(4\tilde{x} - 6\tilde{y}) \dots\dots\dots \textcircled{1}$ $\vec{QC} = \vec{QP} + \vec{PC}$ $= -6\tilde{y} + (-(4\tilde{x} - 2\tilde{y}))$ $= -6\tilde{y} - 4\tilde{x} + 2\tilde{y}$ $= -4\tilde{x} - 4\tilde{y}$ $\vec{QB} = m\vec{QC}$ $= m(-4\tilde{x} - 4\tilde{y})$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

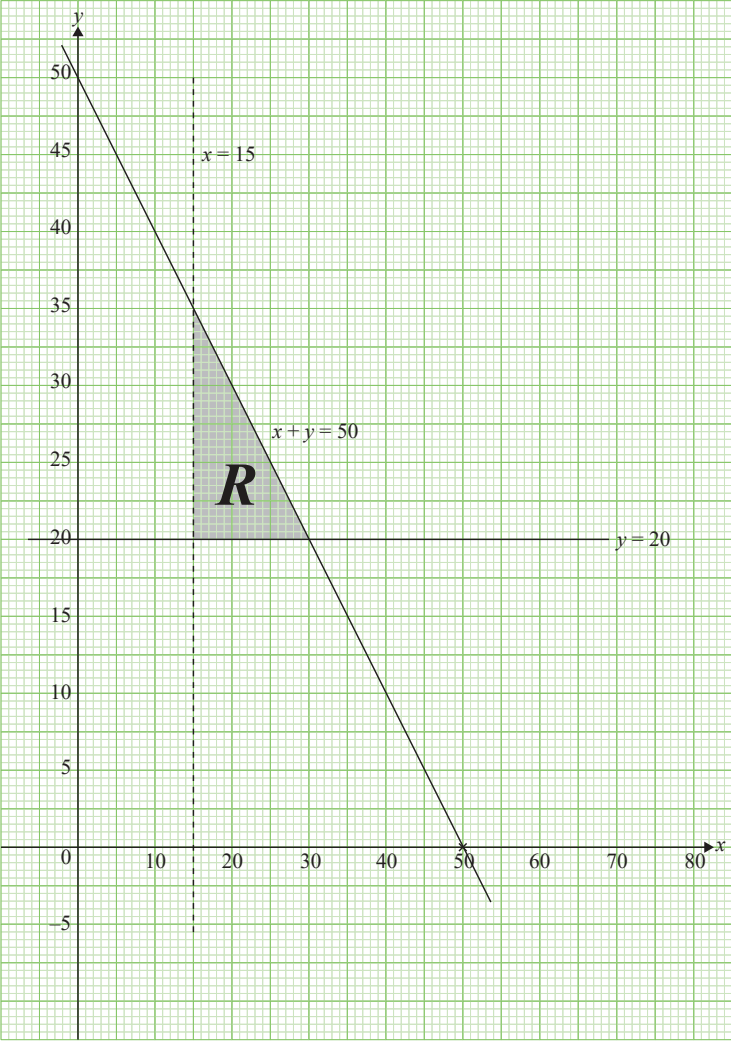
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	$\begin{aligned}\vec{AB} &= \vec{AQ} + \vec{QB} \\ &= 4\vec{x} + m\vec{QC} \\ &= 4\vec{x} + m(-4\vec{x} - 4\vec{y}) \\ &= (4 - 4m)\vec{x} - 4m\vec{y} \dots\dots\dots \textcircled{2}\end{aligned}$ <p>① = ②; $\vec{x}: 4 - 4m = 4k \dots\dots\dots \textcircled{3}$ $\vec{y}: -4m = -6k$</p> <p>Gantikan ④ ke dalam ③ <i>Substitute ④ into ③</i> $m = \frac{3}{2}k \dots\dots\dots \textcircled{4}$</p> $\begin{aligned}4 - 4\left(\frac{3}{2}k\right) &= 4k \\ 4 - 6k &= 4k \\ 4 &= 10k \\ k &= \frac{2}{5}\end{aligned}$ $\begin{aligned}m &= \frac{3}{2}\left(\frac{2}{5}\right) \\ m &= \frac{3}{5}\end{aligned}$	<p>1</p> <p>1</p> <p>1, 1</p>	<p>10</p>
10	<p>(a) $p = \frac{3}{5}, q = \frac{2}{5}, n = 15$ $P(X = r) = {}^n C_r p^r q^{n-r}$ $P(X \geq 13) = P(X = 13) + P(X = 14) + P(X = 15)$ $= {}^{15}C_{13} \left(\frac{3}{5}\right)^{13} \left(\frac{2}{5}\right)^2 + {}^{15}C_{14} \left(\frac{3}{5}\right)^{14} \left(\frac{2}{5}\right)^1 + {}^{15}C_{15} \left(\frac{3}{5}\right)^{15} \left(\frac{2}{5}\right)^0$ $= 0.02194 + 0.004702 + 0.0004702$ $= 0.0271$</p> <p>(b) (i) $Z = \frac{X - \mu}{\sigma}$ $P(X \geq 45) = P\left(Z \geq \frac{45 - 60}{\sqrt{64}}\right)$ $= P(Z \geq -1.875)$ $= 1 - P(Z \leq -1.875)$ $= 1 - 0.0303$ $= 0.9697$</p> <p>Bilangan lulus / <i>Number of passing</i> = $(0.9697)(250)$ $= 242$</p> <p>(ii) $P(X \geq m) = 0.11$ $P\left(Z \geq \frac{m - 60}{8}\right) = 0.11$</p>	<p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(b) (i) $x = 3.5 \rightarrow x^2 = 12.25$</p> <p>Daripada graf / From the graph :</p> <p>Apabila / When $x^2 = 12.25$,</p> $\frac{y}{x} = 14.25$ $\frac{y}{3.5} = 14.25$ $y = 49.875$ <p>(ii) $y = px^3 + qx$</p> $\frac{y}{x} = px^2 + q$ $Y = mX + C$ <p>$p = m$</p> $p = \frac{32.5 - 25}{24.5 - 19.5}$ $p = 1.5$ <p>$q = C$</p> $q = -4.2$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>

Bahagian C

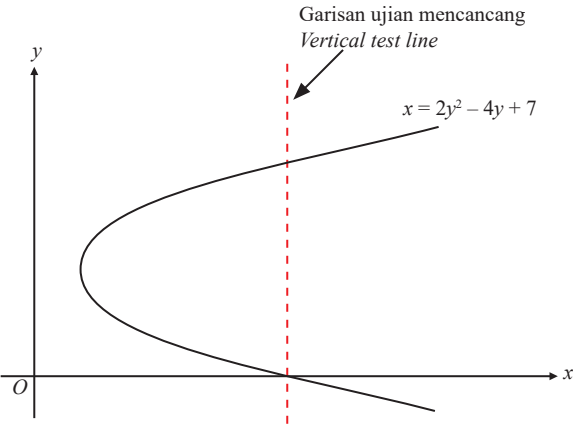
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
12	<p>(a) (i) $\frac{3.60}{P_{2018}} \times 100 = 120$</p> $P_{2018} = \frac{3.60 \times 100}{120}$ $P_{2018} = \text{RM}3.00$ <p>(ii) $\frac{P_{2020}}{8} \times 100 = 110$</p> $P_{2020} = \frac{110 \times 8}{100}$ $P_{2020} = \text{RM}8.80$ <p>(b) (i) $\bar{I}_{2020/2018} = 140$</p> $\frac{(110)(2) + (128)(1) + (120)(3) + (x)(4)}{2 + 1 + 3 + 4} = 140$ $4x + 708 = 1400$ $4x = 692$ $x = 173$ <p>(ii) $\bar{I}_{2022/2018} = \frac{(113)(2) + (128)(1) + (127)(3) + (178)(4)}{2 + 1 + 3 + 4}$</p> $\bar{I}_{2022/2018} = 144.7$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>Apabila / When $t = 3$ $v = t^2 - 6t + 8$ $v = (3)^2 - 6(3) + 8$ $v = -1 \text{ ms}^{-1}$</p> <p>(c) Berhenti seketika / Stops instantaneously $\rightarrow v = 0$ $t^2 - 6t + 8 = 0$ $(t - 4)(t - 2) = 0$ $t = 4, t = 2$</p> <p>(d) $s = \int v dt$ $s = \int_0^2 (t^2 - 6t + 8) dt + \left \int_2^3 (t^2 - 6t + 8) dt \right$ $= \left[\frac{t^3}{3} - 3t^2 + 8t \right]_0^2 + \left[\frac{t^3}{3} - 3t^2 + 8t \right]_2^3$ $= \left\{ \left[\frac{(2)^3}{3} - 3(2)^2 + 8(2) \right] - \left[\frac{(0)^3}{3} - 3(0)^2 + 8(0) \right] \right\}$ $+ \left\{ \left[\frac{(3)^3}{3} - 3(3)^2 + 8(3) \right] - \left[\frac{(2)^3}{3} - 3(2)^2 + 8(2) \right] \right\}$ $= 6\frac{2}{3} + \left 6 - 6\frac{2}{3} \right$ $= 6\frac{2}{3} + \frac{2}{3}$ $s = 7\frac{1}{3} \text{ m}$</p>	<p>1 1 1 1 1 1</p>	<p>10</p>
15	(a) I $x + y \leq 50$ II $x > 15$ III $y \geq 20$	<p>1 1 1</p>	

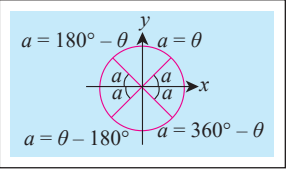
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
(b)		4	
(c) (i)	<p>Bila / When $x = 23$, $20 \leq y \leq 27$</p>	1	
	<p>(ii) Yuran bulanan / Monthly fee = $100x + 120y$ Titik optimum ialah / The optimal point is $(15, 35)$ Keuntungan maksimum / Maximum profit = $RM100(15) + RM120(35)$ = $RM5\ 700$</p>	1	10

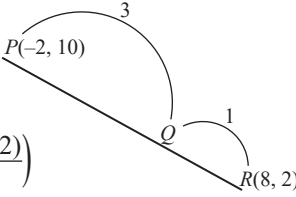
KERTAS 1

Bahagian A

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
1	<p>(a) (i) $f(x) = \frac{2x-1}{2}$ $f^2(x) = f\left(\frac{2x-1}{2}\right)$ $= \frac{2\left(\frac{2x-1}{2}\right) - 1}{2}$ $= \frac{2x-2}{2}$ $= x-1$</p> <p>(ii) $\frac{2x-1}{2} = y$ $2x-1 = 2y$ $2x = 2y+1$ $x = \frac{2y+1}{2}$ $f^{-1}(x) = \frac{2x+1}{2}$ atau / or $f^{-1}(x) = x + \frac{1}{2}$</p> <p>(b)</p>  <p>Bukan fungsi, kerana garisan ujian mencancang bersilang pada 2 titik. <i>Not a function, because the vertical test line intersect at 2 points.</i></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>

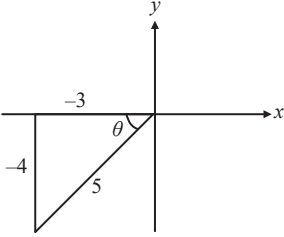
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
2	<p>(a) $f(x) = m\left(x^2 + \frac{6}{m}x - \frac{k}{m}\right)$</p> $= m\left[x^2 + \frac{6}{m}x + \left(\frac{6}{2m}\right)^2 - \left(\frac{6}{2m}\right)^2 - \frac{k}{m}\right]$ $= m\left[x^2 + \frac{6}{m}x + \left(\frac{3}{m}\right)^2 - \left(\frac{3}{m}\right)^2 - \frac{k}{m}\right]$ $= m\left[\left(x + \frac{3}{m}\right)^2 - \frac{9}{m^2} - \frac{k}{m}\right]$ $= m\left(x + \frac{3}{m}\right)^2 - \frac{9}{m} - k$ <p>Ditunjukkan / Shown</p> <p>(b) $x + \frac{3}{m} = 0$</p> $x = -\frac{3}{m}$ $6 = -\frac{3}{m}$ $m = -\frac{1}{2}$ $-\frac{9}{m} - k = 13$ $-\frac{9}{-\frac{1}{2}} - k = 13$ $18 - k = 13$ $k = 5$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
3	<p>(a) $441^x(21^{2-x}) = (7^2 \times 3^2)^x (7 \times 3)^{2-x}$</p> $= (7^x)^2(3^x)^2\left(\frac{7^2}{7^x}\right)\left(\frac{3^2}{3^x}\right)$ $= (n^2)(m^2)\left(\frac{49}{n}\right)\left(\frac{9}{m}\right)$ $= 441mn$ <p>(b) $b^{\log_b k} = 32$</p> $\log_b b^{\log_b k} = \log_b 32$ $(\log_b k)(\log_b b) = \log_b 32$ $\log_b k = \log_b 32$ $k = 32$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>5</p>
4	<p>(a) $1.040404\dots = 1 + 0.04 + 0.0004 + 0.000004 + \dots$</p> $a = 0.04$ $r = \frac{0.0004}{0.04}$ $= 0.01$ $S_\infty = \frac{a}{1-r}$ $S_\infty = \frac{0.04}{1-0.01}$ $= \frac{0.04}{0.09}$ $= \frac{4}{99}$ <p>$\therefore 1.040404\dots = 1 + \frac{4}{99} = 1\frac{4}{99}$</p>	<p>1</p> <p>1</p> <p>1</p>	<p>4</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
8	<p> $\cos / \cos 2x = 2 + 3 \sin x$ $\cos^2 / \cos^2 x - \sin^2 x - 2 - 3 \sin x = 0$ $1 - \sin^2 x - \sin^2 x - 2 - 3 \sin x = 0$ $-2 \sin^2 x - 3 \sin x - 1 = 0$ $2 \sin^2 x + 3 \sin x + 1 = 0$ $(2 \sin x + 1)(\sin x + 1) = 0$ $2 \sin x + 1 = 0$, $\sin x + 1 = 0$ $\sin x = -\frac{1}{2}$, $\sin x = -1$ </p> <p> Sudut rujukan / Reference angle: $x = 30^\circ$, $x = 90^\circ$ $x = 180^\circ + 30^\circ$, 270° , $360^\circ - 30^\circ$ $= 210^\circ$, 270° , 330° </p> 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	4
9	<p>(a) ${}^n P_2 = 72$</p> ${}^n P_r = \frac{n!}{(n-r)!}$ $\frac{n!}{(n-2)!} = 72$ $\frac{n(n-1)(n-2)!}{(n-2)!} = 72$ $n(n-1) = 72$ $n^2 - n - 72 = 0$ $(n-9)(n+8) = 0$ $n-9 = 0 \quad n+8 = 0$ $n = 9 \quad n = -8 \text{ (Abaikan / Ignore)}$ <p>$\therefore n = 9$</p> <p>(b) K - 2 N - 3</p> <p>(i) Bilangan cara / Number of ways</p> $= \frac{(11-1)!}{2! 3!}$ $= 302\,400$ <p>(ii) Bilangan cara / Number of ways</p> $= \frac{11!}{2! 3!}$ $= 332\,6400$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	8
10	<p>(a) $\pi \int_2^k x^2 dy = 2\frac{1}{4}\pi$</p> $\pi \int_2^k \frac{9}{y^2} dy = 2\frac{1}{4}\pi$ $\pi \int_2^k 9y^{-2} dy = 2\frac{1}{4}\pi$ $\left[-\frac{9}{y} \right]_2^k = \frac{9}{4}$ $-\frac{9}{k} - \left(-\frac{9}{2} \right) = \frac{9}{4}$ $-\frac{9}{k} = -\frac{9}{4}$ $k = 4$	<p>$xy = 3$</p> $x = \frac{3}{y}$ <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	(b) $\int_1^4 2mx \, dx - \int_4^1 f(x) \, dx = 27$ $\left[\frac{2mx^2}{2}\right]_1^4 + \int_1^4 f(x) \, dx = 27$ $[mx^2]_1^4 + (-3) = 27$ $m(4)^2 - m(1)^2 - 3 = 27$ $16m - m = 30$ $15m = 30$ $m = 2$	1 1 1	6
11	(a) $Q(x, y) = \left(\frac{nx_1 + mx_2}{m+n}, \frac{ny_1 + my_2}{m+n}\right)$ $PQ = 3QR$ $\frac{PQ}{QR} = \frac{3}{1}$ $Q(x, y) = \left(\frac{(-2)(1) + (3)(8)}{3+1}, \frac{(1)(10) + (3)(2)}{3+1}\right)$ $= \left(\frac{11}{2}, 4\right)$  (b) $m_{PR} = \frac{10-2}{-2-8} \leftarrow m = \frac{y_2 - y_1}{x_2 - x_1}$ $m_{PR} = -\frac{4}{5}$ $\perp : m_1 m_2 = -1$ $\frac{-4}{5} \times m_2 = -1$ $m_2 = \frac{5}{4}$ Persamaan garis lurus melalui $Q \perp PR$ Equation of straight line passes $Q \perp PR$ $y - 4 = \frac{5}{4}\left(x - \frac{11}{2}\right)$ $y = \frac{5}{4}x - \frac{55}{8} + 4$ $y = \frac{5}{4}x - \frac{23}{8}$ $8y = 10x - 23$	1 1 1 1 1	5
12	(a) Min / Mean: $np = 750$ ① Varians / Variance: $np = 450$ ② ① \rightarrow ②; $750q = 450$ $q = 0.6$ $p = 1 - 0.6$ $p = 0.4$ Peratus yang berbasikal / The percentage who cycle = $0.4 \times 100\%$ $= 40\%$	1 1 1	5

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	(b) $P(z > k) = 0.5 - 0.1704$ $= 0.3296$ $k = 0.441$ $\frac{X - \mu}{\sigma} = k$ $\frac{23 - \mu}{\sqrt{16}} = 0.441$ $23 - \mu = 1.764$ $\mu = 23 - 1.764$ $\mu = 21.236$	1 1 1	6

Bahagian B

13	<p>(a)</p>  $\tan(\theta - 45^\circ) = \frac{\tan \theta - \tan 45^\circ}{1 + \tan \theta \tan 45^\circ}$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> $\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \pm \tan A \tan B}$ </div> $= \frac{\frac{4}{3} - 1}{1 + \left(\frac{4}{3}\right)(1)}$ $= \frac{1}{7}$ <p>(b) (i) $\sin 2\theta \cot \theta = 2 \sin \theta \cos \theta \left(\frac{\cos \theta}{\sin \theta}\right)$</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;"> $\cot \theta = \frac{1}{\tan \theta}$ </div> $= 2 \cos^2 \theta$ <div style="border: 1px solid black; padding: 2px; display: inline-block;"> $\tan \theta = \frac{\sin \theta}{\cos \theta}$ </div> $= 2(1 - \sin^2 \theta)$ $= 2 - 2 \sin^2 \theta$ $= 1 + 1 - 2 \sin^2 \theta$ $= 1 + \cos 2\theta \text{ (Ditunjukkan / Shown)}$ <p>(ii) $\sin 2\theta \cot \theta = \frac{4}{3}$ $1 + \cos 2\theta = \frac{4}{3}$ $\cos 2\theta = \frac{1}{3}$; $0^\circ \leq \theta \leq 360^\circ$ $0^\circ \leq \theta \leq 720^\circ$</p> <p>$2\theta = 70.53^\circ, 360^\circ - 70.53^\circ, 360^\circ + 70.53^\circ, 720^\circ - 70.53^\circ$ $2\theta = 70.53^\circ, 289.47^\circ, 430.53^\circ, 649.47^\circ$ $\theta = 35.27^\circ, 144.74^\circ, 215.27^\circ, 324.74^\circ$</p>	1 1 1 1 1 1 1 1 1 1	8
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No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
14	<p>Sebutan pertama / 1st term $a = 86$ cm</p> <p>Beza sepunya / Common difference $d = -6$ cm</p> <p>(a) $T_8 = 86 + (8 - 1)(-6)$ ← $T_n = a + (n - 1)d$ $= 44$ Jejari / Radius = $44 \text{ cm} \div 2$ $= 22$ cm Luas / Area = $\pi(22 \text{ cm})^2$ $= 484\pi \text{ cm}^2$</p> <p>(b) $T_n > 0$ $86 + (n - 1)(-6) > 0$ $-6n + 6 > -86$ $-6n > -92$ $n > 15.33$</p> <p>$\therefore n = 15$</p> <p>(c) $T_{15} = 86 + (15 - 1)(-6) = 2$ cm Jejari / Radius = $2 \text{ cm} \div 1$ 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>8</p>
15	<p>(a) (i) $\vec{CA} = \vec{CB} + \vec{BA}$ $\vec{CA} = -12\vec{y} - 8\vec{x}$</p> <p>(ii) $\vec{TB} = \vec{TA} + \vec{AB}$ $\vec{TB} = \frac{1}{4}\vec{CA} + \vec{AB}$ $\vec{TB} = \frac{1}{4}(-12\vec{y} - 8\vec{x}) + 8\vec{x}$ $\vec{TB} = 6\vec{x} - 3\vec{y}$</p> <p>(b) $\vec{DB} = \vec{DA} + \vec{AB}$ $\vec{DB} = 5\vec{y} + m\vec{x} + 8\vec{x}$</p> <p>$\vec{TB} = k\vec{DB}$ $6\vec{x} - 3\vec{y} = k(5\vec{y} + m\vec{x} + 8\vec{x})$ $5k\vec{y} = -3\vec{y}$ $k = -\frac{3}{5}$</p> <p>$6\vec{x} = k(m + 8)\vec{x}$ $6 = -\frac{3}{5}(m + 8)$ $-10 = m + 8$ $m = -18$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

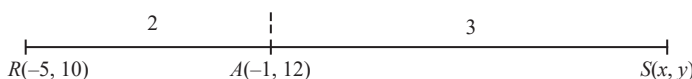
Bahagian A

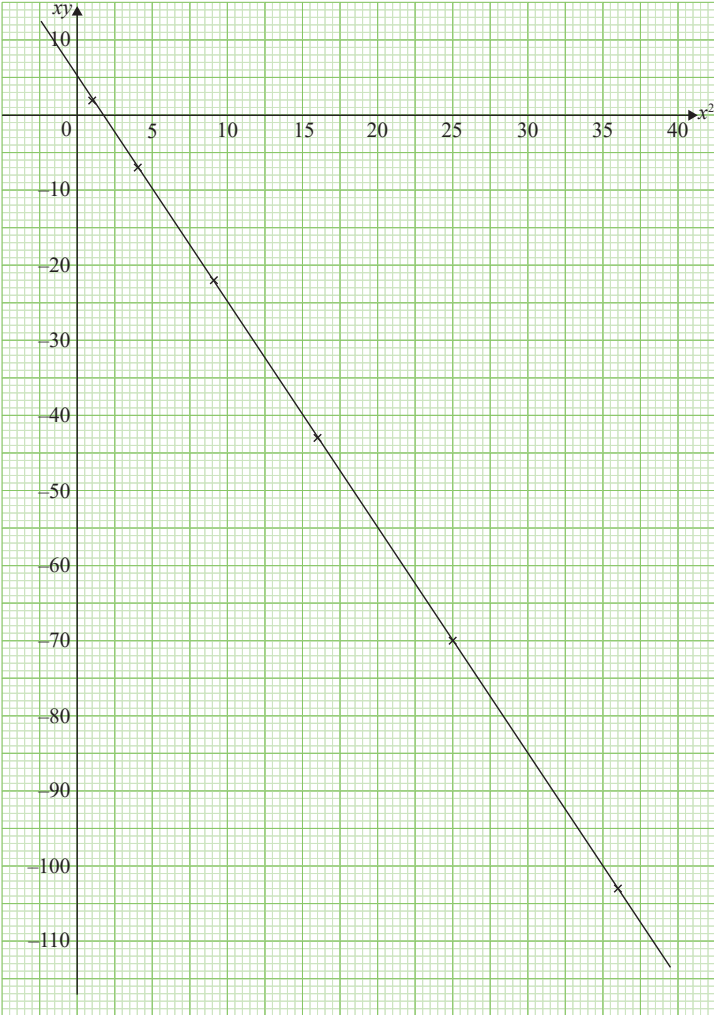
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
1	<p>(a) $3(5^m) = 2\,500 - 5^m$ $3(5^m) + 5^m = 2\,500$ $4(5^m) = 2\,500$ $5^m = \frac{2\,500}{4}$ $5^m = 625$ $5^m = 5^4$ $m = 4$</p> <p>(b) $2x + 4y - z = \frac{1}{2}$ ① $4x + 5y - 2z = -7$ ② $x - 3y - z = \frac{1}{3}$ ③</p> <p>Daripada / From ③, $z = x - 3y - \frac{1}{3}$ ④ Ganti ④ dalam ① / Substitute ④ into ① $2x + 4y - (x - 3y - \frac{1}{3}) = \frac{1}{2}$ $x + 7y + \frac{1}{3} = \frac{1}{2}$ $x = \frac{1}{6} - 7y$ ⑤</p> <p>Ganti ④ & ⑤ ke dalam ② / Substitute ④ & ⑤ into ② $4(\frac{1}{6} - 7y) + 5y - 2(\frac{1}{6} - 7y - 3y - \frac{1}{3}) = 7$ $4(\frac{1}{6} - 7y) + 5y - 2(\frac{1}{6} - 10y) = -7$ $\frac{4}{6} - 28y + 5y + \frac{1}{3} + 20y = -7$ $-3y = -7 - 1$ $y = \frac{8}{3} / 2\frac{2}{3}$</p> <p>Ganti $y = \frac{8}{3}$ ke dalam ⑤ / Substitute $y = \frac{8}{3}$ into ⑤ $x = \frac{1}{6} - 7(\frac{8}{3})$ $x = -\frac{37}{2} / -18\frac{1}{2}$</p> <p>Ganti $x = -\frac{37}{2}$ dan / and $y = \frac{8}{3}$ ke dalam / into ④ $z = -\frac{37}{2} - 3(\frac{8}{3}) - \frac{1}{3}$ $z = -\frac{37}{2} - 8 - \frac{1}{3}$ $z = -\frac{161}{6} / -26\frac{5}{6}$</p> <p>$x = -18\frac{1}{2}$; $y = \frac{8}{3}$; $z = -26\frac{5}{6}$</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>8</p>

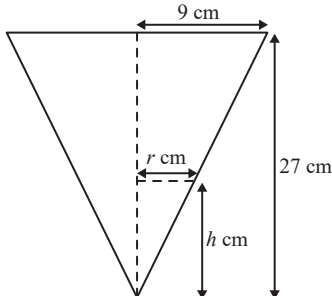
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
2	<p>(a) $(k-1)x^2 + mx - 2 = 0$ $a = k-1$; $b = m$; $c = -2$</p> $b^2 - 4ac = 0$ $(m)^2 - 4(k-1)(-2) = 0$ $m^2 + 8k - 8 = 0$ $8k = 8 - m^2$ $k = \frac{8 - m^2}{8}$ <p>(b) (i) $3x^2 - px - p = 0$ $a = 3$; $b = -p$; $c = -p$ Punca / Roots : $a, 3a$ HTP / SOR : $a + \beta = -\frac{b}{a}$ $a + 3a = -\frac{(-p)}{3}$ $4a = \frac{p}{3}$ $a = \frac{p}{12} \dots\dots\dots \textcircled{1}$ HDP / POR : $a\beta = \frac{c}{a}$ $(a)(3a) = \frac{-p}{3}$ $3a^2 = -\frac{p}{3}$ $\left(\frac{p}{12}\right)^2 = -\frac{p}{9}$ $\frac{p^2}{144} = -\frac{p}{9}$ $9p^2 = -144p$ $9p^2 + 144p = 0$ $9p(p + 16) = 0$ $9p = 0$ $p = 0 \text{ (Abaikan / Ignore)}$ $p + 16 = 0$ $p = -16$ $\therefore p = -16$ (ii) Dari / From $\textcircled{1}$; $a = \frac{p}{12}$ $a = \frac{-16}{12} = -\frac{4}{3}$ $3a = 3\left(-\frac{4}{3}\right)$ $= -4$ $\therefore \text{Punca-punca / Roots: } -\frac{4}{3}, -4$ </p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>7</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
3	<p>(a) $S_1 = 16(2^1 - 1)$ $S_1 = 16$</p> <p>(b) $S_{17} = 16(2^{17} - 1)$ $S_{17} = 2\,097\,136$</p> <p>$S_{13 \rightarrow 17} = S_{17} - S_{12}$ $= 2\,097\,136 - 65\,520$ $= 2\,031\,616$</p> <p>(c) $S_2 = 16(2^2 - 1)$ $= 48$ $T_2 = S_2 - S_1$ $= 48 - 16$ $= 32$</p> <p>$r = \frac{T_2}{T_1}$ $= \frac{32}{16}$ $= 2$</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>
4	<p>(a) $\frac{\text{panjang lengkok } PQ}{\theta} = \frac{\text{lilitan bulatan}}{2\pi}$</p> <p>$\frac{\text{length arc } PQ}{\theta} = \frac{\text{circumference}}{2\pi}$</p> <p>$\frac{s}{\theta} = \frac{2\pi r}{2\pi}$ $s = \frac{\theta \times 2\pi r}{2\pi}$ $s = r\theta$</p> <p>$\frac{s}{\theta} = \frac{2\pi r}{2\pi}$ $s = \frac{\theta \times 2\pi r}{2\pi}$ $s = r\theta$</p> <p>\therefore Ditunjukkan / Shown</p> <p>(b) (i) Perimeter $= s_{AB} + s_{DC \text{ major}} + AC + BD$ $= (5 + 5)(\theta) + (5)(2\pi - \theta) + 5 + 5$ $= 10\theta + 10\pi - 5\theta + 10$ $= (5\theta + 10\pi + 10) \text{ cm}$</p> <p>(ii) Luas / Area $= AOB + DOC_{\text{major}}$ $= \frac{1}{2}(5 + 5)^2(\theta) + \frac{1}{2}(5)^2(2\pi - \theta)$ $= 50\theta + \frac{25}{2}(2\pi - \theta)$ $= 50\theta + 25\pi - \frac{25}{2}\theta$ $= \left(\frac{75}{2}\theta + 25\pi\right) \text{ cm}^2$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin-left: auto; margin-right: auto;"> <p>Luas sektor Area of sector $= \frac{1}{2}r^2\theta / \frac{1}{2}r^2\theta$</p> </div>	<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>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
5	<p>(a) $\vec{OA} = 2\vec{i} + 3\vec{j}$; $\vec{OB} = -4\vec{i} + 7\vec{j}$</p> $\vec{AB} = \vec{AO} + \vec{OB}$ $= -(2\vec{i} + 3\vec{j}) + (-4\vec{i} + 7\vec{j})$ $= -2\vec{i} - 3\vec{j} - 4\vec{i} + 7\vec{j}$ $= -6\vec{i} + 4\vec{j}$ $\left \vec{AB} \right = \frac{ \vec{AB} }{ \vec{AB} } = \frac{x\vec{i} + y\vec{j}}{\sqrt{x^2 + y^2}}$ $\left \vec{AB} \right = \frac{(-6\vec{i} + 4\vec{j})}{\sqrt{(-6)^2 + (4)^2}}$ $= \frac{(-6\vec{i} + 4\vec{j})}{\sqrt{52}} \leftarrow \boxed{\sqrt{52} = \sqrt{4 \times 13}}$ $= \frac{-6\vec{i} + 4\vec{j}}{2\sqrt{13}}$ $= \frac{-3\vec{i} + 2\vec{j}}{\sqrt{13}}$ <p>(b) $\vec{AK} = 3\vec{KB}$</p> $\vec{AO} + \vec{OK} = 3(\vec{KO} + \vec{OB})$ $\vec{AO} + \vec{OK} = 3\vec{KO} + 3\vec{OB}$ $\vec{OK} - 3\vec{KO} = 3\vec{OB} - \vec{AO}$ $\vec{OK} + 3\vec{OK} = 3(-4\vec{i} + 7\vec{j}) - (-2\vec{i} - 3\vec{j})$ $4\vec{OK} = -12\vec{i} + 21\vec{j} + 2\vec{i} + 3\vec{j}$ $4\vec{OK} = -10\vec{i} + 24\vec{j}$ $\vec{OK} = -\frac{5}{2}\vec{i} + 6\vec{j}$	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>6</p>
6	<p>(a) $x = y^2 - 6y + 12$ ①</p> $x + y^2 = 5y$ ② <p>Ganti ① dalam ② / Substitute ① into ② ; $y^2 - 6y + 12 + y^2 = 5y$</p> $2y^2 - 11y + 12 = 0$ $(2y - 3)(y - 4) = 0$ $2y - 3 = 0 \qquad \qquad \qquad y - 4 = 0$ $y = \frac{3}{2} \qquad \qquad \qquad y = 4$ <p>Dari ①, apabila / From ①, when $y = 4$; $x = (4)^2 - 6(4) + 12$</p> $x = 4$ <p>$\therefore A(4, 4)$</p> <p>Dari 1, apabila / From ①, when $y = \frac{3}{2}$</p> $x = \left(\frac{3}{2}\right)^2 - 6\left(\frac{3}{2}\right) + 12$ $x = 5\frac{1}{4}$ <p>$\therefore B\left(5\frac{1}{4}, 1\frac{1}{2}\right)$</p>	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(b) (i) $Z = \frac{X - \mu}{\sigma}$</p> $P(1.1 < X < 2.3) = P\left(\frac{1.1 - 1.3}{\sqrt{0.54}} < Z < \frac{2.3 - 1.3}{\sqrt{0.54}}\right)$ $= P(-0.272 < Z < 1.361)$ $= P(Z > -0.272) - P(Z > 1.361)$ $= 1 - P(Z > -0.272) - P(Z > 1.361)$ $= 1 - 0.3928 - 0.0867$ $= 0.5205$ <p>(ii) $P(X > h) = 0.3550$</p> $P\left(Z > \frac{h - 1.3}{\sqrt{0.54}}\right) = 0.3550$ $\frac{h - 1.3}{\sqrt{0.54}} = 0.372$ $h - 1.3 = 0.2734$ $h = 1.5734$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>0.372 ialah nilai z dalam sifir taburan normal piawai 0.372 is the z-score obtained from the standard normal distribution table</p> </div>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>
9	<p>(a) $m_{OR} = \frac{1 - 0}{2 - 0} = \frac{1}{2}$</p> $OT \perp OR \rightarrow m_{OT} \times m_{OR} = -1$ $\left(\frac{1}{2}\right) \times m_{OR} = -1$ $m_{OR} = -2$ <p>Persamaan OR / Equation of OR : $y - 0 = -2(x - 0)$ $y = -2x$ ①</p> <p>Persamaan RS / Equation of RS : $y - 2x = 20$ ②</p> <p>Ganti ① dalam ② / Substitute ① into ② ;</p> $-2x - 2x = 20$ $-4x = 20$ $x = -5$ <p>Dari / From ① ; $y = -2(-5)$ $= 10$</p> <p>$\therefore R(-5, 10)$</p> <p>(b)</p>  $(x, y) = \left(\frac{nx_1 + mx_2}{m + n}, \frac{ny_1 + my_2}{m + n}\right)$ $A(-1, 12) = \left(\frac{(3)(-5) + (2)(x)}{2 + 3}, \frac{(3)(10) + (2)(y)}{2 + 3}\right)$ $A(-1, 12) = \left(\frac{-15 + 2x}{5}, \frac{30 + 2y}{5}\right)$ $\frac{-15 + 2x}{5} = -1 \qquad \frac{30 + 2y}{5} = 12$ $-15 + 2x = -5 \qquad 30 + 2y = 60$ $2x = 10 \qquad 2y = 30$ $x = 5 \qquad y = 15$ <p>$\therefore S(5, 15)$</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	Jumlah Markah Total Marks														
	$\text{Luas / Area} = \frac{1}{2} \begin{vmatrix} 0 & -5 & 5 & 2 & 0 \\ 0 & 10 & 15 & 1 & 0 \end{vmatrix}$ $= \frac{1}{2} [(0)(10) + (-5)(15) + (5)(1) + (2)(0)]$ $= \frac{1}{2} [(0)(-5) + (10)(5) + (15)(2) + (1)(0)]$ $= \frac{1}{2} -70 - 80 $ $= 75 \text{ unit}^2$ <p>(c) $SH = 5$</p> $\sqrt{(x - x_1)^2 + (y - y_1)^2} = r$ $\sqrt{(x - 5)^2 + (y - 15)^2} = 5$ $x^2 - 10x + 25 + y^2 - 30y + 225 = 25$ $x^2 + y^2 - 10x - 30y + 25 + 225 - 25 = 0$ $x^2 + y^2 - 10x - 30y + 225 = 0$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>10</p>														
10	<p>(a)</p> <table border="1" data-bbox="258 662 958 746"> <tr> <td>x^2</td> <td>1</td> <td>4</td> <td>9</td> <td>16</td> <td>25</td> <td>36</td> </tr> <tr> <td>xy</td> <td>2</td> <td>-7</td> <td>-21.99</td> <td>-43</td> <td>-70</td> <td>-103.02</td> </tr> </table> 	x^2	1	4	9	16	25	36	xy	2	-7	-21.99	-43	-70	-103.02	<p>1</p> <p>3</p>	
x^2	1	4	9	16	25	36											
xy	2	-7	-21.99	-43	-70	-103.02											

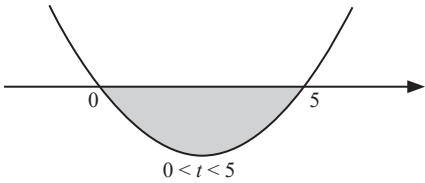
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(b) (i) Dari graf / From the graph : Apabila / When $xy = -25, x^2 = 10,$ $xy = -25$ $(\sqrt{10})y = -25$ $y = -\frac{25}{\sqrt{10}}$</p> <p>(ii) $y = ax + \frac{b}{x}$ $xy = ax^2 + b$ $Y = mX + C$</p> <p>$a = m$ $a = \frac{-85 - (-10)}{30 - 5}$ $a = -3$</p> <p>$b = C$ $b = 5$</p>	<p>1 1 1 1 1</p>	<p>10</p>
11	<p>(a)</p>  <p>$\frac{j}{t} = \frac{9}{27}$ $j = \frac{1}{3}t$ $V = \frac{1}{3}\pi\left(\frac{1}{3}t\right)^2 t$ $V = \frac{1}{27}\pi t^3$ (Ditunjukkan / Shown)</p> <p>(b)</p> <p>$I = \frac{1}{27}\pi t^3$ $\frac{dI}{dt} = (3)\left(\frac{1}{27}\right)\pi t^{3-1}$ $\frac{dI}{dt} = \frac{1}{9}\pi t^2$</p> <p>$\frac{r}{h} = \frac{9}{27}$ $r = \frac{1}{3}h$ $V = \frac{1}{3}\pi\left(\frac{1}{3}h\right)^2 h$ $V = \frac{1}{27}\pi h^3$</p> <p>$V = \frac{1}{27}\pi h^3$ $\frac{dV}{dh} = (3)\left(\frac{1}{27}\right)\pi h^{3-1}$ $\frac{dV}{dh} = \frac{1}{9}\pi h^2$</p>	<p>1 1 1 1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>Apabila $t = 5$ cm;</p> $\frac{dI}{dt} = \frac{1}{9}\pi(5)^2$ $= \frac{25}{9}\pi$ $\delta I \approx \frac{dI}{dt} \times \delta t$ $= \frac{25}{9}\pi \times (5.5 - 5)$ $= 1\frac{7}{18}\pi \text{ cm}^3$		
	<p>When $h = 5$ cm;</p> $\frac{dV}{dh} = \frac{1}{9}\pi(5)^2$ $= \frac{25}{9}\pi$ $\delta V \approx \frac{dV}{dh} \times \delta h$ $= \frac{25}{9}\pi \times (5.5 - 5)$ $= 1\frac{7}{18}\pi \text{ cm}^3$	1	
		1	
(c)	$j = \frac{1}{3}t$ $2.6 = \frac{1}{3}t$ $7.8 = t$ <p>Apabila $t = 7.8$ cm; Katakan $t = x$</p> $\frac{dI}{dx} = \frac{1}{9}\pi(7.8)^2$ $= 6.76\pi$ $\frac{dI}{dt} = 3.5(3.142) - 6$ $= 4.997$ $\frac{dx}{dt} = \frac{dx}{dI} \times \frac{dI}{dt}$ $= \frac{1}{6.76(3.142)} \times 4.997$ $= 0.2353 \text{ cm s}^{-1}$		
	$r = \frac{1}{3}h$ $2.6 = \frac{1}{3}h$ $7.8 = h$ <p>When $h = 7.8$ cm;</p> $\frac{dV}{dh} = \frac{1}{9}\pi(7.8)^2$ $= 6.76\pi$ $\frac{dV}{dt} = 3.5(3.142) - 6$ $= 4.997$ $\frac{dh}{dt} = \frac{dh}{dV} \times \frac{dV}{dt}$ $= \frac{1}{6.76(3.142)} \times 4.997$ $= 0.2353 \text{ cm s}^{-1}$	1	
		1	
		1	
		1	10

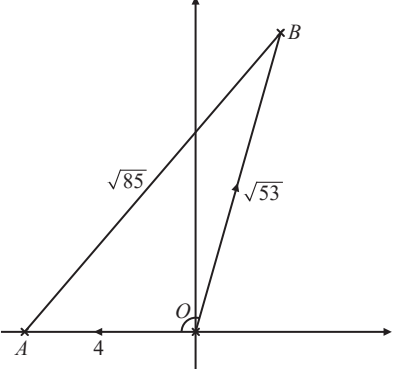
Bahagian C

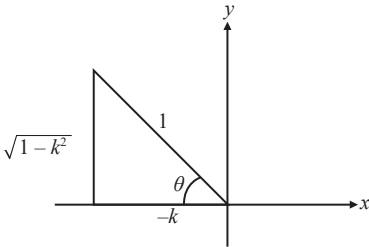
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
12	<p>(a) $I = \frac{Q_1}{Q_0} \times 100$</p> $\frac{m}{25.50} \times 100 = 115$ $m = 29.33$ $\frac{33}{n} \times 100 = 135$ $n = 24.44$ $p = \frac{22.50}{18.75} \times 100$ $p = 120$ $\therefore m = 29.33 \quad , \quad n = 24.44 \quad , \quad p = 120$	1	
		1	
		1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(b) $\bar{I} = \frac{\sum I_i w_i}{\sum w_i}$</p> $\bar{I}_{15/12} = \frac{(115)(500) + (123)(650) + (135)(700) + (120)(350)}{500 + 650 + 700 + 350}$ $\bar{I}_{15/12} = 124.52$ <p>(c) $\frac{Q_{2015}}{45\,000} \times 100 = 124.52$</p> $Q_{2015} = \frac{124.52 \times 45\,000}{100}$ $Q_{2015} = \text{RM}56\,034$ <p>(d) $I_{2018/2015} = 110$</p> $\bar{I}_{2018/2012} = \frac{I_{2018}}{I_{2015}} \times \frac{I_{2015}}{I_{2012}} \times 100$ $\bar{I}_{2018/2012} = \frac{110}{100} \times \frac{124.52}{100} \times 100$ $\bar{I}_{2018/2012} = 136.972$	<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>10</p>
13	<p>(a) $DE^2 = (35)^2 + (5)^2 - 2(35)(5) \cos 120^\circ$</p> $DE = \sqrt{1425}$ $DE = 37.75 \text{ cm}$ <p>(b) $\frac{\sin \angle PDE}{30} = \frac{\sin 120^\circ}{37.75}$</p> $\angle PDE = \sin^{-1}(0.6882)$ $\angle PDE = 43.49^\circ$ <p>(c) Luas / Area = $\frac{1}{9}(37.75)(37.75)\sin 60^\circ$</p> $= 617.07 \text{ cm}^2$ <p>(d) $\angle PED = \angle EDC = 180^\circ - 120^\circ - 43.49^\circ$</p> $= 16.51^\circ$ $\cos 16.51^\circ = \frac{DC}{37.75 \text{ cm}}$ $DC = 37.75 \cos 16.51^\circ$ $DC = 36.19 \text{ cm}$ <p>Luas / Area = $\frac{1}{2}(36.19)(37.75)\sin 16.51^\circ$</p> $= 194.12 \text{ cm}^2$	<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>10</p>
14	<p>(a) $v = mt^2 + kt$</p> $a = \frac{dv}{dt}$ $\frac{dv}{dt} = 2mt + k$	<p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>Apabila / When $t = 2$ s, $a = -4$ m s⁻²; $a = 2mt + k$ $-4 = 2m(2) + k$ $-4 = 4m + k$ $-4 - 4m = k$ ①</p> <p>Berhenti seketika / Stops instantaneously $\rightarrow v = 0, t = 5$ s; $v = mt^2 + kt$ $0 = m(5)^2 + k(5)$ $0 = 25m + 5k$ ②</p> <p>Ganti ① dalam ② / Substitute ① into ② ; $25m + 5(-4 - 4m) = 0$ $25m - 20 - 20m = 0$ $5m = 20$ $m = 4$</p> <p>Dari / From ① ; $k = -4 - 4(4)$ $k = -4 - 16$ $k = -20$</p> <p>$\therefore v = 4t^2 - 20t$</p> <p>(b) Kiri / Left : $v < 0$ $4t^2 - 20t < 0$ $4t(t - 5) < 0$</p> <div style="text-align: center;">  </div> <p>(c) $s = \int_2^3 (4t^2 - 20t) dt$ $= \left[\frac{4}{3}t^3 - 10t^2 \right]_2^3$ $= \left[\frac{4}{3}(3)^3 - 10(3)^2 \right] - \left[\frac{4}{3}(2)^3 - 10(2)^2 \right]$ $= -54 - \left(-\frac{88}{3} \right)$ $= -\frac{74}{3} \text{ m} = -24\frac{2}{3} \text{ m}$</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>10</p>
15	(a) I $x + y \leq 30$ II $y \leq x + 10$ III $4x + 8y \geq 120$	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	$x + \frac{b}{2a} = \pm \sqrt{\frac{b^2 - 4ac}{4a^2}}$ $x = -\frac{b}{2a} \pm \frac{\sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \text{ (Ditunjukkan / shown)}$	<p>1</p> <p>1</p> <p>1</p>	<p>7</p>
3	<p>(a)</p> $\frac{\sqrt{3} - \sqrt{5}}{\sqrt{12} - \sqrt{45} + \sqrt{75} - \sqrt{180}}$ $= \frac{\sqrt{3} - \sqrt{5}}{\sqrt{4 \times 3} - \sqrt{9 \times 5} + \sqrt{25 \times 3} - \sqrt{36 \times 5}}$ $= \frac{\sqrt{3} - \sqrt{5}}{2\sqrt{3} - 3\sqrt{5} + 5\sqrt{3} - 6\sqrt{5}}$ $= \frac{\sqrt{3} - \sqrt{5}}{7\sqrt{3} - 9\sqrt{5}}$ $= \frac{\sqrt{3} - \sqrt{5}}{7\sqrt{3} - 9\sqrt{5}} \times \frac{7\sqrt{3} + 9\sqrt{5}}{7\sqrt{3} + 9\sqrt{5}}$ $= \frac{7(3) + 9\sqrt{15} - 7\sqrt{15} - 9(5)}{(7\sqrt{3})^2 - (9\sqrt{5})^2}$ $= \frac{2\sqrt{15} - 24}{-258}$ $= \frac{12 - \sqrt{15}}{129}$ <p>(b)</p> $7^{k+2} + 7^{k+1} - 21(7^k) = (7^k)(7^2) + (7^k)(7^1) - (7)(3)(7^k)$ $= 7^k(49 + 7 - 21)$ $= 7^k(35)$ $= 7^k(7 \times 5)$ $= 5(7^{k+1})$	<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	$(180\,000)(0.965)^{n-1} < 50\,000$ $(0.965)^{n-1} < 0.2778$ $\log_{10}(0.965)^{n-1} < \log_{10}0.2778$ $(n-1)\log_{10}(0.965) < \log_{10}0.2778$ $(n-1)(-0.0155) < -0.5563$ $n-1 > \frac{-0.0155}{-0.0155}$ $n-1 > 35.89$ $n > 36.89$ <p>$\therefore n = 37$ tahun / years</p>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">$T = ar^{n-1}$</div> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
5	 <p> $\vec{OA} = -4\hat{i}$ $\vec{OB} = 2\hat{i} + 7\hat{j}$ $\vec{OA} = \sqrt{(-4)^2} = 4$ $\vec{OB} = \sqrt{(2)^2 + (7)^2} = \sqrt{53}$ $\vec{AB} = \vec{AO} + \vec{OB}$ $= 4\hat{i} + 2\hat{i} + 7\hat{j}$ $= 6\hat{i} + 7\hat{j}$ $\vec{AB} = \sqrt{(6)^2 + (7)^2} = \sqrt{85}$ </p> <p>Menggunakan Petua kosinus / Using the cosine rule:</p> $(OA)^2 + (OB)^2 - 2(OA)(OB) \cos \angle BOA = AB^2$ $4^2 + (\sqrt{53})^2 - 2(4)(\sqrt{53}) \cos \angle BOA = (\sqrt{85})^2$ $16 + 53 - 58.2409 \cos \angle BOA = 85$ $\cos \angle BOA = \frac{85 - 69}{-58.2409}$ $\angle BOA = \cos^{-1} / \cos^{-1}(-0.2747)$ $= 105.94^\circ$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>4</p>
6	<p>(a) $\left(\frac{y}{x} = (5-p)x + \frac{4}{x^2}\right) \dots \times x^2$</p> $xy = (5-p)x^3 + 4$ $Y = mX + C$ <p>(b) $C = \frac{3}{2}k = 4$</p> $\frac{3k}{2} = 4$ $3k = 8$ $k = \frac{8}{3}$ $\frac{4 - (-5)}{0 - 3} = 5 - p$ $\frac{9}{-3} = 5 - p$	<p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
11	<p>(a) $p = \frac{5}{12}, q = \frac{7}{12}, n = 7$ $p(X=5) = {}^7C_5 \left(\frac{5}{12}\right)^5 \left(\frac{7}{12}\right)^2$ $= 0.08974$</p> <p>(b) (i) $1.5 = \frac{X-165}{\sqrt{400}}$ $30 = X-165$ $X = 195$</p> <p>(ii) $P(X < k) = 0.5987$ $1 - P(X > k) = 0.5987$ $P\left(Z > \frac{k-165}{\sqrt{400}}\right) = 0.4013$</p> <div style="border: 1px solid orange; padding: 5px; display: inline-block; margin-top: 10px;"> $\frac{k-165}{20} = 0.25$ ← 0.25 ialah nilai z dalam sifir taburan normal piawai 0.25 is the z-score obtained from the standard normal distribution table </div> <p>$k - 165 = 5$ $k = 170$</p>	1 1 1 1 1 1 1	7
12	<p>(a)</p> <div style="text-align: center; margin-bottom: 20px;">  </div> <p>(i) $\tan \theta = \frac{\sqrt{1-k^2}}{-k}$ $\cot / \cot \theta = \frac{1}{\tan \theta}$ $\cot / \cot \theta = -\frac{k}{\sqrt{1-k^2}}$</p> <p>(ii) $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$ $= (-k)^2 - \left(-\frac{\sqrt{1-k^2}}{1}\right)^2$ $= k^2 - (1-k^2)$ $= k^2 - 1 + k^2$ $= 2k^2 - 1$</p> <p>(b) $p = -3$</p> <p>$y = 3 \sin \frac{5}{2}x \rightarrow \frac{5}{2}$ kitaran / cycles 1 kitaran / cycles : $360^\circ \div \frac{5}{2} = 144^\circ$ $\frac{3}{4}$ kitaran / cycles : $144^\circ \times \frac{3}{4} = 108^\circ$ $\therefore m = 108^\circ$</p>	1 1 1 1 1 1 1 1 1 1	7

Bahagian B

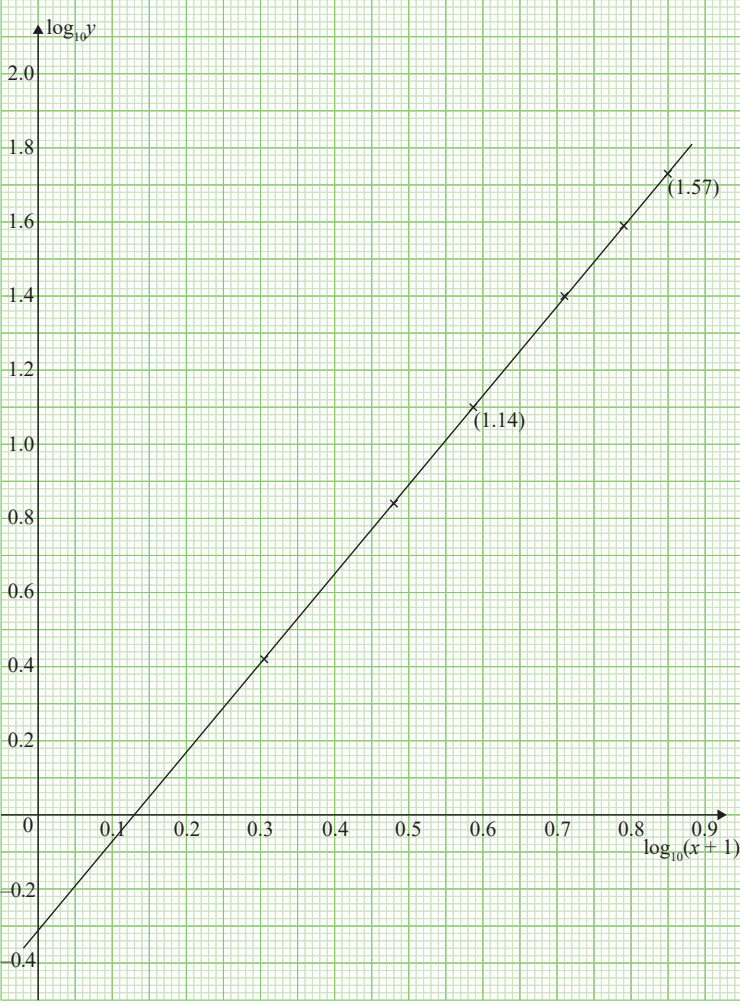
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks	
13	(a) Katakan / Let $3x - 1 = y$ $3x = y + 1$ $x = \frac{y + 1}{3}$ $\therefore f^{-1}(x) = \frac{x + 1}{3}$	1	8	
	(b) $f^{-1}g(x) = mx + 5$ $f^{-1}(2x - h) = mx + 5$ $\frac{(2x - h) + 1}{3} = mx + 5$ $\frac{2x - h + 1}{3} = mx + 5$	1		
	$mx = \frac{2}{3}x$	$\frac{-h + 1}{3} = 5$		1
	$m = \frac{2}{3}$	$-h + 1 = 15$ $-h = 14$ $h = -14$		1
	(c) $pg(x) = 5x$ $p[g(x)] = 5x$ $p(2x + 14) = 5x$	1		
	Katakan / Let $2x + 14 = k$ $2x = k - 14$ $x = \frac{k - 14}{2}$			
	$p(k) = 5\left(\frac{k - 14}{2}\right)$ $= \frac{5k - 70}{2}$ $= \frac{5}{2}k - 35$	1		
	$\therefore p(x) = \frac{5}{2}x - 35$	1		
	14	(a) $\angle COB = 2 \times 43^\circ$ $= 86^\circ$ $= 86^\circ \times \frac{3.142}{180^\circ}$ $= 1.501 \text{ rad}$		1
		$s_{BC} = r\theta$		1
$s_{BC} = (9 \text{ cm})(1.501 \text{ rad})$ $= 13.509 \text{ cm}$		1		
(b) $BC^2 = 9^2 + 9^2 - 2(9)(9) \cos 86^\circ$ $BC = \sqrt{150.6995}$ $= 12.28 \text{ cm}$	1			

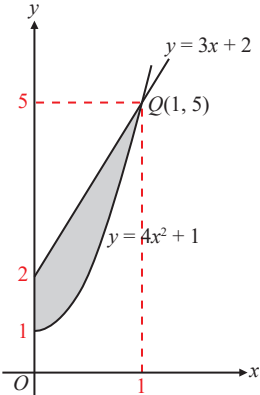
Bahagian A

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
1	<p>$x = \text{payung/umbrella}$; $y = \text{topi/cap}$; $z = \text{T-shirt}$</p> <p>$x + 2y + z = 75$ ①</p> <p>$2x + y + z = 79$ ②</p> <p>$x + y + 2z = 82$ ③</p> <p>② — ③ ; $x - z = -3$ ④</p> <p>② \times 2 — ①; $3x + z = 83$ $z = 83 - 3x$ ⑤</p> <p>Gantikan ⑤ dalam ④ / <i>Substitute ⑤ into ④</i> ;</p> <p>$x - (83 - 3x) = -3$ $x - 83 + 3x = -3$ $4x = 80$ $x = 20$</p> <p>Dari / <i>From</i> ⑤; $z = 83 - 3(20)$ $z = 83 - 60$ $z = 23$</p> <p>Dari / <i>From</i> ③; $20 + y + 2(23) = 82$ $20 + y + 46 = 82$ $y = 16$</p> <p>\therefore Baju — T / <i>T-shirt</i> = RM23, Payung / <i>Umbrella</i> = RM20, Topi / <i>Cap</i> = RM16</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>
2	<p>(a) $f(0) = (0)^2 + p(0) - 5$ $f(0) = -5$ $\therefore H(0, -5)$</p> <p>(b) $f(x) = x^2 + px + \left(\frac{p}{2}\right)^2 - \left(\frac{p}{2}\right)^2 - 5$ $f(x) = \left(x + \frac{p}{2}\right)^2 - \frac{p^2}{4} - 5$ $x + \frac{p}{2} = 0$ $x = -\frac{p}{2}$ $2 = -\frac{p}{2}$ $p = -4$</p> <p>$m = -\frac{p^2}{4} - 5$ $m = -\frac{(-4)^2}{4} - 5$ $m = -9$</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(c) $f(x) = (x - 2)^2 - 9$ Bergerak 3 unit ke kanan / Moves 3 units to the right $f(x) = (x - 2 - 3)^2 - 9$ $f(x) = (x - 5)^2 - 9$</p>	1	6
3	<p>(a) $a = \text{RM}12\,000$; $r = 100\% + 8\% = 1.08$ $S_n = \frac{a(r^n - 1)}{r - 1}$, $r \neq 1$ $S_8 = \frac{12\,000(1.08^8 - 1)}{1.08 - 1}$ $S_8 = \text{RM}12\,7639.53$</p> <p>(b) $T_n > 80\,000$ $T_n = ar^{n-1}$ $12000(1.08)^{n-1} > 80\,000$ $(1.08)^{n-1} > 6.6667$ $(n - 1)\log_{10} 1.08 > \log_{10} 6.6667$ $n - 1 > \frac{\log_{10} 6.6667}{\log_{10} 1.08}$ $n - 1 > 24.65$ $n > 25.65$ $n = 26$</p> <p>\therefore Encik Brian akan mula memperoleh keuntungan melebihi RM80 ribu pada tahun 2034 <i>Mr. Brian will start obtaining a net profit exceeding RM80 thousand in the year 2034</i></p>	1 1 1 1 1	7
4	<p>(a) Di titik pusing / At turning point $(-1, 5) \rightarrow \frac{dy}{dx} = 0$ $p(-1)^2 + 3(-1) = 0$ $p - 3 = 0$ $p = 3$</p> <p>(b) $\frac{dy}{dx} = 3x^2 + 3x$ $\frac{d^2y}{dx^2} = 6x + 3$ pada / at $(-1, 5)$ $= 6(-1) + 3$ $= -6 + 3$ $= -3 < 0$ $\therefore \frac{d^2y}{dx^2} < 0$ $\therefore (-1, 5)$ adalah maksimum / $(-1, 5)$ is a maximum</p> <p>(c) $y = \int(3x^2 + 3x) dx$ $y = \frac{3x^3}{3} + \frac{3x^2}{2} + c$ pada / at $(-1, 5)$ $5 = \frac{3(-1)^3}{3} + \frac{3(-1)^2}{2} + c$ $5 = -1 + \frac{3}{2} + c$ $c = \frac{9}{2}$</p>	1 1 1 1 1 1 1	

Bahagian B

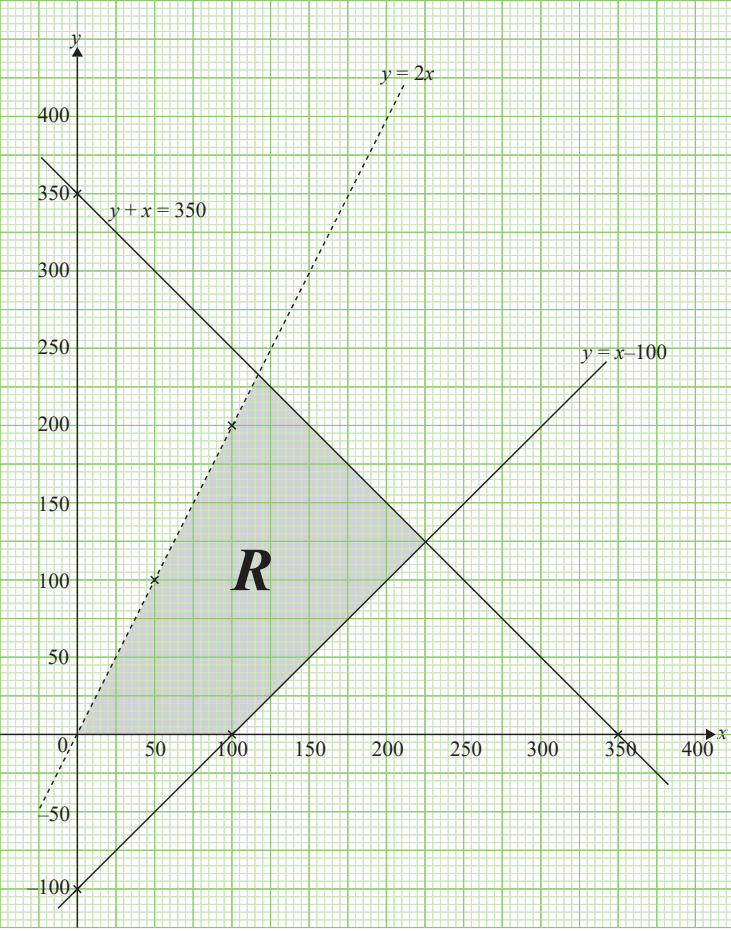
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks														
8	<p>(a)</p> <table border="1" data-bbox="239 231 972 309"> <tr> <td>$\log_{10}(x + 1)$</td> <td>0.30</td> <td>0.48</td> <td>0.60</td> <td>0.70</td> <td>0.78</td> <td>0.85</td> </tr> <tr> <td>$\log_{10}y$</td> <td>0.42</td> <td>0.84</td> <td>1.14</td> <td>1.38</td> <td>1.57</td> <td>1.73</td> </tr> </table>	$\log_{10}(x + 1)$	0.30	0.48	0.60	0.70	0.78	0.85	$\log_{10}y$	0.42	0.84	1.14	1.38	1.57	1.73	1	
	$\log_{10}(x + 1)$	0.30	0.48	0.60	0.70	0.78	0.85										
$\log_{10}y$	0.42	0.84	1.14	1.38	1.57	1.73											
	3																
	<p>(b) (i) Apabila / When $x = 3.5 \rightarrow \log_{10}(x + 1) = 0.65$</p> <p>Dari graf / From the graph</p> <p>$\log_{10}(x + 1) = 0.65 ; \log_{10} y = 1.25$ $y = 10^{1.25}$ $y = 17.78$</p>	1															
		1															

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	$s_{AB\text{ minor}} = (8 \text{ cm})(2.306 \text{ rad}) \leftarrow s = r\theta$ $= 18.448 \text{ cm}$ Perimeter = $14.62 \text{ cm} + 18.448 \text{ cm}$ $= 33.068 \text{ cm}$ (c) Luas $AOB_{\text{ minor}}$ / Area of $AOB_{\text{ minor}} = \frac{1}{2}(8)^2(2.306) \leftarrow L = \frac{1}{2}r^2\theta$ $= 73.792 \text{ cm}^2$ Luas $AOBC$ / Area of $AOBC = 2 \times \Delta OAC$ $= 2 \times \left(\frac{1}{2} \times 18 \times 8\right)$ $= 144 \text{ cm}^2$ Luas lorekan / Area of shaded = $144 \text{ cm}^2 - 73.792 \text{ cm}^2$ $= 70.208 \text{ cm}^2$	1 1 1 1 1 1	10
10	(a) Kecerunan tangen pada lengkung $y = 4x^2 + 1$ Gradient of tangent to the curve $y = 4x^2 + 1$ $m_1 = \frac{dy}{dx} = 8x$ $= 8(1)$; pada titik / at point $Q(1, 5)$ $= 8$ Kecerunan normal / Gradient of normal $\rightarrow m_1 m_2 = -1$ $(8)(m_2) = -1$ $m_2 = -\frac{1}{8}$ Persamaan normal di $Q(1, 5)$ / Equation of normal at $Q(1, 5)$ $y - 5 = -\frac{1}{8}(x - 1)$ $y = -\frac{1}{8}x + \frac{1}{8} + 5$ $y = -\frac{1}{8}x + \frac{41}{8}$ (b) 	1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
	<p>(ii) $\vec{NP} = \vec{NM} + \vec{MP}$</p> $= 4\tilde{x} + \frac{2}{3}\vec{MO}$ $= 4\tilde{x} + \frac{2}{3}(\vec{MN} + \vec{NO})$ $= 4\tilde{x} + \frac{2}{3}(-4\tilde{x} - 8\tilde{y})$ $= 4\tilde{x} - \frac{8}{3}\tilde{x} - \frac{16}{3}\tilde{y}$ $= \frac{4}{3}\tilde{x} - \frac{16}{3}\tilde{y}$	1	
	<p>(b) $\vec{MR} = k\vec{MQ}$</p> $\vec{MR} = k(-4\tilde{x} - 6\tilde{y})$ $\vec{NR} = h\vec{NP}$ $= h\left(\frac{4}{3}\tilde{x} - \frac{16}{3}\tilde{y}\right)$ $\vec{MR} = \vec{MN} + \vec{NR}$ $= -4\tilde{x} + h\left(\frac{4}{3}\tilde{x} - \frac{16h}{3}\tilde{y}\right)$ $= \left(\frac{4h}{3} - 4\right)\tilde{x} - \frac{16}{3}\tilde{y}$ $\tilde{x} : \frac{4h}{3} - 4 = -4k$ $4h = -12k + 12 \dots\dots\dots \textcircled{1}$ $\tilde{y} : -6k = -\frac{16h}{3}$ $k = \frac{8h}{9} \dots\dots\dots \textcircled{2}$ <p>Gantikan $\textcircled{2}$ dalam $\textcircled{1}$ / <i>Substitute $\textcircled{2}$ into $\textcircled{1}$</i></p> $4h = -12\left(\frac{8h}{9}\right) + 12$ $4h = -\frac{32h}{3} + 12$ $\frac{44}{3}h = 12$ $h = \frac{9}{11}$ $k = \frac{8}{9}\left(\frac{9}{11}\right)$ $k = \frac{8}{11}$	1	
		1	10

Bahagian C

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
12	(a) $\frac{8.50}{P} \times 100 = 150$ $p = 5.67$	1	10
	$\frac{q}{5.93} \times 100 = 125$ $q = 7.41$	1	
	$r = \frac{6.05}{5.50} \times 100$ $r = 110$	1	
	(b) $\bar{I}_{2023/2020} = 140$ $\frac{(150)(3) + (146)(s) + (125)(2) + (110)(1)}{3 + s + 2 + 1} = 140$ $810 + 146s = 140s + 840$ $6s = 30$ $s = 5$	1	
		1	
	(c) $\frac{P_{2023}}{1\,500} \times 100 = 140$ $P_{2023} = \frac{140 \times 1500}{100}$ $P_{2023} = \text{RM2 } 100$	1	
		1	
	(d) $\bar{I}_{2024/2020} = 190$ $\bar{I}_{2024/2023} = \frac{I_{2024}}{I_{2020}} \times \frac{I_{2020}}{I_{2023}} \times 100$ $\bar{I}_{2024/2023} = \frac{190}{100} \times \frac{100}{25} \times 100$ $\bar{I}_{2024/2023} = 152$	1	
		1	
	13	(a) $\frac{\sin \angle RQS}{110} = \frac{\sin 40^\circ}{75}$ $\angle RQS = \sin^{-1}(0.9428)$ $\angle RQS = 70.53^\circ$ $\angle QRS = 180^\circ - 70.53^\circ - 40^\circ$ $= 69.47^\circ$ $SQ^2 = (75)^2 + (110)^2 - 2(75)(110) \cos 69.47^\circ$ $SQ = \sqrt{11\,938.49}$ $SQ = 109.26 \text{ m}$ Jumlah pagar yang diperlukan / Total fence needed: Perimeter = $80 \text{ m} + 60 \text{ m} + 75 \text{ m} + 110 \text{ m} + 109.26 \text{ m}$ $= 434.26 \text{ m}$	
		1	
		1	
		1	
		1	
		1	
		1	
		1	
		1	
		1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Jumlah Markah Total Marks
15	<p>(a) I $x + y \leq 350$ II $x \geq y + 100$ $y \leq x - 100$ III $x \geq \frac{1}{2}y$ $y \leq 2x$</p> <p>(b)</p> 	<p>1 1 1</p> <p>4</p>	
	<p>(c) (i) Apabila, $x = 180$ julat nilai y ialah $80 \leq y \leq 170$ Maka, bilangan maksimum kek cawan strawberi yang dihasilkan ialah 170 biji. <i>When $x = 130$, the range of y values is $80 \leq y \leq 170$ Hence, the maximum number of strawberry cupcakes produced is 170 pieces.</i></p> <p>(ii) Keuntungan / Profit = $1.50x + 2.50y$ Titik optimum ialah / The optimal point is (225, 125) Keuntungan maksimum / Maximum profit = RM1.50(225) + RM2.50(125) = RM650</p>	<p>1 1 1</p>	<p>10</p>