

KERTAS SOALAN PEPERIKSAAN SEBENAR SPM 2021

FORMAT
TERKINI

+3 SET
KERTAS MODEL
FORMAT INSTRUMEN
SPM TERKINI

MATEMATIK TAMBAHAN

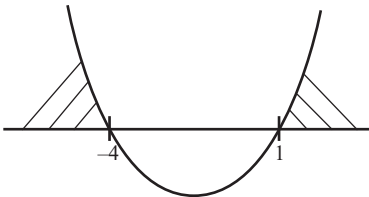
KERTAS SOALAN PEPERIKSAAN SEBENAR SPM 2021

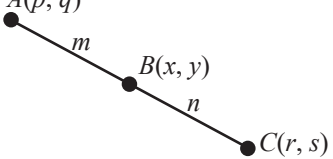
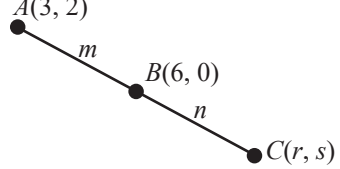
KERTAS 1

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
1	$\angle AOB \text{ major} = 2\pi - \frac{\pi}{3}$ $= \frac{5}{3}\pi$ $\text{Luas/Area} = \frac{1}{2}(2)^2 \left(\frac{5}{3}\pi\right)$ $= \frac{10}{3}\pi \text{ cm}^2$	1 1	2
2	$m = \frac{7-1}{5-2} = 2$ $\frac{c-1}{0-2} = 2$ $c-1 = -4$ $c = -3$ $\ln y = 2 \ln x - 3$ $\ln y - \ln x^2 = -3$ $\ln\left(\frac{y}{x^2}\right) = -3$ $\frac{y}{x^2} = e^{-3}$ $y = \frac{x^2}{e^3}$	1 1 1 1	4



No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
3	(a) $S_n < 650$ $217 \left[\frac{1 - \left(\frac{2}{3}\right)^n}{1 - \frac{2}{3}} \right] < 650$ $1 - \left(\frac{2}{3}\right)^n < \frac{650}{651}$ $1 - \frac{650}{651} < \left(\frac{2}{3}\right)^n$ $\frac{1}{651} < \left(\frac{2}{3}\right)^n$ $\left(\frac{2}{3}\right)^n > \frac{1}{651}$ $n < \frac{\lg\left(\frac{1}{651}\right)}{\lg\left(\frac{2}{3}\right)}$ $n < 15.97$ $n = 15$ (b) $S_\infty - T_5 = \frac{217}{1 - \frac{2}{3}} - 217\left(\frac{2}{3}\right)^4$ $= 651 - \frac{3\,472}{81}$ $= 608\frac{11}{81}$	1 1 2 1	5
4	(a) $\frac{dy}{dx} = 1 - \frac{4}{x^3}$ (b) $y = -2x$ $m_1 = -2$ $m_2 = \frac{1}{2}$ $1 - \frac{4}{x^3} = \frac{1}{2}$ $\frac{1}{2} = \frac{4}{x^3}$ $x = 2$ Gantikan $x = 2$ ke dalam Substitute $x = 2$ into $y = x + \frac{2}{x^2}$ $= 2 + \frac{2}{x^2}$ $= 2 + \frac{2}{4}$ $= \frac{5}{2}$ $P\left(2, \frac{5}{2}\right)$	1 1 1 1	4

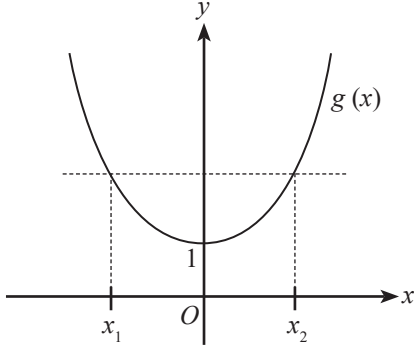
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
5	(a) $f(x) > 0$ $x^2 + 3x - 4 > 0$ $(x + 4)(x - 1) > 0$		
		1	
	$x < -4, x > 1$	1	
	(b) (i) $px + q - (x^2 + 3x - 4) = 0$ $-x^2 + (p - 3)x + q + 4 = 0$ $x^2 - (p - 3)x - q - 4 = 0$ $\alpha + \beta = p - 3$ $\alpha\beta = -q - 4$	1 1	
	(ii) $x^2 + rx + r - 10 = 0$ $\frac{2}{\alpha} + \frac{2}{\beta} = -r$ dan/and $\left(\frac{2}{\alpha}\right)\left(\frac{2}{\beta}\right) = r - 10$ $\frac{2}{\alpha} + \frac{2}{\beta} = -r$ $2\left(\frac{\beta + \alpha}{\alpha\beta}\right) = -r$ $\frac{2(p - 3)}{-q - 4} = -r$ $r = \frac{2(p - 3)}{q + 4}$	1	
	$\left(\frac{2}{\alpha}\right)\left(\frac{2}{\beta}\right) = r - 10$ $\frac{4}{\alpha\beta} = r - 10$ $\frac{4}{-q - 4} = r - 10$ $r = \frac{-4}{q + 4} + 10$		
	$\frac{2(p - 3)}{q + 4} = \frac{-4}{q + 4} + 10$ $2(p - 3) = -4 + 10(q + 4)$ $2(p - 3) = 10q + 36$ $p - 3 = 5q + 18$ $p = 5q + 21$	1	
		1	
			7

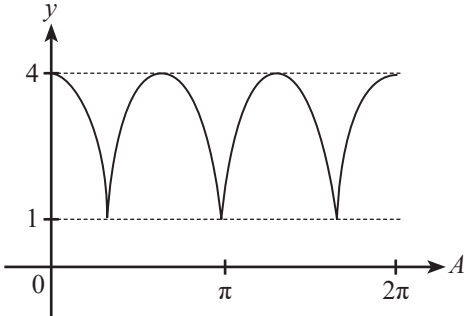
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
8	(a)  $\frac{q-y}{y-s} = \frac{m}{n}$ $nq - ny = my - ms$ $ms + nq = (m+n)y$ $y = \frac{ms + nq}{m+n}$ $\frac{x+p}{r-x} = \frac{m}{n}$ $nx - np = mr - mx$ $(m+n)x = mr + np$ $x = \frac{mr + np}{m+n}$ $(x, y) = \left(\frac{mr + np}{m+n}, \frac{ms + nq}{m+n} \right)$ (b) (i)  $\frac{m}{n} = \frac{6-3}{r-6}$ $= \frac{3}{r-6}$ $m \leq n$ $r-6 \geq 3$ $r \geq 9$ $\frac{m}{n} = \frac{2-0}{0-s}$ $= -\frac{2}{s}$ $m \leq n$ $s < 0$ $s \leq -2$ (ii) $m_{AB} = \frac{2-0}{3-6} = -\frac{2}{3}$ $m = -\frac{p}{6}$ $-\frac{p}{6} = -\frac{2}{3}$ $p = 4$	1 1 1 1 1 1	6

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
9	(a) $g(x) = -3x^2 + 8x - 4$ (b) Kawasan berlorek/Shaded area $= \int_1^2 (x^3 - 6x^2 + 12x - 6) dx - [-x^3 + 4x^2 - 4x]_1^2$ $= \left[\frac{x^4}{4} - \frac{6x^3}{3} + \frac{12x^2}{2} - 6x + x^3 - 4x^2 + 4x \right]_1^2$ $= \left[\frac{x^4}{4} - x^3 + 2x^2 - 2x \right]_1^2$ $= \left[\frac{2^4}{4} - 2^3 + 2(2)^2 - 2(2) \right] - \left[\frac{1}{4} - 1^3 + 2(1)^2 - 2(1) \right]$ $= \left(\frac{16}{4} - 8 + 8 - 4 \right) - \left(\frac{1}{4} - 1 + 2 - 2 \right)$ $= 0 - \left(-\frac{3}{4} \right)$ $= \frac{3}{4} \text{ unit}^2$	1 2 1 1 5	
10	(a) $(x, x + 20, x + 40)$ mm (b) $a = x$ $T_{72} = x + (72 - 1)(20)$ $= x + 1\,420$ $S_{72} = 55\,440$ $\frac{72}{2} (x + x + 1\,420) = 55\,440$ $2x + 1\,420 = \frac{55\,440}{36}$ $x = 60$ 18 kepingan terakhir/Last 18 terms: $T_{55}, T_{56}, \dots, T_{72}$ $S_{18} = \frac{18}{2} [2(60 + 30(20)) + (18 - 1)(20)]$ $= 14\,940 \text{ mm}$ (c) Cara 1/Method 1 $60 + (72 - 1)(20) = 1\,480$ $1\,480$ 500 $2\pi r = 1\,480$ $r = \frac{1\,480}{2}$ $= \frac{740}{\pi}$ $60 + (72 - 1)(20) = 1\,480 \text{ dan/and } r = \frac{740}{\pi}$	1 1 1 1 1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	$V_1 = \pi r^2 h$ $= \pi \left(\frac{740}{\pi} \right)^2 (500)$ $= \frac{273\,800\,000}{\pi} \text{ mm}^3$ $= \frac{2.738 \times 10^8}{\pi} \text{ mm}^3$ Cara 2/Method 2 500  1 480 $2\pi r = 500$ $r = \frac{500}{2\pi}$ $= \frac{250}{\pi}$ $V_2 = \pi r^2 h$ $= \pi \left(\frac{250}{\pi} \right)^2 (1\,480)$ $= \frac{92\,500\,000}{\pi} \text{ mm}^3$ $= \frac{9.25 \times 10^8}{\pi} \text{ mm}^3$ $V_1 = \pi \left(\frac{740}{\pi} \right)^2 (500) \text{ dan/and } V_2 = \pi \left(\frac{250}{\pi} \right)^2 (1\,480)$ Cara 1 membentuk silinder dengan isi padu maksimum: Method 1 forms a cylinder with maximum volume: $V_1 = \frac{2.738 \times 10^8}{\pi} \text{ mm}^3 \text{ dan/and } r = \frac{740}{\pi}$	1	8
11	(a) (i) $6! = 720$ (ii) $\frac{1 \text{ kad/card}}{3 \text{ kad/cards}}$ atau/or $\frac{2 \text{ kad/cards}}{2 \text{ kad/cards}}$ $\frac{1 \text{ kad/card}}{3 \text{ kad/cards}} = 4 \times 2! \times 2! \times 3$ $= 48 \text{ cara/ways}$ $\frac{2 \text{ kad/cards}}{2 \text{ kad/cards}}$ $: \frac{15 \text{ atau/or } 17 \text{ atau/or } 19}{26 \text{ atau/or } 62} = 6 \text{ cara/ways}$ $: \frac{51 \text{ atau/or } 57 \text{ atau/or } 59}{62} = 3 \text{ cara/ways}$	1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	$: \frac{26}{51 \text{ atau/or } 57 \text{ atau/or } 59} + \frac{26}{71 \text{ atau/or } 75 \text{ atau/or } 79} +$ $\frac{26}{91 \text{ atau/or } 95 \text{ atau/or } 97} = 9 \text{ cara/ways}$ $: \frac{62}{71 \text{ atau/or } 75 \text{ atau/or } 79} = 3 \text{ cara/ways}$ $: \frac{62}{91 \text{ atau/or } 95 \text{ atau/or } 97} = 3 \text{ cara/ways}$ ATAU/OR ${}^1P_1 \times {}^1P_1 \times {}^3P_1 \times {}^3P_1 \text{ atau/or } {}^1P_1 \times {}^1P_1 \times {}^2P_1 \times {}^3P_1 \text{ atau/or}$ ${}^1P_1 \times {}^3P_1 \times {}^1P_1 \times {}^1P_1 \text{ atau/or } {}^2P_1 \times {}^3P_1 \times {}^1P_1 \times {}^1P_1 \text{ atau/or } {}^4P_2 \times 1 \times 1$ Jumlah bilangan cara/Total number of ways: $= 48 + 6 + 3 + 9 + 3 + 3$ $= 72$ (b) (i) $n = 0$ (ii) ${}^pC_3 = 26(p-2)$ $\frac{p!}{(p-3)!3!} = 26(p-2)$ $\frac{p(p-1)(p-2)(p-3)!}{(p-3)!(6)} = 26(p-2)$ $p(p-1) = 26(6)$ $p(p-1) = 13(12)$ $p = 13$	2	
		1	
		1	
		1	
		1	7
12	(a) $P(X=2) + P(X=3) = 1 - \frac{81}{128} - \frac{1}{64}$ $= \frac{45}{128}$ (b) ${}^5C_2(p)^2(q)^3 + {}^5C_3(p)^3(q)^2 = \frac{45}{128}$ $10p^2q^3 + 10p^3q^2 = \frac{45}{128}$ $10p^2q^2(q+p) = \frac{45}{128}$ $p^2q^2(q+p) = \frac{9}{256}$ $p^2q^2(1) = \frac{9}{256}$ $pq = \frac{3}{16}$ $p = \frac{3}{16q}$ Tertunjuk/Shown	1	
		1	
		1	
		1	4

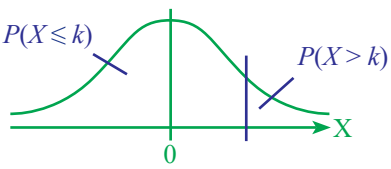
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
13	(a) $\frac{3}{4x-1} = \frac{1}{3}$	1	
	$x = \frac{5}{2}$	1	
	(b) $f(m+1) = 3fg(p)$		
	$\frac{3}{4(m+1)-1} = 3\left(\frac{3}{4p^2+3}\right)$	1	
	$3(4m+4-1) = 4p^2+3$		
	$12m+9 = 4p^2+3$		
	$m = \frac{4p^2-6}{12}$	1	
	$= \frac{2p^2-3}{6}$	1	
(c)	(i) $\frac{3}{4g(x)-1} = \frac{3}{4x^2+3}$	1	
	$4g(x)-1 = 4x^2+3$		
	$g(x) = x^2+1$	1	
	(ii) Ujian garis mengufuk Horizontal line test		
	 Bukan hubungan satu kepada satu Not one to one relationship	1	
14	(a) $(2^{x+1})^2 + (\sqrt{2^x})^2 = (3\sqrt{2})^2$	1	
	$4(2^{2x}) + 2^x = 18$	1	
	$4(2^{2x}) + 2^x - 18 = 0$	1	
	$[4(2^x) + 9][2^x - 2] = 0$		
	$4(2^x) + 9 = 0$		
	$2^x = -\frac{9}{4}$		
	$2x > 0$		
	$2x = -\frac{9}{4}$ (tidak mungkin/not possible)		
	$2^x - 2 = 0$		
	$2^x = 2$ $x = 1$	1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
5	(a) (i) $2 \cot^2 A \sin^2 A = 2 \left(\frac{\cos^2 A}{\sin^2 A} \right) \sin^2 A$ $= 2 \cos^2 A$ $= (2 \cos^2 A - 1) + 1$ $= 1 + \cos 2A$ $2 \cot^2 A \sin^2 A = 2 \left(\frac{\cot^2 A}{\sin^2 A} \right) \sin^2 A$ $= 2 \cot^2 A$ $= (2 \cot^2 A - 1) + 1$ $= 1 + \cot 2A$	1 1	9
	(ii) $2 \cot^2 A \sin^2 A = \frac{1}{2}$ $1 + \cos 2A = \frac{1}{2}$ $\cos 2A = -\frac{1}{2}$ $\alpha = \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$	1 1	
	$2 \cot^2 A \sin^2 A = \frac{1}{2}$ $1 + \cos 2A = \frac{1}{2}$ $\cos 2A = -\frac{1}{2}$ $\alpha = \cos^{-1}\left(\frac{1}{2}\right) = \frac{\pi}{3}$ $2A = \pi - \frac{\pi}{3}, \pi + \frac{\pi}{3}$ $A = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$	1	
	(b) 	4	
6	(a) (i) $\vec{OX} = \vec{OA} + \vec{AX}$ $= 4\vec{a} + \vec{b}$	1 1	
	(ii) $\vec{BY} = \vec{BA} + \vec{AY}$ $= -3\vec{b} + (-\vec{a})$ $= -3\vec{b} - \vec{a}$	1	

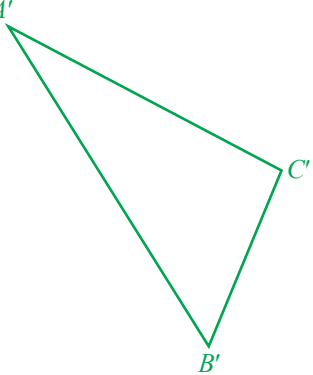
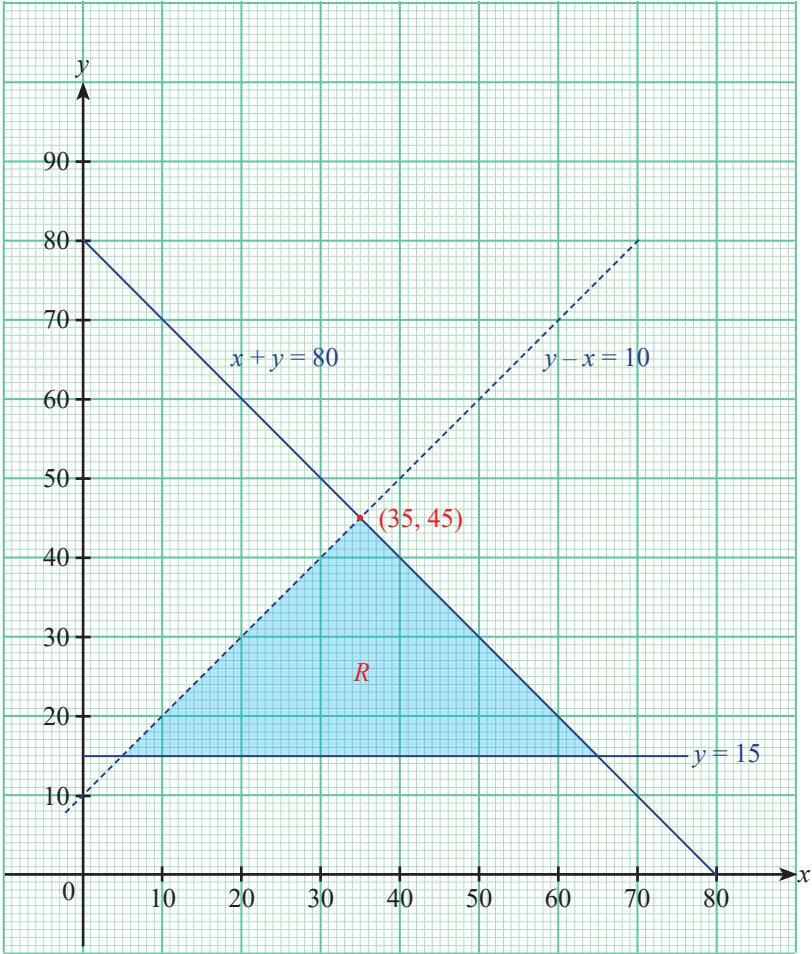
No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(b) $\vec{BP} = k\vec{BY}$ $\vec{OP} = \lambda\vec{OX}$ $\vec{BP} = \vec{BO} + \vec{OP}$ $k\vec{BY} = (\vec{BA} + \vec{AO}) + \lambda(4\vec{a} + \vec{b})$ $k(-\vec{a} - 3\vec{b}) = (-3\vec{b} - 4\vec{a}) + \lambda(4\vec{a} + \vec{b})$ $-k\vec{a} - 3k\vec{b} = (-4 + 4\lambda)\vec{a} + (-3 + \lambda)\vec{b}$ $-4 + 4\lambda = -k$ ① $-3 + \lambda = -3k$ ② $\lambda = 3 - 3k$ ③ Gantikan ③ ke dalam ① Substitute ③ into ① $-4 + 4(3 - 3k) = -k$ $-4 + 12 - 12k = -k$ $k = \frac{8}{11}$ $\vec{BP} = \frac{8}{11}\vec{BY}$ $BP : PY = 8 : 3$	1 1 1 1 1 1 1 1	8
7	(a) $\frac{dy}{dx} = 2x - 2$ $y = \int(2x - 2)dx$ $= \frac{2x^2}{2} - 2x + c$ $x = -2, y = -7$ $-7 = (-2)^2 - 2(-2) + c$ $c = -15$ $y = x^2 - 2x - 15$ (b) $y = (x + 1)^2 - 2(x + 1) - 15$ $= x^2 + 2x + 1 - 2x - 2 - 15$ $= x^2 - 16$ $x^2 = y + 16$ $V = \pi \int_{-16}^0 (y + 16)dy$ $= \pi \left[\frac{y^2}{2} + 16y \right]_{-16}^0$ $= \pi \left[\frac{0^2}{2} + 16(0) \right] - \pi \left[\frac{(-16)^2}{2} + 16(-16) \right]$ $= 128\pi$	1 1 1 1 1 1 1 1 1 1 1 1 1	7
8	(a) (i) $A = (26 - 2x)(x)$ $= 26x - 2x^2$ (ii) $\frac{dA}{dx} = 0$ $26 - 4 = 0$ $x = 6.5 \text{ cm}$ $A_{\text{maksimum}/\text{maximum}} = 26(6.5) - 2(6.5)^2$ $= 84.5 \text{ cm}^2$	1 1 1 1 1 1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(b) $\frac{dA}{dt} = 36 \text{ cm}^2 \text{ s}^{-1}, x = \sqrt{5}$ $\frac{dA}{dt} = \frac{dA}{dx} \times \frac{dx}{dt}$ $36 = [26 - 4(\sqrt{5})] \times \frac{dx}{dt}$ $\frac{dx}{dt} = 2.11 \text{ cm s}^{-1}$ $x = \int \left(\frac{dx}{dt} \right) dt$ $= \int 2.11 dt$ $= 2.11t + c$ $t = 0, x = \sqrt{5}$ $\sqrt{5} = 2.11(0) + c$ $c = \sqrt{5}$ $x = 2.11t + \sqrt{5}$ $t = 3, x = 2.11(3) + \sqrt{5}$ $= 8.57 \text{ cm}$ (c) $\delta x = 1.98 - 2 = -0.02 \text{ cm}$ $\delta A \approx \frac{dA}{dx} \times \delta x$ $\approx [26 - 4(2)] \times (-0.02)$ $\approx -\frac{9}{25} \text{ cm}^2$	2 1 1 1 1 1	10
9	(a) (i) $(x, y) = \left(\frac{3+7}{2}, \frac{2+(-6)}{2} \right)$ $= (5, -2)$ $(5, -2) = \left(\frac{2x+3(-1)}{2+3}, \frac{2y+3(-8)}{2+3} \right)$ $5 = \frac{2x-3}{5} \qquad -2 = \frac{2y-24}{5}$ $25 = 2x - 3 \qquad -10 = 2y - 24$ $2x = 28 \qquad 2y = 14$ $x = 14 \qquad y = 7$ $D(14, 7)$ (ii) Luas/Area $\triangle CDE$ $= \frac{1}{2} \begin{vmatrix} 5 & 14 & 7 & 5 \\ -2 & 7 & -6 & -2 \end{vmatrix}$ $= \frac{1}{2} [5 \times 7 + 14 \times (-6) + 7 \times (-2)] - [-2 \times 14 + 7 \times 7 + (-6) \times 5] $ $= \frac{1}{2} -54 $ $= 27 \text{ unit}^2$	1 1 1 1	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks														
	(b) (i) $m_{PA} = \frac{y-2}{x-3}, m_{PB} = \frac{y-(-8)}{x-(-1)}$ $\left(\frac{y-2}{x-3}\right)\left(\frac{y-(-8)}{x-(-1)}\right) = -1$ $y^2 + 8y - 2y - 16 = -(x^2 + x - 3x - 3)$ $x^2 + y^2 - 2x + 6y - 19 = 0$ (ii) $x = 5, y = -2$ $5^2 + (-2)^2 - 2(5) + 6(-2) - 19 = -12$ $-12 \neq 0$, maka lokus P tidak melalui C $-12 \neq 0$, therefore locus P does not pass through point C	1 1 1 1 1 1	10														
10	(a) <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>xy</td><td>3.25</td><td>2.56</td><td>1.74</td><td>1.00</td><td>0.25</td><td>-0.54</td></tr></table>	x	1	2	3	4	5	6	xy	3.25	2.56	1.74	1.00	0.25	-0.54	1 3	
x	1	2	3	4	5	6											
xy	3.25	2.56	1.74	1.00	0.25	-0.54											

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(b) (i) $y^2 = \frac{4}{x^2}$ $x^2 y^2 = 4$ $(xy)^2 = 4$ $xy = 2$ $x = 2.65$ (ii) $y + \sqrt{h} = \frac{k^2}{x}$ $xy + x\sqrt{h} = k^2$ $xy = (-\sqrt{h})x + k^2$ $m = \frac{4-1}{0-4}$ $= -\frac{3}{4}$ $m = -\sqrt{h}$ $-\sqrt{h} = -\frac{3}{4}$ $\sqrt{h} = \frac{3}{4}$ $h = \frac{9}{16}$ $c = k^2$ $k^2 = 4$ $k = 2$	1 1 1 1 1 1	10
11	(a) (i) $n = 5\,000, p = \frac{97}{1+97+2} = 0.97$ $\mu = np$ $= (5\,000)(0.97)$ $= 4\,850$ (ii) $p = 0.03, q = 0.97, n = 6, r = 2$ $P(X = 2) = {}^6C_2(0.03)^2(0.97)^4$ $= 0.01195$ (iii) $n = 10, p = \frac{1}{3}, q = \frac{2}{3}, r > 2$ $P(X > 2) = 1 - P(X \leq 2)$ $= 1 - P(X = 0) - P(X = 1) - P(X = 2)$ $= 1 - {}^{10}C_0\left(\frac{1}{3}\right)^0\left(\frac{2}{3}\right)^{10} - {}^{10}C_1\left(\frac{1}{3}\right)^1\left(\frac{2}{3}\right)^9 - {}^{10}C_2\left(\frac{1}{3}\right)^2\left(\frac{2}{3}\right)^8$ $= 1 - 0.0173 - 0.0867 - 0.1951$ $= 0.7009$ (b) $P(x > k) = \frac{1}{4} [P(X \leq k)]$ 	1 1 1 1 1	

[illegible]

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(b) (i)  (ii) $\angle A'B'C' = 37^\circ$	1 1	10
15	(a) I : $x + y \leq 80$ II : $y - x < 10$ III : $y \geq 15$ (b) 	1 1 1 3	

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
	(c) (i) 44	1	10
	(ii) Titik maksimum/ <i>Maximum point</i> = (36, 44)	1	
	$a(36) + 4(36) + a(44) = 400$	1	
	$80a = 400 - 144$		
	$a = 3.2$		
	Baki bayaran murid kelas B <i>The balance of payment by a student of class B</i> = RM3.20	1	

KERTAS MODEL SPM SET 1

KERTAS 1

No.	Skema Pemarkahan Marking Scheme	Markah Marks	Markah Total Total Marks
1	$\log_a x^2 y = \log_a x^2 + \log_a y$ $= 2 \log_a x + \log_a y$ $\log_a \frac{y^2}{x^2} = \log_a y^2 - \log_a x^2$ $= 2 \log_a y - 2 \log_a x$ $2 \log_a x + \log_a y = 6 \dots\dots\dots (1)$ $2 \log_a y - 2 \log_a x = 5 \dots\dots\dots (2)$ $(1) + (2) : 3 \log_a y = 11$ $\log_a y = \frac{11}{3}$ $(1) : 2 \log_a x + \frac{11}{3} = 6$ $2 \log_a x = \frac{7}{3}$ $\log_a x = \frac{7}{6}$ $(a) \log_a y^2 x = \log_a y^2 + \log_a x$ $= 2 \log_a y + \log_a x$ $= 2 \left(\frac{11}{3} \right) + \frac{7}{6}$ $= \frac{17}{2}$ $(b) \log_a \frac{x}{y} = \log_a x - \log_a y$ $= \frac{7}{6} - \frac{11}{3}$ $= -\frac{5}{2}$	6	6