



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

**MODUL KOLEKSI ITEM
PERCUBAAN SPM
2023**

**MATEMATIK TAMBAHAN
KERTAS 2**

UNTUK KEGUNAAN PEMERIKSA SAHAJA

**SKEMA
PEMARKAHAN**

PERATURAN PEMARKAHAN PEPERIKSAAN PERCUBAAN SPM TAHUN 2023

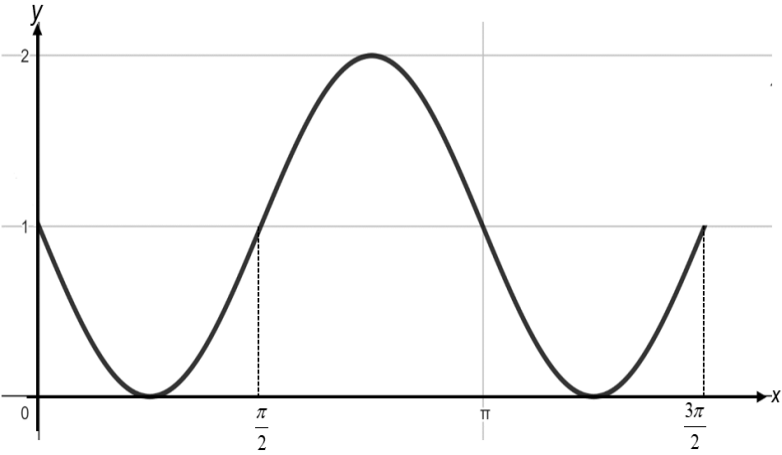
MATEMATIK TAMBAHAN (3472/2)

KERTAS 2

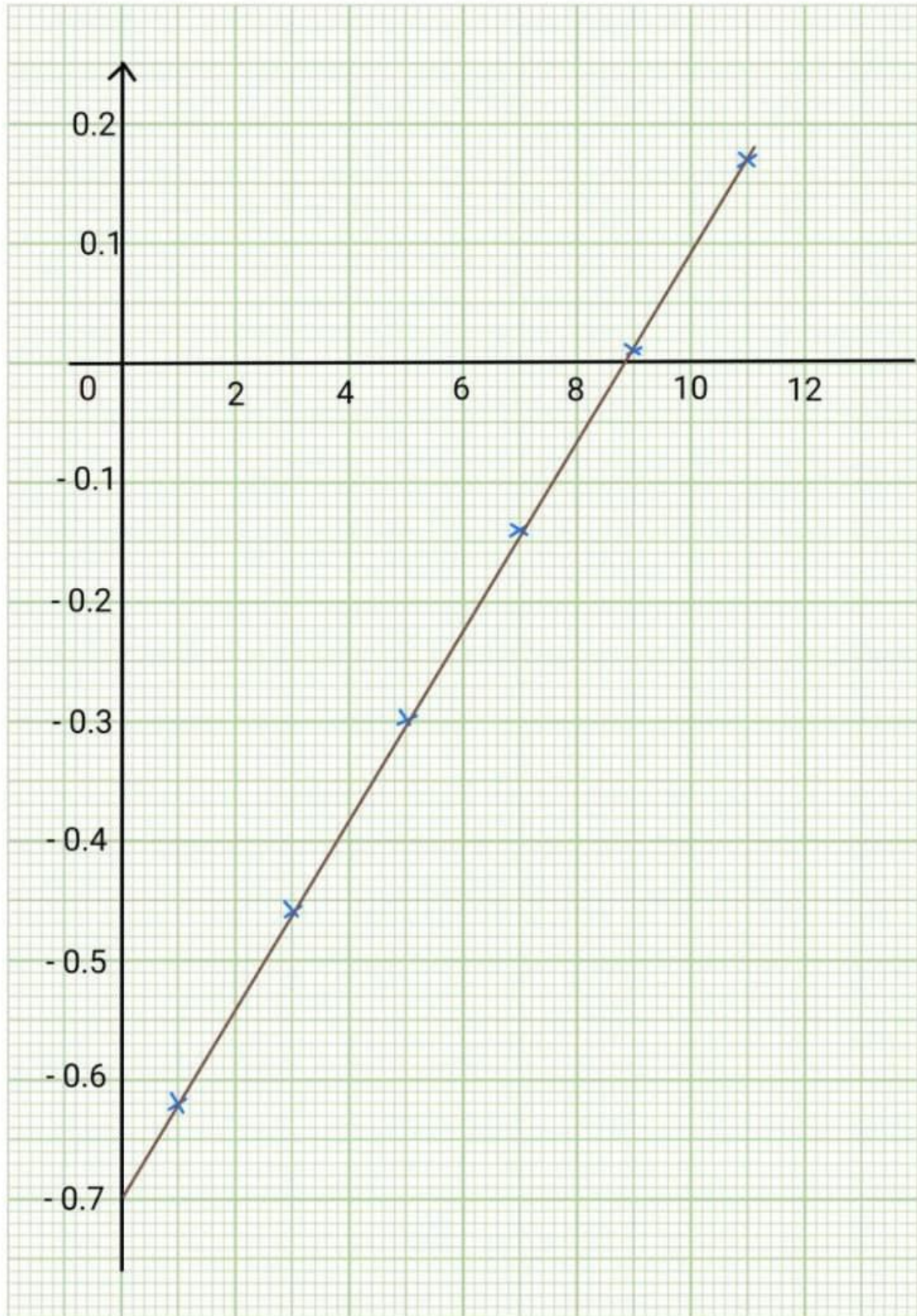
NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
1 (a)	$7x + 7z = 8$ atau $7x + [(a^2 - 14) + 5]z = a + 4$ $(-a^2 + 16)z = -a + 4$ $a = \pm 4$ $a = -4$	K1 K1 N1 N1	6
1 (b)	$-a^2 + 16 = 0$ $a = 4$	K1 N1	
2 (a)	$f^2(x) = p^2x + pq + q$ atau $f^3(x) = p^3x + p^2q + pq + q$ $p = 2$ $q = 2$	K1 N1 N1	8
2 (b)	$f^{-1}(x) = \frac{x-2}{2}$ atau $2x + 2 = -6$ -4	K1 N1	
2 (c)	$f^4(x) = 16x + 30$ $f^1(x) = 2x + 2$ $f^2(x) = 4x + 6$ $f^3(x) = 8x + 14$ $f^4(x) = 16x + 30$ $f^n(x) = 2^n x + 2^{n+1} - 2$	N1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
3(a)	$10.47 = 15\theta$ $\theta = 0.698 \text{ rad}$ Bilangan keratan = $\frac{2 \times 3.142}{0.698} = 9$ keratan	K1 N1 N1	7
3(b)	$2 \times \frac{1}{2} \times 15^2 \times 0.698 = 157.05$ $10.47(8) = 83.76$ atau $2 \times 15 \times 8 = 240$ Jumlah luas Permukaan = $157.05 + 83.76 + 240$ 480.81 cm^2	K1 K1 K1 N1	
4			7
(a)(i)	$0.8 + (n-1)0.02 = 1.18$ $n = 20$	K1 N1	
(ii)	$S_n = \frac{20}{2}[0.8 + 1.18]$ atau $S_n = \frac{20}{2}[2(0.8) + (20-1)(0.02)]$ 19.8 kg	K1 N1	
4(b)	$0.02 : 0.5$ ($d = 0.5$) $T_n = 3.5 + 19(0.5)$ $X = 13$ minit	N1 K1 N1	
5(a)	$C\left(-\frac{2}{3}, 2\right)$ $\frac{2n + \left(-\frac{2}{3}\right)m}{m+n} = 0$ atau $\frac{-2n + 2m}{m+n} = 1$ $3:1$	P1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
5(b)(i)	$PB = \frac{1}{2} PE$ $\sqrt{(x-0)^2 + (y-4)^2} = \frac{1}{2} \sqrt{(x-2)^2 + (y-(-2))^2}$ $3x^2 + 3y^2 + 4x - 36y + 56 = 0$	P1 K1 N1	8
6 (a)	$m + (n-9) = \frac{n-1}{2} \text{ atau } m(n-9) = \frac{7}{2}$ $m(17-2m-9) = \frac{7}{2} \text{ atau } \left(\frac{17-n}{2}\right)(n-9) = \frac{7}{2}$ $(2m-7)(2m-1) = 0 \text{ atau } (n-10)(n-16) = 0$ $m = \frac{1}{2}$ $n = 16$	P1 K1 K1 N1 N1	8
6 (b)	$2 \left[x^2 - \frac{15x}{2} + \left(\frac{-15/2}{2}\right)^2 - \left(\frac{-15/2}{2}\right)^2 + \frac{7}{2} \right]$ $2 \left(x - \frac{15}{4} \right)^2 - \frac{169}{8}$ $x = \frac{15}{4}$	K1 N1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
7 (a)	Use $\sin^2 x + \cos^2 x = 1$ atau $\sin 2x = 2 \sin x \cos x$ $1 - 2 \sin x \cos x$ atau $\cos^2 x + \sin^2 x - 2 \sin x \cos x$	K1 N1	
7 (b)	 <p>Bentuk graf $-\sin x$</p> <p>$1\frac{1}{2}$ pusingan bagi domain $0 \leq x \leq \frac{3}{2}\pi$</p> <p>Min = 0, max=2, titik tengah = 1</p>	P1 P1 P1	8
7 l(i)	2	N1	
(ii)	Julat $0 < k < 1$ atau $y = k + 1, 1 < y < 2$ 2 penyelesaian	K1 N1	
8 (a)	$\overrightarrow{PB} = \overrightarrow{PO} + \overrightarrow{OB}$ atau $\overrightarrow{PB} = \overrightarrow{PA} + \overrightarrow{AB}$ atau $\overrightarrow{OQ} = \overrightarrow{OA} + \overrightarrow{AQ}$ $\overrightarrow{PB} = -6\hat{h} + 4\hat{k}$ $\overrightarrow{OQ} = \frac{9}{2}\hat{h} + 2\hat{k}$	P1 N1 N1	

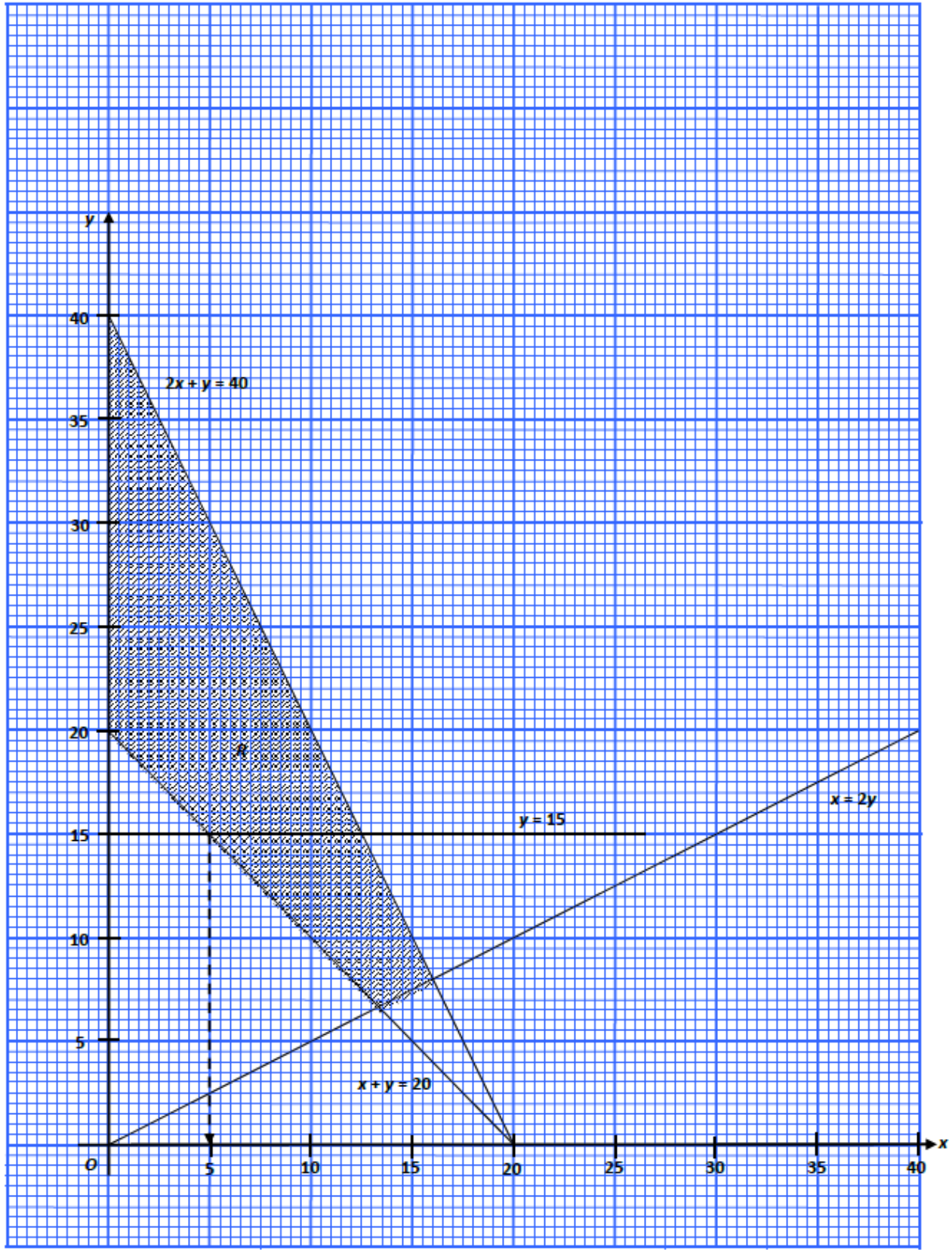
NO.	PERATURAN PEMARKAHAN							SUB-MARKAH	MARKAH PENUH
8 (b)	$\overrightarrow{PR} = -\frac{12}{5}\tilde{h} + \frac{8}{5}\tilde{k}$ atau setara							K1	10
	$-\frac{12}{5} = -6\lambda$ dan $\frac{8}{5} = 4\lambda$							K1	
	$\lambda = \frac{2}{5}$ atau setara							K1	
	$\overrightarrow{PR} = \frac{2}{5}\overrightarrow{PB}$ atau setara							N1	
(c)	$\frac{1}{2} 3h h = 12$ atau $\frac{1}{2}(3PA)h$ atau $\frac{OAB}{PAB} = \frac{3}{1}$							K1	
	$\frac{1}{2} 9h \left(\frac{8}{ h }\right)$ atau 3×12 atau $OAB = 3(12)$							K1	
	36							N1	
9 (a)	2x-1	1	3	5	7	9	11	N1	10
	$\log_{10} y$	-0.62	-0.46	-0.30	-0.14	0.01	0.17	N1	
	plot $\log_{10} y$ melawan $(2x+1)$							K1	
	<ul style="list-style-type: none"> • paksi-paksi betul dan skala seragam • sekurang-kurangnya satu titik di plot betul 								
	6 titik di plot betul							N1	
	garis penyuaian terbaik							N1	
	(c) $\log_{10} y = \log_{10} s(2x-1) + \log_{10} r$							P1	
	$\log_{10} r = -0.7$ atau $\log_{10} s = \frac{0.2 - (-0.7)}{11.4 - 0}$							K1	
	$r = 0.1995$							N1	
	$s = 1.199$							N1	
$\log_{10} y = -0.38$							N1		



NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
10 (a)(i)	${}^{10}C_0(0.7)^0(0.3)^{10}$ atau ${}^{10}C_1(0.7)^1(0.3)^9$ atau ${}^{10}C_2(0.7)^2(0.3)^8$ ${}^{10}C_0(0.7)^0(0.3)^{10} + {}^{10}C_1(0.7)^1(0.3)^9 + {}^{10}C_2(0.7)^2(0.3)^8$ 0.00159	K1 K1 N1	10
(a)(ii)	Bilangan Pelajar = $\frac{280}{0.7}$ 400	K1 N1	
10 (b)(i)	$z = 1.406$ $\frac{70-m}{5} = 1.406$ $m = 62.97$	P1 K1 N1	
(b)(ii)	$\frac{50 - 62.97}{5}$ 0.00474	K1 N1	
11(a)	$Q(4,0)$ $\sin 60^\circ = \frac{h}{4}$ atau $\cos 60^\circ = \frac{b}{4}$ atau $h = 2\sqrt{3}$ atau $b = 2$ $V_1(\text{kon}) = \frac{1}{3}\pi(2\sqrt{3})^2(2)$ atau $V_2 = \pi\left[16x - \frac{x^3}{3}\right]_2^4$ $\pi\left[\left(16(4) - \frac{4^3}{3}\right) - \left(16(2) - \frac{2^3}{3}\right)\right]$ $V_1 + V_2 = \frac{1}{3}\pi(2\sqrt{3})^2(2) + \pi\left[\left(16(4) - \frac{4^3}{3}\right) - \left(16(2) - \frac{2^3}{3}\right)\right]$ $\frac{64\pi}{3}$	P1 K1 K1 K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
11(b)	$-\frac{1}{5} \times m_T = -1 \text{ dan } m_T = 5$ $\frac{dy}{dx} = 4x - 3 = 5$ $y = 2(2)^2 - 3(2) + 2 \text{ atau } A(2,4)$ $y = 5x - 6$	K1 K1 K1 N1	10
12 (a)	$CF = \sqrt{10^2 + 8^2} \text{ atau } CM = \sqrt{14^2 + 5^2} \text{ atau}$ $FM = \sqrt{8^2 + 14.87^2}$ $CF = 12.81 \text{ atau } CM = 14.87 \text{ atau } FM = 16.89$ $16.89^2 = 14.87^2 + 12.81^2 - 2(14.87)(12.81)\cos\angle FCM$ 74.79°	P1 N1 K1 N1	10
12 (b)	$\frac{\sin \angle CMF}{12.81} = \frac{\sin 74.79^\circ}{16.89}$ $\angle CMF = 47.04^\circ$	K1 N1	
12 (c)	$\text{luas FCM} = \frac{1}{2}(16.89)(14.87)\sin 47.04^\circ \text{ atau}$ $\text{luas FCM} = \frac{1}{2}(12.81)(14.87)\sin 74.79^\circ \text{ atau}$ $\text{luas FCM} = \frac{1}{2}(16.89)(12.81)\sin 58.17^\circ$ $91.90 / / 91.91 \text{ cm}^2$	K1 N1	
12 (d)	$\frac{1}{2} \times h \times 12.81 = 91.90 \text{ atau } \frac{1}{2} \times h \times 12.81 = 91.91$ $h = 14.35 \text{ cm}$	K1 N1	

NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
13(a) (i)(ii)	$\frac{20.00}{Q_{2022}} \times 100 = 137 \text{ atau } \frac{y}{x} \times 100 = 125 \text{ atau } \frac{y}{y-8} \times 100 = 125$ $\text{atau } \frac{x+8}{x} \times 100 = 125$ <p>Bahan A : $Q_{2022} = RM14.60$</p> <p>Bahan E : $Q_{2022} = RM32.00$</p> $Q_{2023} = RM40.00$	K1 N1 N1 N1	10
13(b)	$\frac{137(1) + 90(1) + (h-2)(1) + 2h(1) + 125(1)}{1+1+1+1+1} = 127$ $h = 95$	K1 N1	
13(c)	$I_{\frac{2024}{2023}} = \frac{143}{100} \times \frac{100}{127} \times 100 \text{ atau } \frac{85.00}{Q_{2022}} \times 100 = 127$ $\frac{x}{85.00} \times 100 = 112.60 \text{ atau } \frac{Q_{2024}}{66.93} \times 100 = 143$ $RM95.71$	K1 K1 N1	
14(a)	$x + y \geq 20$ $x \leq 2y$ $10x + 5y \leq 200$	N1 N1 N1	10
14(b)	<p>Draw one line correctly</p> <p>Draw all line correctly</p> <p>Shaded and label R</p> <p>Rujuk graf di bawah</p>	K1 N1 N1	
14(c)	$y = 15, x \text{ minimum} = 5$ $10(5) + 5(15) = 125$ <p>Baki maksimum = $200 - 125$</p> 75	K1 K1 K1 N1	



NO.	PERATURAN PEMARKAHAN	SUB-MARKAH	MARKAH PENUH
15 (a)	$v_0 = 8$	P1	10
15 (b)	$8 + 2t - t^2 = 0$ $(t - 4)(t + 2) = 0$ $t = 4$	K1 K1 N1	
15 (c)	$2 - 2t = 0$ $v_{\max} = 8 + 2(1) - (1)^2$ $v_{\max} = 9$	K1 K1 N1	
15 (d)	$8t + t^2 - \frac{t^3}{3}$ $\left(8(4) + (4)^2 - \frac{(4)^3}{3}\right) - \left(8(0) + (0)^2 - \frac{(0)^3}{3}\right)$ atau $\left(8(6) + (6)^2 - \frac{(6)^3}{3}\right) - \left(8(4) + (4)^2 - \frac{(4)^3}{3}\right)$ $41\frac{1}{3}$	K1 K1 N1	