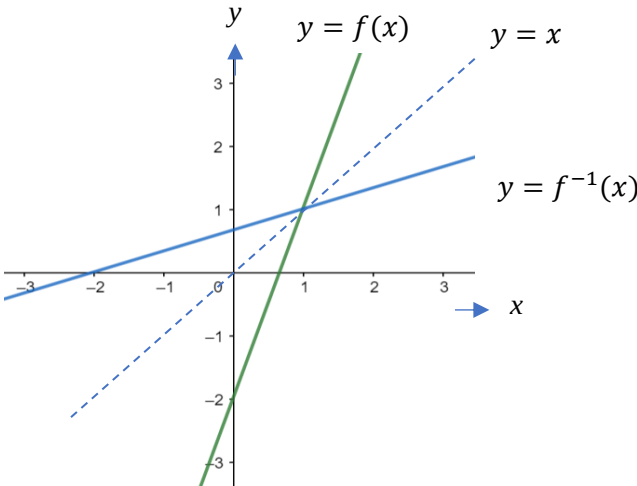


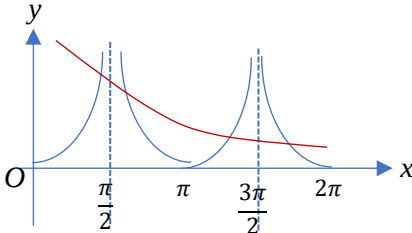
PERATURAN PEMARKAHAN KERTAS 2 PERCUBAAN SPM 2021

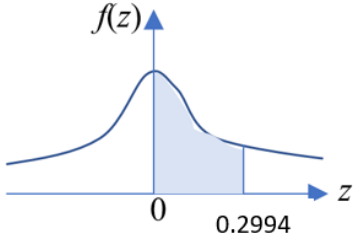
No		JAWAPAN	MARKAH	
1	(a)	$f^{-1}(x) = \frac{x+2}{3}$ atau $g^{-1}(x) = x + 3$	1	1
	(b)	$fg(x) = 3(x-3) - 2$ atau $g^{-1}f^{-1}(x) = g^{-1}\left(\frac{x+2}{3}\right)$ $fg(x) = 3x - 11$ $= \left(\frac{x+2}{3}\right) + 3$ $(fg)^{-1}(x) = \frac{x+11}{3}$ atau $g^{-1}f^{-1}(x) = \frac{x+11}{3}$ Maka : $(fg)^{-1}(x) = g^{-1}f^{-1}(x)$	1 1 1	3
	(c)	 *Graf $y=f(x)$ * Graf $y = f^{-1}(x)$ Graf $y = f^{-1}(x)$ adalah pantulan graf $y = f(x)$ pada garis lurus $y = x$.	1 1	3
			1	7
2	(a)	Katakan integer tersebut ialah x dan $x+1$ $x^2 + (x+1)^2 = 841$ $2x^2 + 2x - 840 = 0$ $x = \frac{-2 \pm \sqrt{2^2 - 4(2)(-840)}}{2(2)}$ $x = 20$ atau $x = -21$ Jika $x = 20$, integer yang satu lagi ialah 21 *Dua-dua pasangan Jika $x = -21$, integer yang satu lagi ialah -20 betul	1M 1M 1M 1M	4M
	(b)	$(-4p)^2 - 4p(5-p) > 0$ $20p^2 - 20p > 0$ Terima sebarang kaedah mencari julat $p < 0$, $p > 1$	1M 1M 1M	3M
			7M	

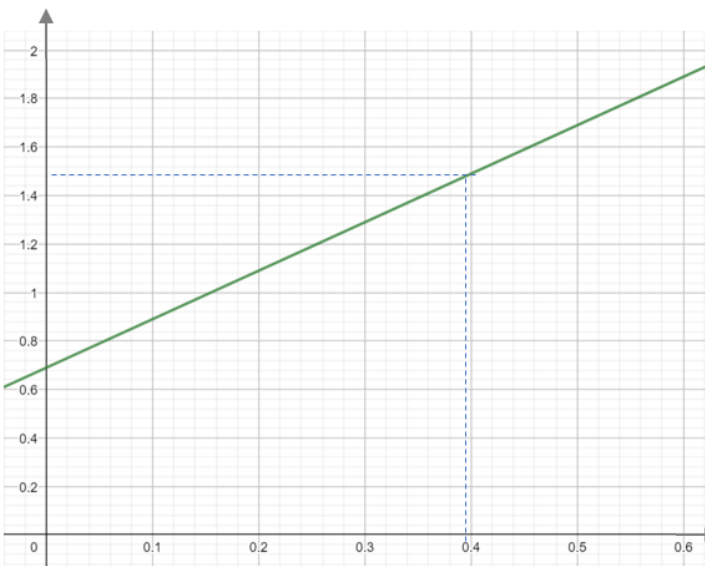
3	(a)	$a + 2d = 13.5 \rightarrow (1)$ <i>atau</i> $a + 5d = 15.75 \rightarrow (2)$ $(2) - (1): 3d = 2.25, d = 0.75$ <i>Ganti d = 0.75 dalam (1) : $a + 2(0.75) = 13.5, a = 12$</i> <i>Tinggi susunan 20 gelas :</i> $12 + 19(0.75)$ $= 26.25 \text{ cm}$	1 1 1 1 1	5
	(b)	Katakan bilangan gelas ialah n . $12 + (n - 1)(0.75) \geq 50$ $(n - 1)(0.75) \geq 38$ $(n - 1) \geq 50.67$ $n \geq 51.67$ $n = 52$	1 1	2
			7	
4		Katakan x = harga sebuah buku latihan y = harga sebatang pen z = harga sebotol air minuman $3x + 2y + 3z = 11.40 \rightarrow (1)$ $2x + 4y + z = 9.80 \rightarrow (2)$ $x = 2z \rightarrow (3)$ Gantikan (3) dalam (1) dan (2) $9z + 2y = 11.40 \rightarrow (4)$ $5z + 4y = 9.80 \rightarrow (5)$ $(4) \times 2: 18z + 4y = 22.80 \rightarrow (6)$ $(6) - (5) : 13z = 13$ $z = 1.00$ Maka $x = 2.00$ Gantikan nilai x dan z dalam (2) : $y = 1.20$ Maka harga sebuah buku latihan = RM2.00 Harga sebatang pen = RM1.20 Harga sebotol air minuman = RM1.00	• 3 persamaan betul 2M • 2 persamaan betul 1M • Gunakan kaedah penggantian atau penghapusan 1M • $x = \text{RM}2.00$ 1M • $y = \text{RM}1.20$ 1M • $z = \text{RM}1.00$ 1M	2 1 1 1 1
			6	

5	(a)	$p = 3^{0.1}$ dan $q = 3^{0.5}$ - Dua-dua betul $N = -3(3^{0.1} \times 3^{0.5})^5$ $= -3(3^{0.6})^5$ $= -3(3)^3$ $= -3^4$ $= -81$ - Penggunaan mana-mana satu hukum log	1 1 1	3
	(b)	$PQ^2 = BP^2 - BQ^2$ $BQ = \sqrt{2^2 + 5} = 3$ $\tan 30^\circ = \frac{1}{\sqrt{3}}$ $\frac{PQ}{3} = \frac{1}{\sqrt{3}}$ Maka $PQ = \sqrt{3} \text{ cm}$	1 1 1 1	4
			7	
6	(a)	(i) $\overrightarrow{MB} = \overrightarrow{MO} + \overrightarrow{OB}$ $= -2\hat{a} + 8\hat{b}$ - Hukum segitig di gunakan Di (i) , (ii) atau (iii)P 1 M (ii) $\overrightarrow{AP} = \alpha (\overrightarrow{AO} + \overrightarrow{ON})$ $= \alpha \left(-4\hat{a} + \frac{5}{8}(8\hat{b}) \right)$ $= -4\alpha \hat{a} + 5\alpha \hat{b}$ - Jawapan (i) 1 M - Jawapan (ii) 1 M - Jawapan (iii) 1 M (iii) $\overrightarrow{MP} = \overrightarrow{MA} + \overrightarrow{AP}$ $= 2\hat{a} - 4\alpha \hat{a} + 5\alpha \hat{b}$ $= (2 - 4\alpha)\hat{a} + 5\alpha \hat{b}$	1 1 1 1	4
	(b)	Katakan $\overrightarrow{MP} = \mu \overrightarrow{MB}$ $(2 - 4\alpha)\hat{a} + 5\alpha \hat{b} = -2\mu \hat{a} + 8\mu \hat{b}$ Bandingkan pekali $\hat{a}$ dan $\hat{b}$: $(2 - 4\alpha) = -2\mu, \quad \rightarrow (1)$ $5\alpha = 8\mu, \quad \mu = \frac{5}{8}\alpha \rightarrow (2)$ Gantikan (2) dalam (1): $\alpha = \frac{8}{11}$ - Bandingkan pekali 1m - Selesaikan persamaan 1M	1 1 1 1	4
			8	
7	(a)	$m_{AC}=1, c=2$: Persamaan AC: $y = x + 2 \rightarrow (1)$	1 1	

		$m_{BD} = -1$: Persamaan BD: $y - 5 = -1(x + 1)$ $y = -x + 4 \rightarrow (2)$ Selesaikan persamaan serentak (1) dan (2) $M = (1,3)$ Untuk cari C: $\frac{p-2}{2} = 1$ atau $\frac{q}{2} = 3$ $C = (4, 6)$	1 1 1 1	6
	(b)	$D = (4, 0)$ Luas $= \frac{1}{2} \begin{vmatrix} -2 & -1 & 2 & 4 & -2 \\ 0 & 5 & 6 & 0 & 0 \end{vmatrix}$ $= \frac{1}{2} (-10 - 4) - (10 + 24) $ $= 25 \text{ unit}^2$	1 1	2
8				
8	(a)	$(x - 2)^2 = 2x + 4$ $x^2 - 6x = 0$ $P(6,4)$ $Q(0, -2)$ $R(0,2)$ - Selesaikan persamaan serentak 1M - P (6,4) 1M - Q (0, -2) dan R (0,2) 1M	1 1 1	3
	(b)	Luas berlorek $= \int_0^6 (2x + 4)^{\frac{1}{2}} - (x - 2) dx$ $= \left[\frac{(2x+4)^{\frac{3}{2}}}{\frac{3}{2}} - \frac{x^2}{2} + 2x \right]_0^6$ $= \left(\frac{64}{3} - 18 + 12 \right) - \left(\frac{8}{3} \right)$ $= 12\frac{2}{3} // 12.67 \text{ unit}^2$ Kaedah Alternatif Luas berlorek $= \frac{1}{2} (6)(6) - \int_2^4 \left(\frac{y^2}{2} - 2 \right) dy$ $= 18 - \left[\frac{y^3}{2(3)} - 2y \right]_2^4$ $= 18 - \left[\left(\frac{64}{6} - 8 \right) - \left(\frac{8}{6} - 4 \right) \right]$ $= 12\frac{2}{3} // 12.67 \text{ unit}^2$ - Luas segi tiga atau kamiran 1M - Hasil kamiran dan ganti nilai 1M - Menolak 1M - Jawapan 1M	1 1 1 1	4
	(c)	Isipadu $= \pi \int_{-2}^0 (2x + 4) dx$ $= \pi \left[\frac{2x^2}{2} + 4x \right]_{-2}^0$ $= \pi [(0) - (4 - 8)]$ $= 4\pi \text{ unit}^3$	1 1 1	3
10				

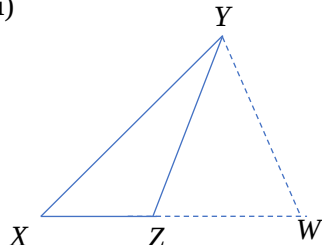
9	(a)	$\frac{1 - \cos 2x}{\sin 2x} = \frac{1 - (1 - 2\sin^2 x)}{2 \sin x \cos x}$ $= \frac{2\sin^2 x}{2 \sin x \cos x}$ $= \tan x$	1													
			1	2												
	(b)	$\tan^2 x = \frac{5}{7}$ $\tan x = \pm \sqrt{\frac{5}{7}}$ Sudut rujukan : $x = 40.20^\circ$ atau 0.7017 rad $x = 0.7017 \text{ rad}$, $2.4399 \text{ rad} // 2.44 \text{ rad}$, 3.844 rad dan 5.581 rad * semua betul 2M * dua betul 1M	1													
			1													
			2	4												
	(c)	$y = \tan x$, $0 \leq x \leq 2\pi$  (i) * Bentuk graf tan 1M * Semua betul 1M (ii) Tulis dan lakar $y = \frac{\pi}{x}$ 1M Bilangan penyelesaian : 4 1M $x \left \frac{1 - \cos 2x}{\sin 2x} \right = \pi$ $ \tan x = \frac{\pi}{x}$ Lakar <table><tr><td>x</td><td>0</td><td>π</td><td>2π</td></tr><tr><td>y</td><td>∞</td><td>1</td><td>0.5</td></tr><tr><td>Titik</td><td>$(0, \infty)$</td><td>$(\pi, 1)$</td><td>$(2\pi, 0.5)$</td></tr></table> Bilangan penyelesaian = 4	x	0	π	2π	y	∞	1	0.5	Titik	$(0, \infty)$	$(\pi, 1)$	$(2\pi, 0.5)$	1	
x	0	π	2π													
y	∞	1	0.5													
Titik	$(0, \infty)$	$(\pi, 1)$	$(2\pi, 0.5)$													
			1													
			1													
			1													
			4													
			10													

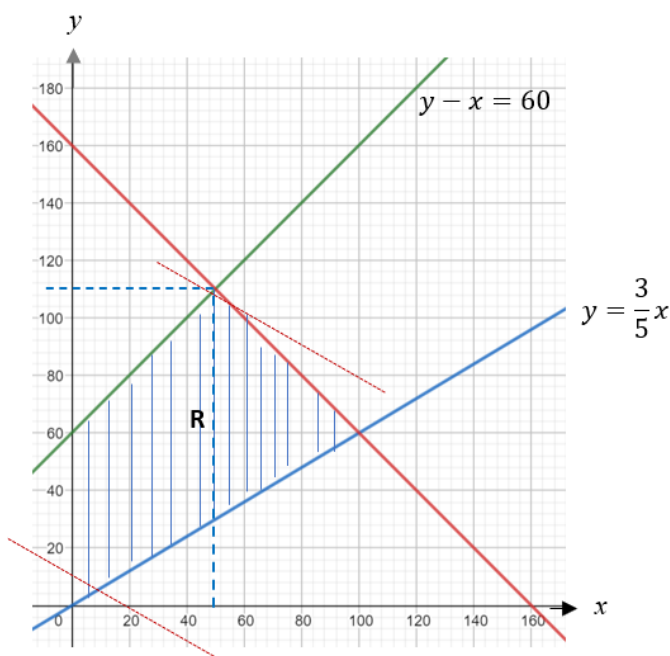
NO		JAWAPAN	MARKAH	
10	(a)	(i) $P\left(Z > \frac{2 - (-5)}{\sigma}\right) = 0.3$ $P\left(Z > \frac{7}{\sigma}\right) = 0.3$ $\frac{7}{\sigma} = 0.524 \text{ // } 0.5244$ $\sigma = 13.36 \text{ // } 13.35$ (ii) $P(-5 < X < -1) = P\left(\frac{-5 - (-5)}{13.36} < Z < \frac{-1 - (-5)}{13.36}\right)$ $= P(0 < Z < 0.2994)$ $= 0.1177$ 	1	5
			1	
			1	
			1	
			1	
	(b)	(i) Min: $np = 5 \rightarrow (1)$ Varian : $npq = 4 \rightarrow (2)$ (2) ÷ (1): $q = \frac{4}{5}, \quad p = \frac{1}{5},$ (ii) $P(X \geq 1) = 1 - P(X = 0)$ $= 1 - {}^{10}C_0 \left(\frac{1}{5}\right)^0 \left(\frac{4}{5}\right)^{10}$ $= 0.8916$	1	5
			1	
			1	
			1	
			1	
			10	

NO		JAWAPAN	MARKAH													
11	(a)	<table><tr><td>$\log_{10} t$</td><td>0.23</td><td>0.30</td><td>0.43</td><td>0.48</td><td>0.57</td></tr><tr><td>$\log_{10} D$</td><td>1.14</td><td>1.29</td><td>1.56</td><td>1.64</td><td>1.83</td></tr></table>	$\log_{10} t$	0.23	0.30	0.43	0.48	0.57	$\log_{10} D$	1.14	1.29	1.56	1.64	1.83	1	2
		$\log_{10} t$	0.23	0.30	0.43	0.48	0.57									
$\log_{10} D$	1.14	1.29	1.56	1.64	1.83											
1																
	(b)	Rujuk kertas graf  - Paksi dan satu titik ditanda betul 1M - Semua titik ditanda betul 1M - Garis lurus penyuaian terbaik dilukis betul 1M SILA RUJUK GRAF DI LAMPIRAN 1	1	3												
		1														
	(c)	(i) $\log_{10} D = \log_{10} a + b \log_{10} t$ $\log_{10} a = 0.69 \text{ , } a = 4.898$ $b = \frac{1.83 - 0.69}{0.57} = 2$ (ii) $t = 2.5, \log_{10} t = 0.3979 \text{ ,}$ $\log_{10} D = 1.49, \text{ } D = 30.9 \text{ m}$	1													
		1														
	(d)	$60 = 4.898 \times t^2 \text{ atau } \log_{10} 60 = 0.69 + 2 \log_{10} t$ $t = 5 \text{ saat}$	1													
		1														
			10													

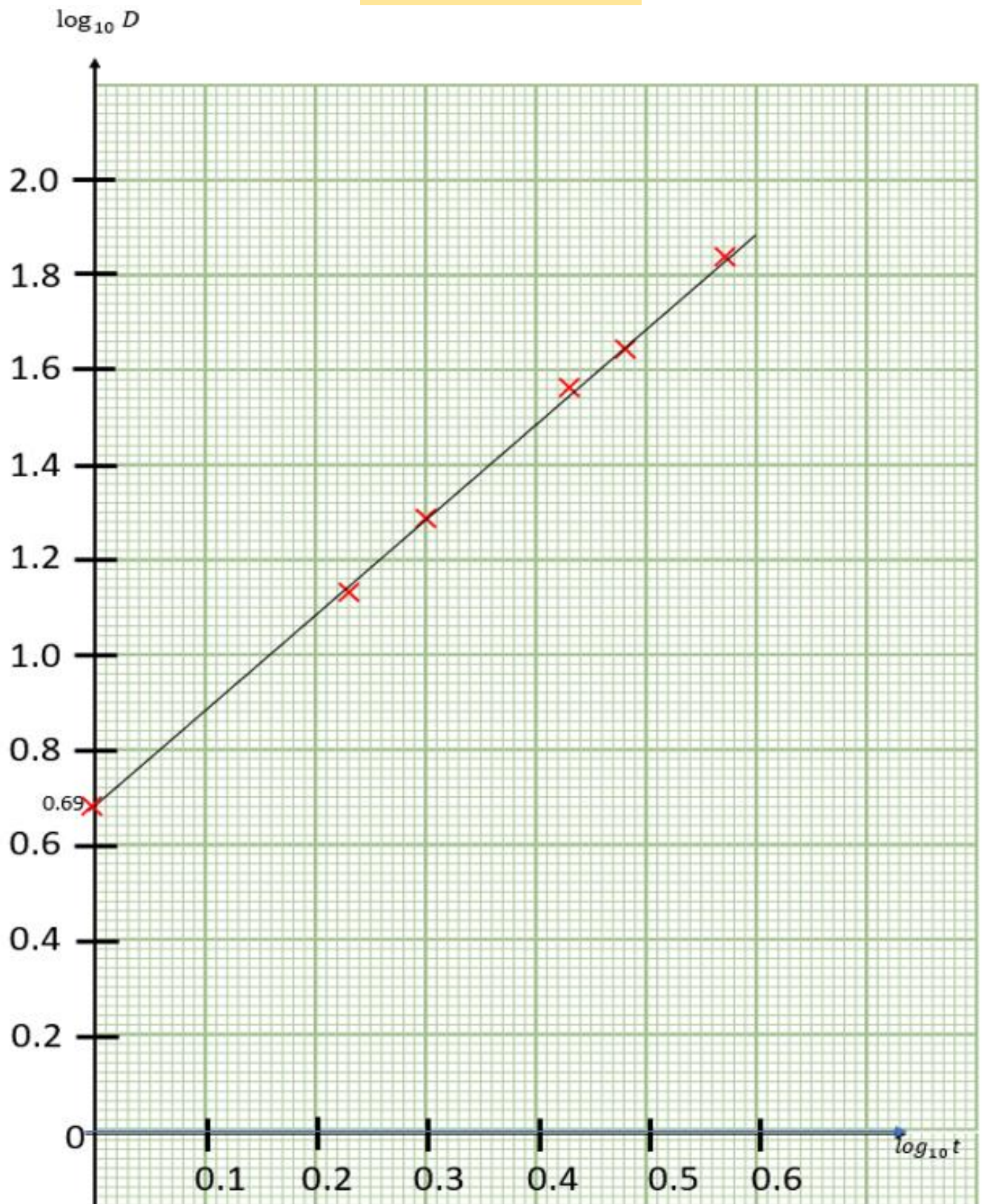
NO		JAWAPAN	MARKAH	
12	(a)	$v = \int (4 - 2t) dt$ $= 4t - t^2 + c$ $t = 0, v = 5, c = 5$ Maka : $v = 4t - t^2 + 5$	1	2
	(b)	- Bentuk parabola 1M - Titik (0,5), (5,0) dan (6,-7) 1M	1 1	2
	(c)	$s = \int 4t - t^2 + 5 dt$ $= 2t^2 - \frac{t^3}{3} + 5t + c$ $t=0, s=0, c=0, \text{ maka } s = 2t^2 - \frac{t^3}{3} + 5t$ (i) Sesaran bila $t = 6$: $s = 2t^2 - \frac{t^3}{3} + 5t$ $= 2(6)^2 - \frac{6^3}{3} + 5(6)$ $= 30 \text{ m}$ (ii) Zarah bertukar arah gerakan bila $t = 5 \text{ s}$ $s = 2(5)^2 - \frac{5^3}{3} + 5(5) = 33\frac{1}{3} \text{ m}$ Garis nombor mewakili gerakan zarah : Maka jumlah jarak = $33\frac{1}{3} + (33\frac{1}{3} - 30)$ $= 36\frac{2}{3} \text{ m}$	1 1 1 1 1 1	

NO		JAWAPAN	MARKAH	
	(c)	Kaedah Alternatif: Jumlah jarak = $\int_0^5 4t - t^2 + 5dt + \left \int_5^6 4t - t^2 + 5dt \right$ $= \left[2t^2 - \frac{t^3}{3} + 5t \right]_0^5 + \left \left[2t^2 - \frac{t^3}{3} + 5t \right]_5^6 \right$ $= 33\frac{1}{3} + \left(33\frac{1}{3} - 30 \right)$ $= 36\frac{2}{3} \text{ m}$ - Kamiran dengan had betul 1M - Kombinasi betul 1M - Jawapan 1M		6
			10	
13	(a)	$110 = \frac{x}{5.00} \times 100$ $x = 5.50$	1	
			1	2
	(b)	$120 = \frac{z}{y} \times 100$ $120y = 100z \rightarrow (1)$ $z = y + 1 \rightarrow (2)$ $120y = 100(y + 1)$ $20y = 100, \quad y = 5.00$ $z = 6.00$	1	
			1	
			1	3
	(c)	(i) $122.5 = \frac{2.50}{Q_{2020}} \times 100$ $Q_{2020} = RM 2.04$ (ii) Bahan P: $I_{2021/2020} = 110$ Bahan Q: $I_{\frac{2021}{2020}} = \frac{3.00}{2.50} \times 100$ $= 120$ Bahan R: $I_{\frac{2021}{2020}} = 120$ Bahan S: $I_{\frac{2021}{2020}} = \frac{1.50}{1.20} \times 100$ $= 125$ $122.5 = \frac{110(1) + 120(5) + 120w + 150w}{6 + 2w}$ $122.5(6) + 122.5(2w) = 110 + 600 + 120w + 150w$ $25 = 25w$ $w = 1$	1	
			1	
			1	
			1	5
			10	

NO		JAWAPAN	MARKAH	
14	(a)	(i) Panjang kawat berduri = $XY+ XW+YW$ Luas segi tiga $XYW = 130$ $\frac{1}{2} (20.8) (XW) \sin 30^o = 130$ $XW = \frac{130 \times 2}{20.8 \sin 30^o}$ $= 25 \text{ m}$ $YW^2 = 20.8^2 + 25^2 - 2(20.8)(25) \cos 30^o$ $YW = 12.53 \text{ m}$ Maka panjang kawat berduri = $20.8+25+12.53$ $= 58.33 \text{ m}$ (ii) $\frac{\sin XYW}{25} = \frac{\sin 30^o}{12.53}$ $\text{Sudut } XYW = 86.03^o$	1	
	(b)	(i)  Sudut $XWY = 180^o - 30^o - 86.03^o$ $= 63.97^o$ Sudut $XYZ = 63.93^o - 30^o$ $= 33.97^o$ Lakar segi tiga 1M Luas tanah , $A_1 = 25 \times 25$ $= 625 \text{ m}^2$ Luas kolam ikan , $A_2 = \frac{1}{2} (20.8)(12.53) \sin 33.97^o$ $= 72.81 \text{ m}^2$ Luas kawasan bercucuk tanam = $A_1 - A_2 = 625 - 72.81$ $= 552.19 \text{ m}^2$	1	
			1	4
			10	

NO		JAWAPAN	MARKAH	
15	(a)	(i) $y - x \leq 60$	1	2
		(ii) $y \geq \frac{3}{5}x$	1	
	(b)	$x + y \leq 160$ Jumlah maksimum bilangan pekerja yang boleh diupah ialah 160 orang.	1	1
	(c)	Graf  *Satu garisan dilukis betul 1M *Dua garisan dilukis betul 1M * Rantau betul SILA RUJUK GRAF DI LAMPIRAN 2	1 1 1	3
	(d)	(i) 100 orang	1	
		(ii) Fungsi objektif upah : $k = 15x + 30y$ Upah maksimum di (50,110) Maka upah maksimum = $15(50) + 30(110)$ = RM 4050	1 1 1	
			10	

LAMPIRAN 1: SOALAN 11



LAMPIRAN 2: SOALAN 15

