



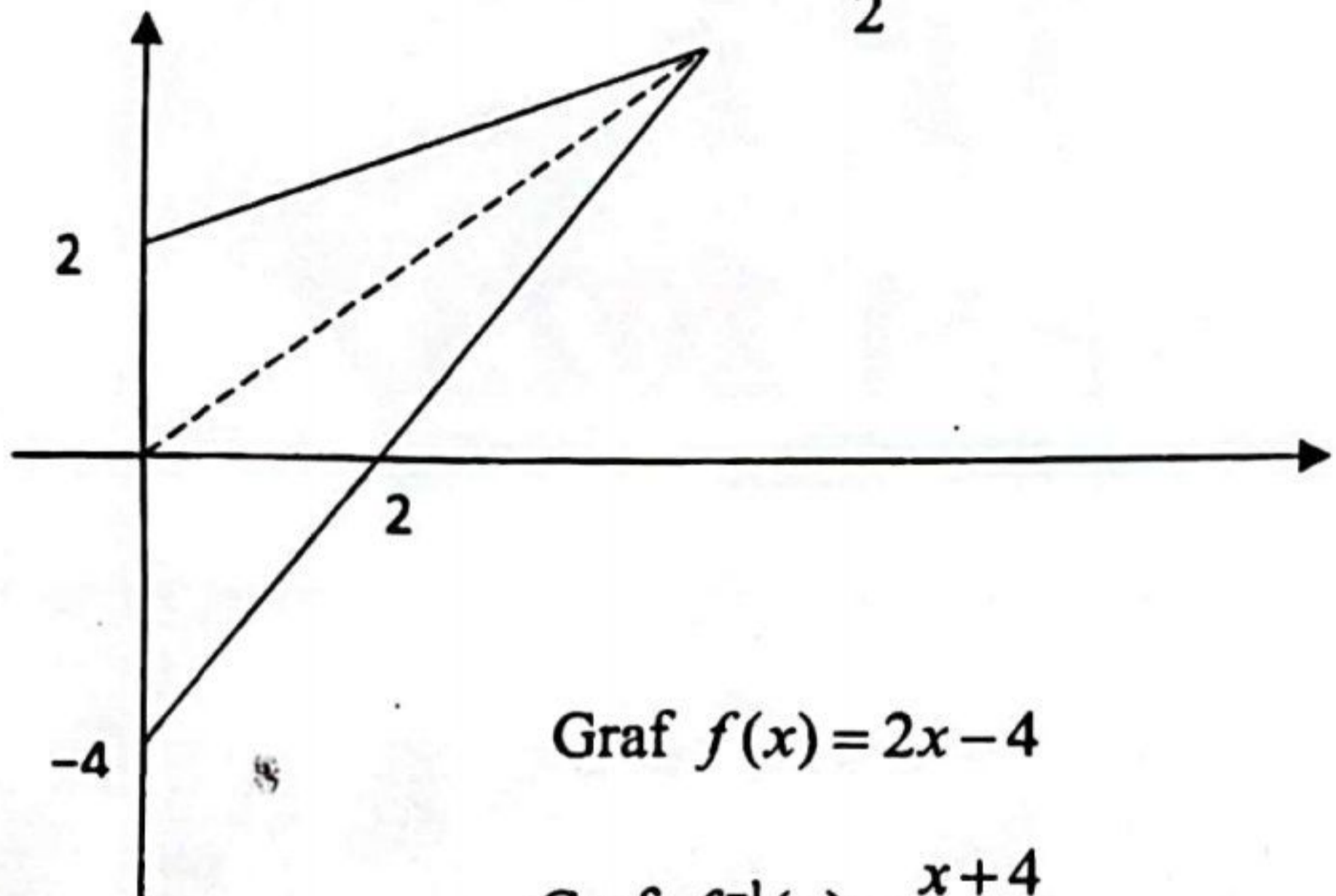
KEMENTERIAN PENDIDIKAN
Jabatan Pendidikan Negeri Terengganu

MPP 3

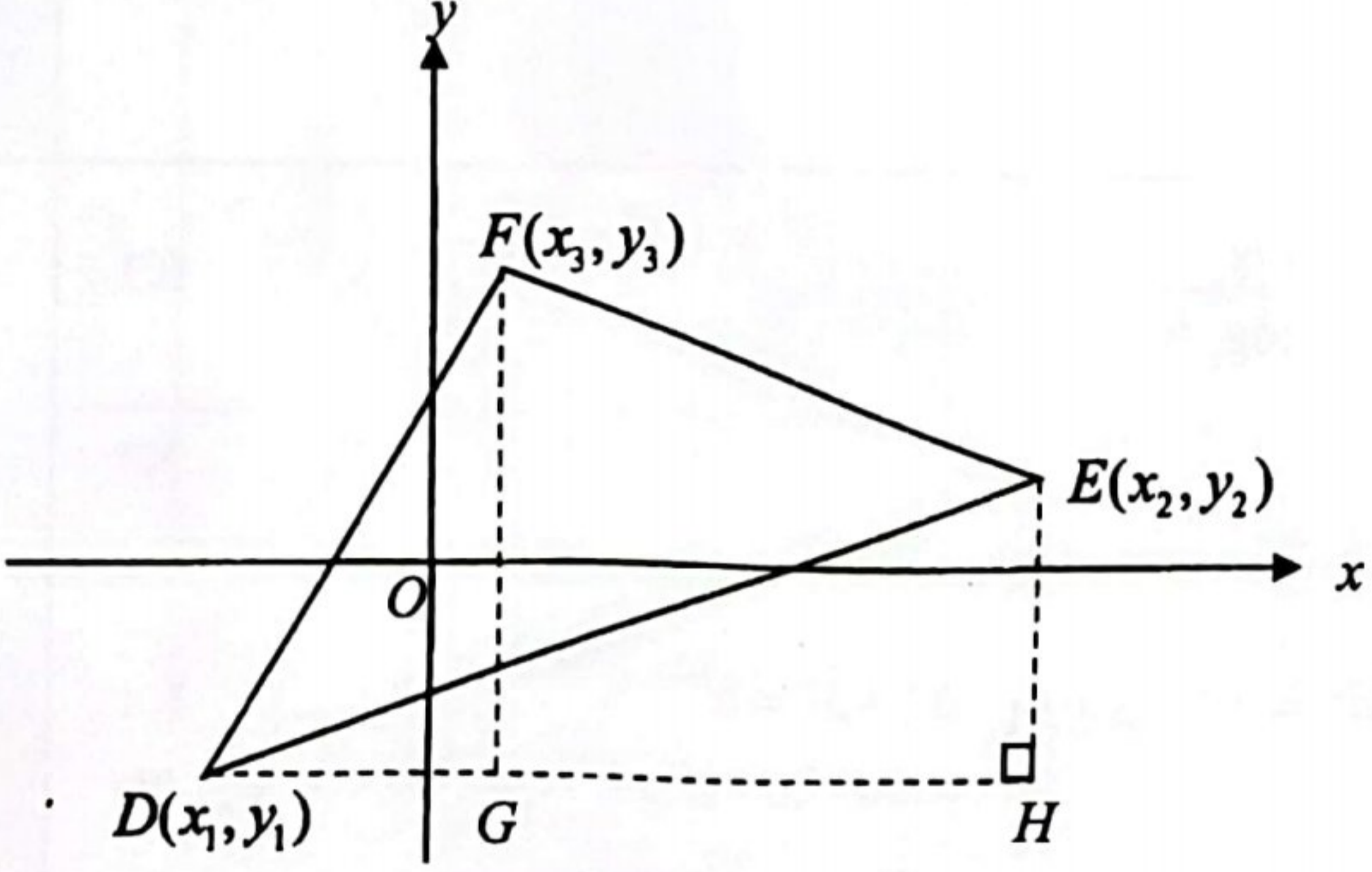
SPM 2023

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

No	Skema Pemarkahan	Σ Markah
1	$\frac{m}{2}\pi$ atau $m\pi$ P1 $\frac{m}{2}\pi < s < m\pi$ N1	2
2	<p>(a) $2y - 4 = x$ atau setara dan $f^{-1}(x) = \frac{x+4}{2}$ N1</p> <p>(b)</p>  <p>Graf $f(x) = 2x - 4$ P1</p> <p>Graf $f^{-1}(x) = \frac{x+4}{2}$ P1</p> <p>Graf bagi f^{-1} adalah pantulan bagi graf f pada garis lurus $y = x$ ATAU setara. N1</p>	4

3	<p>(a) 0.004822 [Panduan : ${}^{10}C_2 (0.7)^2 (0.3)^{10-2}$] N1</p> <p>(b) Tulis $1 - P(X=0) - P(X=1)$ @ $P(X=2)+P(X=3)+\dots+P(X=10)$ P1</p> $1 - {}^{10}C_0 (0.3)^0 (0.7)^{10} - {}^{10}C_1 (0.3)^1 (0.7)^9$ <p>@ setara K1</p> <p>0.8507 N1</p>	4
4	<p>(a) Guna : $\log_a b = \frac{\log_c a}{\log_c b}$ K1</p> $b = \frac{a^2}{81}$ N1 <p>(b) Guna : $a^m \times a^n = a^{m+n}$ ATAU $a^m + a^n = a^{m+n}$ K1 3^{m-1} N1</p>	4
5	$ar^{5-1} = 9(ar^{3-1})$ $r = 3$ $S_n = \frac{a(3^n - 1)}{3 - 1} \quad @ \quad S_3 = \frac{a(3^3 - 1)}{3 - 1}$ $S_6 = 28S_3$	4
6	$\frac{1}{y} = \frac{k}{h} + \frac{3}{h} \left(\frac{1}{x} \right)$ $\frac{3}{h} = \frac{4}{5}$ $\frac{h(4)}{k(4)+3} = 1$ $h = \frac{15}{4} \text{ dan } k = 3$	4

7	<p>Hapus anu pertama dengan kaedah penggantian @ penghapusan Hapus anu kedua dengan kaedah penggantian @ penghapusan</p> <p>$x = 80 @ y = 30 @ z = 10$ $x = 80 @ y = 30 @ z = 10$ $x = 80 \text{ dan } y = 30 \text{ dan } z = 10$</p>	<p>K1 K1 N1 N1 N1</p>	5
8	<p>(a)</p>  <p>Luas $\triangle DEF = \text{Luas } \triangle DEF + \text{Luas trapezium } EFGH - \text{Luas } \triangle DEH$</p> $= \left(\frac{1}{2} \times DG \times FG \right) @ \left[\frac{1}{2} \times GH \times (EH + FG) \right] @ \left(\frac{1}{2} \times DH \times EH \right) \quad \text{K1}$ $= \frac{1}{2} (x_3 - x_1)(y_3 - y_1) + \frac{1}{2} (x_2 - x_3)[(y_2 - y_1) + (y_3 - y_1)] - \frac{1}{2} (x_2 - x_1)(y_2 - y_1) \quad \text{K1}$ $= \frac{1}{2} (x_1 y_2 + x_2 y_3 + x_3 y_1) - (x_2 y_1 + x_3 y_2 + x_1 y_3) \quad \text{N1}$ <p>(b) $\frac{1}{2} [(-6)(5) + 10(8) + 1(-5)] - [(-5)(10) + 5(1) + 8(-6)]$ K1</p> <p style="text-align: center;">69 N1</p>	5	5

9	<p>(a) (i) 7 (ii) $a^2 - 8a + 7 = -5$ dan $(a - 6)(a - 2) = 0$ $a = 2, 6$</p> <p>(b) $\delta y = [(x + \delta x)^2 - 8(x + \delta x) + 7] - [x^2 - 8x + 7]$</p> <p>$\frac{dy}{dx} = \lim_{\delta x \rightarrow 0} \frac{2x + \delta x - 8}{\delta x}$ dan $\frac{dy}{dx} = 2x + 0 - 8$</p> <p>$\frac{dy}{dx} = 2x - 8$</p>	<p>N1 K1 N1 K1 K1 N1</p>	6
10	<p>(a) (i) ${}^{12}C_4 \times {}^8C_4 \times {}^4C_4$ 34650</p> <p>(ii) ${}^{12}C_7 \times {}^5C_4 \times {}^1C_1$ 3960</p> <p>(b) (i) $9 \times 8 \times 1 \times 1 \times 1 @ {}^9P_2 \times {}^1P_1 \times {}^1P_1 \times {}^1P_1$ 72</p> <p>(ii) $3 \times 2 \times 3 \times 8 \times 7$ @ $3 \times 8 \times 2 \times 3 \times 7$ @ $3 \times 8 \times 7 \times 2 \times 3$ 3024</p>	<p>K1 N1 K1 N1 K1 N1 K1 N1</p>	8

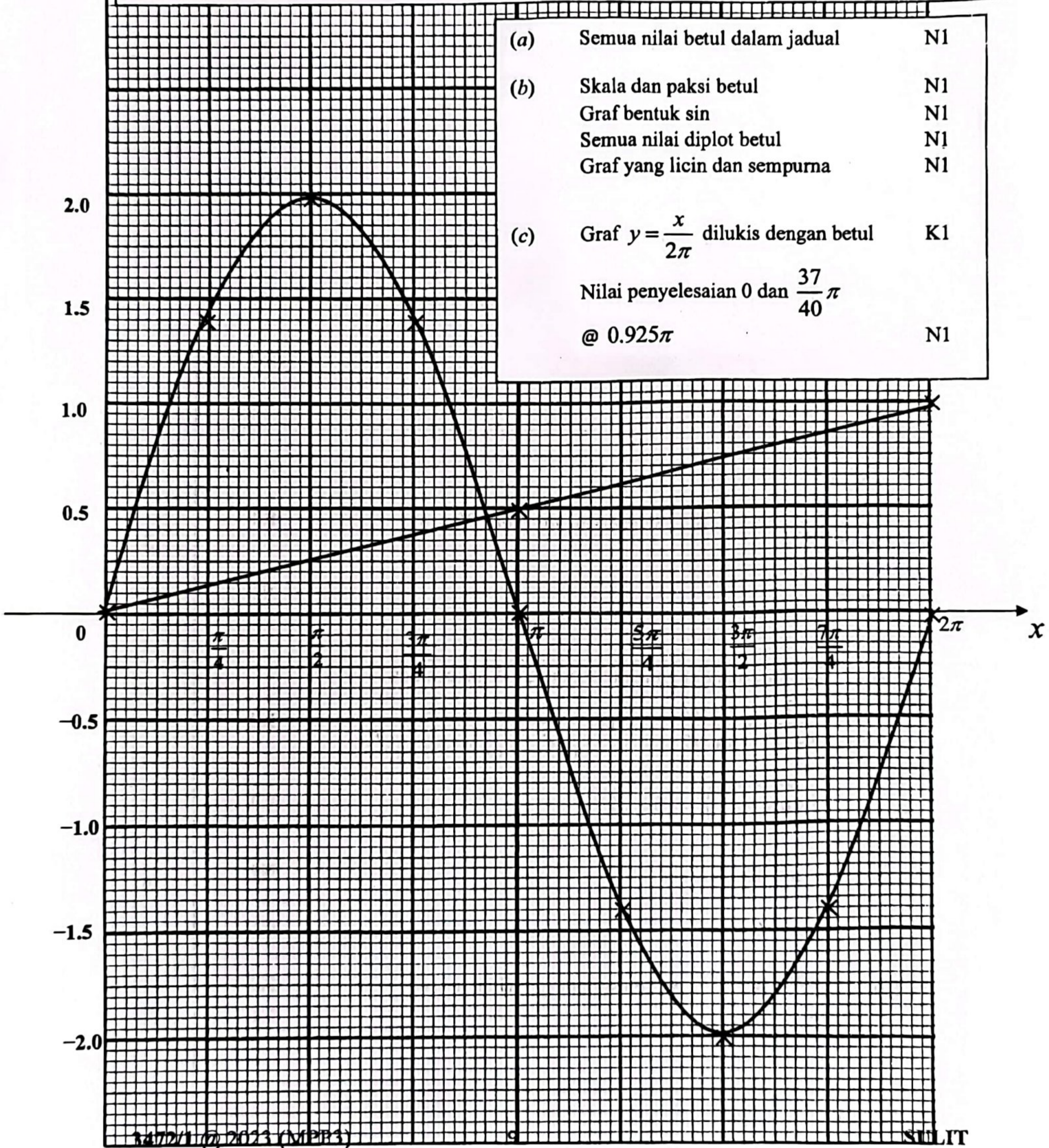
11	<p>(a) $(3x-2)(x+1) < 0$ atau setara & Mencari ketaksamaan dengan kaedah Graf @ Jadual @ Garis Nombor</p> <p>$-1 < x < \frac{2}{3}$</p> <p>(b) $-3 \left[x^2 + \frac{1}{3}x + \left(\frac{1}{3}\right)^2 - \left(\frac{1}{3}\right)^2 - \frac{2}{3} \right]$</p> <p>$-3 \left(x + \frac{1}{6} \right)^2 + \frac{25}{12}$</p> <p>Nilai maksimum = $\frac{25}{12}$</p> <p>(c) (i) $\alpha + \beta = \frac{-m-1}{3}$</p> <p>(ii) $\frac{1}{\alpha} + \frac{1}{\beta} = -k$ & $\frac{1}{\alpha} \left(\frac{1}{\beta} \right) = k - 14$</p> <p>Mencari *k dalam sebutan m dan n.</p> <p>[Panduan $\frac{-m-1}{n-2} = \frac{-14m-25}{n-2}$]</p> <p>$m = 26 - 14n$</p>	<p>K1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>9</p>
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12	<p>(a) Bezakan $9 - x^2$ terhadap x dan samakan dengan -2 $P(1,8)$</p> <p>(b) mencari pintasan $-x$; 3 dan 5 $\left(\frac{1}{2} \times 8 \times 4\right) @ \int_1^3 (9-x) dx$ $\left(\frac{1}{2} \times 8 \times 4\right) - \int_1^3 (9-x) dx$</p> <p>$\frac{20}{3}$</p> <p>(c) $9y - \frac{y^2}{2}$ $\frac{\pi}{2} \int_k^9 (9-y) dy = 16\pi$ $k=1$</p>	<p>K1 N1</p> <p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>9</p>
13	<p>(a) Tulis hukum segi tiga atau hukum poligon dalam (i) atau (ii) $\overline{AD} = \overline{AB} + \overline{BC} + \overline{CD} @ \overline{QP} = \overline{QC} + \overline{CP}$ Guna hukum segi tiga atau hukum poligon dalam (i) atau (ii) $6\underline{x} + 8\underline{y} + (-8\underline{x}) @ (1-\lambda)(-8\underline{x}) + 6\underline{y}$</p> <p>(i) $-2\underline{x} + 8\underline{y}$</p> <p>(ii) $(-8 + 8\lambda)\underline{x} + 6\underline{y}$ [Panduan : $\overline{CP} = (1-\lambda)\overline{CD}$]</p> <p>(b) $\overline{AD} = k\overline{QP}$ (guna apa-apa huruf @ simbol selain λ) $-2\underline{x} + 8\underline{y} = k[(-8 + 8\lambda)\underline{x} + 6\underline{y}]$ Bandingkan : $-2 = (-8 + 8\lambda)k$ & $8 = 6k$ selesaikan persamaan serentak $k = \frac{4}{3}$ & $\lambda = \frac{13}{16}$</p>	<p>P1</p> <p>K1</p> <p>N1</p> <p>N1</p> <p>8</p> <p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p>

14	$s = \frac{y}{2}\pi$ @ $A = \frac{y}{8}\pi$	P1	8
	$2x + \frac{2y + y\pi}{2} = 80$	K1	
	$xy + \frac{y^2}{8}\pi = 448$	K1	
	$x = 40 - \left(\frac{2 + \pi}{4}\right)y$	P1	
	$\left(40 - \left(\frac{2 + \pi}{4}\right)y\right)y + \frac{y^2}{8}\pi = 448$	K1	
	$(5y - 112)(5y - 112) = 0$	K1	
	$y = \frac{112}{5}$	N1	
$x = \frac{56}{5}$	N1		
15	Rujuk Graf		8

No. 15

x	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π
y	0	1.41	2.00	1.41	0	-1.41	-2.00	-1.41	0



- (a) Semua nilai betul dalam jadual N1
- (b) Skala dan paksi betul N1
 Graf bentuk sin N1
 Semua nilai diplot betul N1
 Graf yang licin dan sempurna N1
- (c) Graf $y = \frac{x}{2\pi}$ dilukis dengan betul K1
 Nilai penyelesaian 0 dan $\frac{37}{40}\pi$
 @ 0.925π N1

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SULIT

No	Peraturan Pemarkahan	Jumlah	
1	(a) (i) $gf(x) = 2\left(\frac{x}{p}\right) + 3$	K1	7
	$\frac{px-3p}{2} = x-3$ (Banding g^{-1})	K1	
	$p=2$	N1	
	(b) (i) $f^2(x) = p(px)$ Ganti $p=2$	K1	
	$f^2(x) = 4x$	N1	
	(ii) Tulis $f^3(x) = 9x$ atau $f^4(x) = 16x$	K1	
	$f^n(x) = n^2x$	N1	
2	${}^m C_2 = 15$	P1	3
	$\frac{m!}{(m-2)!2!} = 15$ & Selesaikan $m^2 - m - 30 = 0$	K1	
	$m = 6$	N1	
3	(a) Pendaraban dengan surd konjugat & selesaikan		6
	$\frac{7}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}}$ dan $\frac{21+7\sqrt{2}}{(3)^2 - 3\sqrt{2} + 3\sqrt{2} - (\sqrt{2})^2}$	K1	
	$(\sqrt{a+b\sqrt{2}})^2 = (3+\sqrt{2})^2$	K1	
	$a = 11$	N1	
	$b = 6$	N1	
	(b) $e^{\ln(11)^2} + e^{\ln(6)^2}$ & Selesaikan @ $*(11)^2 + *(6)^2$	K1	
157	N1		

4	<p>(a) (i) $\frac{1 - \cos x}{\sin x}$</p> $= \frac{1 - (1 - 2 \sin^2 \frac{x}{2})}{2 \sin \frac{x}{2} \cos \frac{x}{2}}$ $= \frac{2 \sin^2 \frac{x}{2}}{2 \sin \frac{x}{2} \cos \frac{x}{2}}$ $= \frac{\sin \frac{x}{2}}{\cos \frac{x}{2}}$ $= \tan \frac{x}{2} \quad (LHS = RHS)$ <p>(ii) $\frac{1 - \cos x}{\sin x} + \sin x = 0$ &</p> $1 - \cos x + (1 - \cos^2 x) = 0$ <p>Selesaikan $\cos^2 x + \cos x - 2 = 0$</p> $0^\circ, 360^\circ$	<p>K1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>8</p>
	<p>(b) $\sqrt{1 - m^2}$ dilihat</p> <p>Guna $\cos 2A = \cos^2 A - \sin^2 A$ @</p> $\cos 2A = 2 \cos^2 A - 1$ @ $\cos 2A = 1 - 2 \sin^2 A$ <p>&</p> <p>Selesaikan</p> $\sin^2 \frac{\theta}{2} = \frac{1 - \sqrt{1 - m^2}}{2}$	<p>P1</p> <p>K1</p> <p>N1</p>

5	<p>(a) $180 = \frac{3}{2}[2a + (3-1)d]$ @ $396 = a + (30-1)d$ K1</p> <p>Selesaikan persamaan serentak K1</p> <p>$d = 12$ & $a = 48$ N1</p> <p>$S_{30} = \frac{30}{2}[2(*48) + (30-1)(*12)]$ K1</p> <p>6660 N1</p> <p>(b) $6660 - \frac{20}{2}[2(*48) + (20-1)(*12)]$ K1</p> <p>3420 N1</p> <p>(c) $T_{29} = *48 + (29-1)(*12)$ K1</p> <p>$\frac{384}{12}$ K1</p> <p>32 N1</p>	10
6	<p>(a) $24^2 = 13^2 + 13^2 - 2(13)(13)\cos\angle BOQ$ @ K1</p> <p>$\sin \frac{\angle BOQ}{2} = \frac{\left(\frac{24}{2}\right)}{13}$ @ setara N1</p> <p>2.352 N1</p> <p>(b) $\tan\left(\frac{*134.76^\circ}{2}\right) = \frac{BR}{13}$ @ $S_{BAQ} = 13(2\pi - *2.352)$ K1</p> <p>*31.20 + *31.20 + *51.12 K1</p> <p>113.52 N1</p> <p>(c) $\frac{1}{2}(13)^2 \sin *134.76^\circ$ @ $\frac{1}{2}(13)^2 (*0.79)$ K1</p> <p>$\frac{1}{2}(13)^2 \sin *134.76^\circ + \frac{1}{2}(13)^2 (*0.79)$ @ setara K1</p> <p>126.76 N1</p>	8

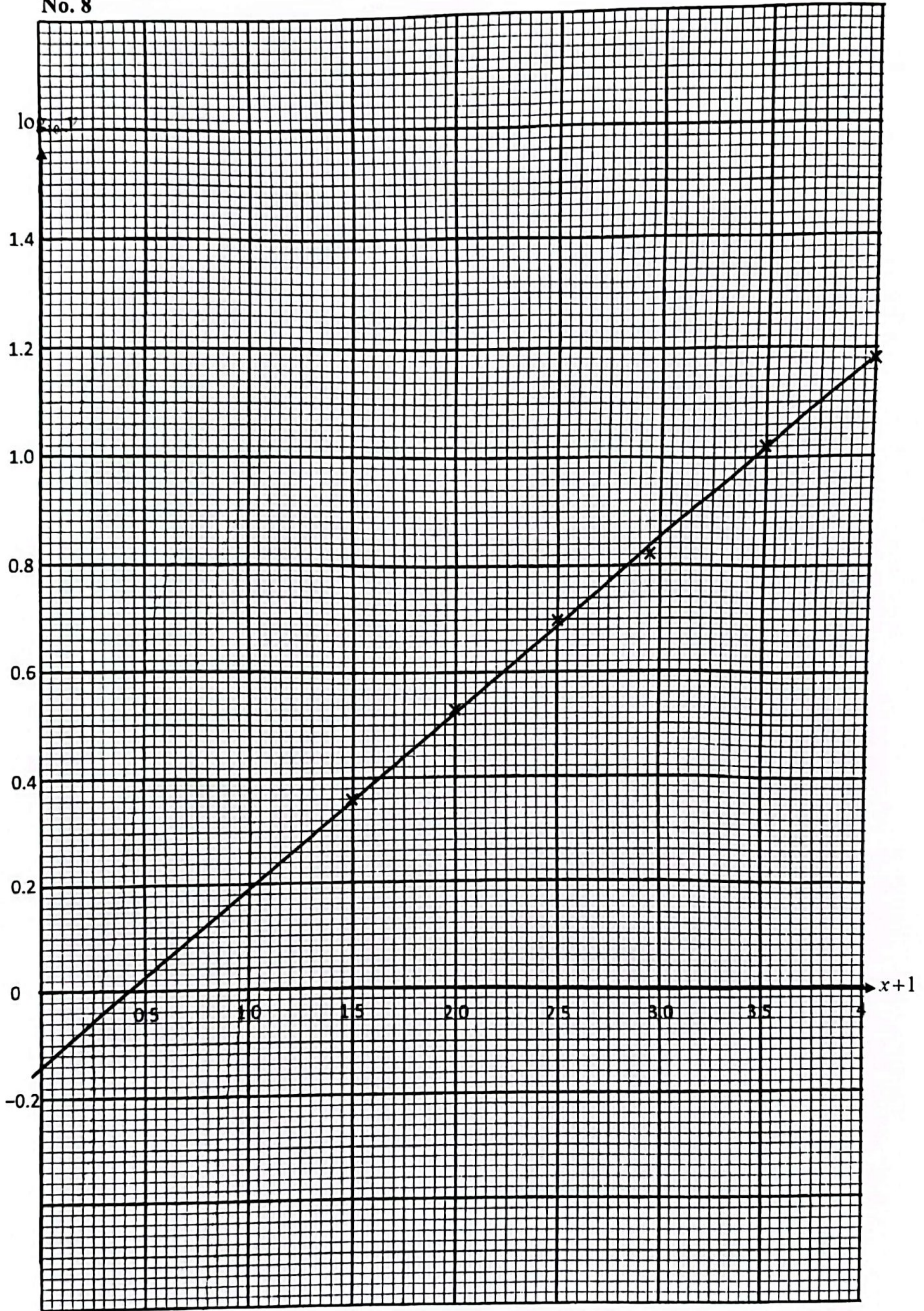
7	<p>(a) $\overline{OP} = -4\mathbf{i} + \mathbf{j}$ (Boleh tersirat) P1</p> <p>Tulis hukum segi tiga bagi ΔPQR P1</p> <p>Panduan: $\overline{OR} = \overline{OP} + \overline{PR}$ @ $\overline{OQ} = \overline{OR} + \overline{RQ}$</p> <p>$-4\mathbf{i} + \mathbf{j} + 6\mathbf{i} + 3\mathbf{j}$ @ $2\mathbf{i} + 4\mathbf{j} + 2\mathbf{i} - 6\mathbf{j}$ K1</p> <p>$2\mathbf{i} + 4\mathbf{j}$ & $4\mathbf{i} - 2\mathbf{j}$ N1</p> <p>$\left(\frac{2+4}{2}, \frac{4+(-2)}{2}\right)$ @ setara K1</p> <p>$(3,1)$ N1</p> <p>(b) $\frac{6\mathbf{i} + 3\mathbf{j}}{\sqrt{(6)^2 + (3)^2}}$ K1</p> <p>$\frac{2}{\sqrt{5}}\mathbf{i} + \frac{1}{\sqrt{5}}\mathbf{j}$ N1</p>	8																
8	<p>(a)</p> <table border="1" data-bbox="411 1581 1465 1774"> <tbody> <tr> <td>$x+1$</td> <td>1.5</td> <td>2</td> <td>2.5</td> <td>2.95</td> <td>3.5</td> <td>4</td> <td>N1</td> </tr> <tr> <td>$\log_{10} y$</td> <td>0.36</td> <td>0.53</td> <td>0.70</td> <td>0.82</td> <td>1.02</td> <td>1.18</td> <td>N1</td> </tr> </tbody> </table> <p>Paksi betul dan skala seragam bagi garis lurus K1</p> <p>Semua titik diplot betul N1</p> <p>garis lurus penyuaian terbaik N1</p> <p>(b) (i) $y = 2.754$ N1</p> <p>(ii) $\log_{10} y = (x+1)\log_{10} p - \log_{10} q$ P1</p> <p>$*0.328 = \log_{10} p$ & $-\log_{10} q = *-0.14$ K1</p> <p>$p = 2.13$ N1</p> <p>$q = 1.38$ N1</p>	$x+1$	1.5	2	2.5	2.95	3.5	4	N1	$\log_{10} y$	0.36	0.53	0.70	0.82	1.02	1.18	N1	10
$x+1$	1.5	2	2.5	2.95	3.5	4	N1											
$\log_{10} y$	0.36	0.53	0.70	0.82	1.02	1.18	N1											

(a)	(i)	$\frac{2}{3} \times m_1 = -1$	K1
		$2 = -\frac{3}{2}(0) + c$ & selesaikan	K1
		$y = -\frac{3}{2}x + 2$	N1
	(ii)	$\frac{2}{3}x + \frac{19}{3} = -\frac{3}{2}x + 2$ & selesaikan	K1
		$B(-2, 5)$	N1
(b)		$-2 = \frac{(n-m)(0) + m(-5)}{(n-m) + m} @ 5 = \frac{(n-m)(2) + m\left(\frac{19}{2}\right)}{(n-m) + m}$	K1
		Selesaikan $-2 = \frac{(n-m)(0) + m(-5)}{(n-m) + m} @ 5 = \frac{(n-m)(2) + m\left(\frac{19}{2}\right)}{(n-m) + m}$	K1
		$m:n = 2:5$	N1
(c)		$\left[\sqrt{[x - (-2)]^2 + (y - 5)^2} = 3 \right]$	K1
		$x^2 + y^2 + 4x - 10y + 20 = 0$	N1

10

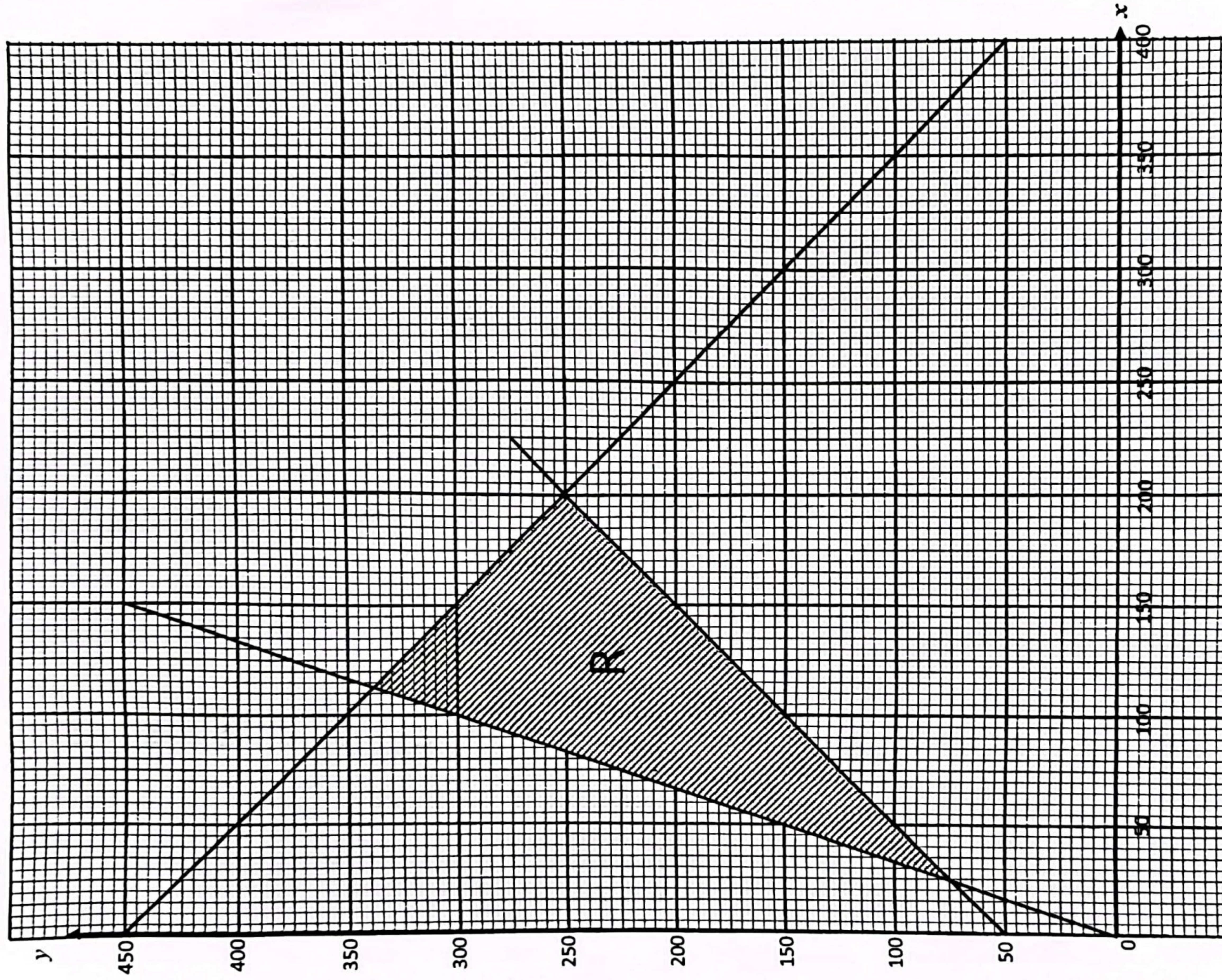
10	<p>(a) $P(X \geq 1) > 0.9$ $P(X = 0) < 0.1$ ${}^n C_0 \left(\frac{1}{3}\right)^0 \left(\frac{2}{3}\right)^n < 0.1$ $n \log_{10} \frac{2}{3} < \log_{10} 0.1$ & selesaikan $n = 6$</p> <p>(b) $P(X > 50.1) = 0.05$ @ $P(X > 34.3) = 0.8849$ $P\left(Z > \frac{50.1 - \mu}{\sigma}\right) = 0.05$ @ $P\left(Z > \frac{34.3 - \mu}{\sigma}\right) = 0.8849$ $\frac{50.1 - \mu}{\sigma} = 1.645$ @ $\frac{34.3 - \mu}{\sigma} = 1.2$ $\frac{50.1 - \mu}{1.645} = \frac{34.3 - \mu}{1.2}$ $\mu = 40.3$ $\sigma = 5$</p>	<p>P1 P1 K1 K1 N1 K1 K1 N1 N1</p>	<p>10</p>
11	<p>(a) (i) $3x^2 - 4x$ (ii) $3x^2 - 4x = 0$ & selesaikan $(0, 0)$ dan $\left(\frac{4}{3}, -\frac{32}{27}\right)$ $\frac{d^2y}{dx^2} = 6(*0) - 4 = -4 < 0$ dan $\frac{d^2y}{dx^2} = 6 \left(\frac{4}{3}\right) - 4 = 4 > 0$ $(0, 0)$ titik maksimum $\left(\frac{4}{3}, -\frac{32}{27}\right)$ titik minimum</p> <p>(b) $\frac{dy}{dx} = 3(2)^2 - 4(2)$ $3x^2 - 4x = 4$ & selesaikan $x = -\frac{2}{3}$ $P\left(-\frac{2}{3}, -\frac{32}{27}\right)$</p>	<p>N1 K1 N1 K1 N1 N1 K1 K1 N1 N1</p>	<p>10</p>

No. 8



13	<p>(a) $\frac{P_{21}}{3.00} \times 100 = 140$</p> <p>4.20</p> <p>(b) $\frac{140(2p) + 135(3) + 120(1) + 130(p)}{2p + 3 + 1 + p} = 134.5$</p> <p>$p = 2$</p> <p>(c) $\frac{25}{P_{21}} \times 100 = 134.5$</p> <p>18.59</p> <p>(d) $(\bar{I}_{23/15} \Rightarrow) 130 \times \frac{125}{100}$</p> <p>$(\bar{I}_{23/15} \Rightarrow) 162.5$</p> <p>$\left[\frac{140[2 \cdot (2)] + 135(3) + 120(1) + 162.5 \cdot (2)}{2 \cdot (2) + 3 + 1 + 2} \right]$</p> <p>141</p>	<p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>10</p>
14	<p>(a) $x + y \leq 450$</p> <p>$y - x \geq 50$</p> <p>$y \leq 3x$</p> <p>(b) Satu *garis lurus dilukis dengan betul</p> <p>Semua *garis lurus dilukis dengan betul</p> <p>Rantau R dilorek</p> <p>(c) (i) $30 \leq x \leq 115$</p> <p>(ii) $x = 125, y = 175$</p> <p>Yuran pengajaran minimum</p> <p>$k = 8000(125) + 12000(175)$</p> <p>RM3100000</p>	<p>N1</p> <p>N1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>N1</p> <p>N1</p> <p>K1</p> <p>N1</p> <p>10</p>

No. 14



15	(a)	Bezakan v_A terhadap t dan samakan dengan 0	K1	10
		Gantikan $*t$ dalam v_A	K1	
		$\frac{25}{8}$	N1	
	(b)	$v_A = 0$ dan selesaikan	K1	
		Kamirkan V_A terhadap t	K1	
		Gantikan $t = *2$ ke dalam $*s_A$	K1	
		$\frac{14}{3}$	N1	
	(c)	Kamirkan v_B terhadap t dan tentukan c	K1	
		$*s_B - *s_A$ $(s_B > s_A)$	K1	
		$\frac{34}{3}$	N1	