



i-MODUL KECEMERLANGAN SPM SMKA DAN SABK 2023  
**SIJILPELAJARAN MALAYSIA 2023 (SET 2)**

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**MATEMATIK TAMBAHAN**  
**Kertas 2**  
**PERATURAN PEMARKAHAN**

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**UNTUK KEGUNAAN PEMERIKSA SAHAJA**

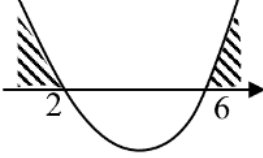
**AMARAN**

Peraturan pemarkahan ini **SULIT** dan **Hak Cipta Majlis Pengetua SMKA** dan **Majlis Pengetua SABK**. Kegunaan khusus untuk guru-guru tingkatan 5 di SMKA dan SABK sahaja. Peraturan ini tidak boleh dikeluarkan dalam apa jua bentuk media cetak.

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Peraturan pemarkahan ini mengandungi 12 halaman bercetak

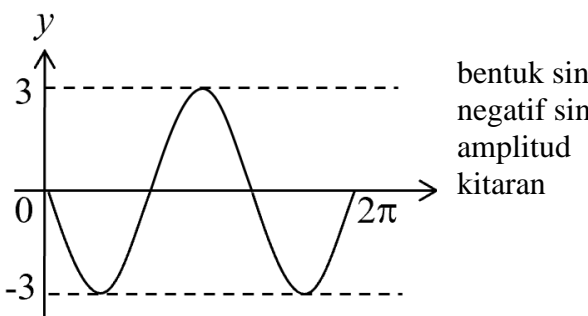
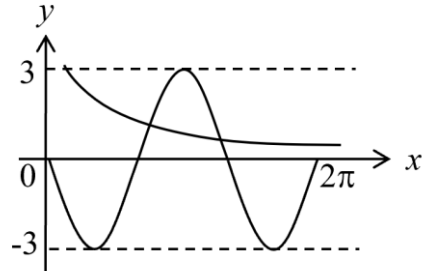
**CADANGAN PERATURAN PEMARKAHAN (SKEMA)**  
**KERTAS 2**  
**BAHAGIAN A**

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
<b>1 (a)</b>	$x^2 - 8x + 12 \geq 0$ $(x-2)(x-6) \geq 0$ $x \leq 2 \quad , \quad x \geq 6$ 	K1 N1	6
<b>1 (b) (i)</b>	$f(x) = -(x^2 - 2x - 8)$ $= -\left[ x^2 - 2x + \left(-\frac{2}{2}\right)^2 - \left(-\frac{2}{2}\right)^2 - 8 \right]$ $= -\left[ (x-1)^2 - 9 \right]$ $= -(x-1)^2 + 9$ $a = 1 \text{ dan } b = 9$	K1  K1	
<b>1 (b) (ii)</b>	$f(x) = -(x+1)^2 + 9$	N1 N1	
<b>2 (a)</b>	$p - 2q = 0$ $p = 2q$	K1 N1	
<b>2(b)</b>	$\left({}^7C_6 \times {}^9C_6\right) + \left({}^7C_7 \times {}^9C_5\right)$ $= 714$	K1K1 N1	5

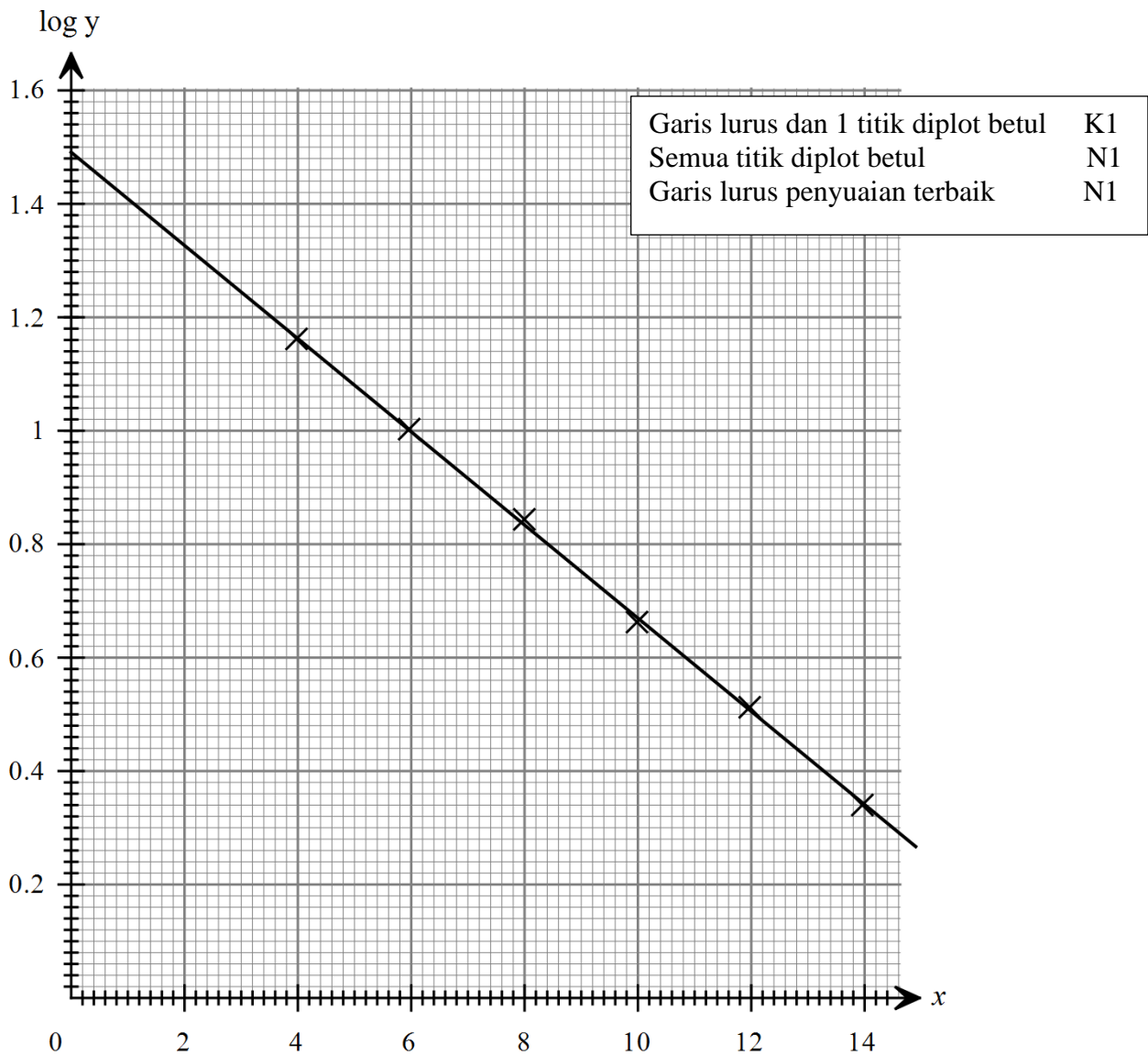
Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
3	$3x + 2y + z = 56$ $4x + 3y + z = 77$ $6x + y + 4z = 83$ <p>Hapus satu anu dalam persamaan / jadikan satu anu sebagai perkara rumus</p> $z = 77 - 4x + 3y$ $3x + 2y + (77 - 4x + 3y) = 56$ <p>Selesaikan persamaan serentak/ penggantian</p> $-x + 5y = 21$ $-10x + 13y = -25$ $x = 6$ $y = 15$ $z = 8$	N1 N1 N1  K1 K1  N1 N1 N1	8

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
<b>4 (a)</b>	$\left(x + \frac{b}{2a}\right)^2 - \left(\frac{b}{2a}\right)^2 + \frac{c}{a} = 0$ $\left(x + \frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{c}{a}$ $\left(x + \frac{b}{2a}\right)^2 = \frac{b^2}{4a^2} - \frac{4ac}{4a^2}$ $x + \frac{b}{2a} = \pm \sqrt{\frac{b^2}{4a^2} - \frac{4ac}{4a^2}}$ $x = -\frac{b}{2a} \pm \sqrt{\frac{b^2}{4a^2} - \frac{4ac}{4a^2}}$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$	K1          K1          N1	8
<b>4(b)</b>	$y = 7 - 4x$ $4x^2 - 4x(7 - 4x) + (7 - 4x)^2 - 1 = 0$ $36x^2 - 84x + 48 = 0$ $x = \frac{-(-84) \pm \sqrt{(-84)^2 - 4(36)(48)}}{2(36)}$ $x = \frac{4}{3}, x = 1$ $y = \frac{5}{3}, y = 3$	P1  K1          K1          N1          N1	

Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh
5 (a)	Skim B 2000, 2100, 2205 $r_1 = \frac{2205}{2100} \quad r_2 = \frac{2100}{2000}$ $r_1 = 1.05 \quad r_2 = 1.05$ $r_1 = r_2$	K1  N1	
5 (b)	Skim A (Salim) $2000 + (n-1)200 \geq 3000$ $200n \geq 1200$ $n = 6 \text{ (tahun ke 6)}$ Simpanan selama 20 tahun pertama bekerja $S_{20} - S_5$ $= \left[ \frac{20}{2} (2(200) + (19)200) - \frac{5}{2} (2(2000) + 4(200)) \right] \times 0.15 \times 12$ $= \text{RM } 118800$ Skim B (Sally) $2000(1.05)^{n-1} \geq 3000$ $(n-1)\log 1.05 \geq \log 1.5$ $n \geq 9.311$ $n = 10 \text{ (tahun ke 10)}$ Simpanan selama 20 tahun pertama bekerja $S_{20} - S_9$ $= \left( \frac{2000(1.05^{20} - 1)}{1.05 - 1} - \frac{2000(1.05^9 - 1)}{1.05 - 1} \right) \times 0.15 \times 12$ $= \text{RM } 79341.80$ Salim mempunyai jumlah simpanan lebih banyak	K1  K1  N1  K1  N1	9

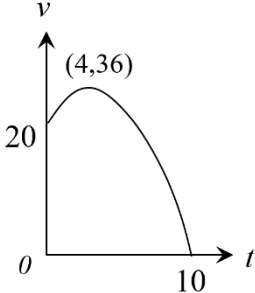
Soalan	Skema Pemarkahan	Sub Markah	Markah Penuh						
<p><b>6 (a)</b></p> <p><math>\frac{3}{7}(14u)</math> atau <math>-\frac{4}{7}(14u)</math></p> <p><math>6u</math> <math>-8u</math></p> <p><b>6 (b)</b></p> <p><math>\sqrt{2^2+(14y)^2}</math> @ <math>\sqrt{2^2+p^2} = \sqrt{40}</math></p> <p><math>\sqrt{2^2+(14y)^2} = \sqrt{40}</math> @ <math>14y = 6</math></p> <p><math>y = \frac{3}{7}</math></p> <p><math>\overline{PR} = \frac{2i+6j}{\sqrt{40}}</math></p>		<p>K1</p> <p>N1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p>	7						
<p><b>7 (a)</b></p> <p><b>7 (b)</b></p>	 <p>bentuk sin negatif sin amplitud kitaran</p> <p><math>y = \frac{\pi}{x}</math></p> <table border="1" data-bbox="367 1344 598 1467"> <tr> <td><math>x</math></td> <td><math>\pi</math></td> <td><math>2\pi</math></td> </tr> <tr> <td><math>y</math></td> <td>1</td> <td><math>\frac{1}{2}</math></td> </tr> </table>  <p>2 bilangan penyelesaian</p>	$x$	$\pi$	$2\pi$	$y$	1	$\frac{1}{2}$	<p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p> <p>K1</p> <p>K1</p> <p>N1</p>	7
$x$	$\pi$	$2\pi$							
$y$	1	$\frac{1}{2}$							

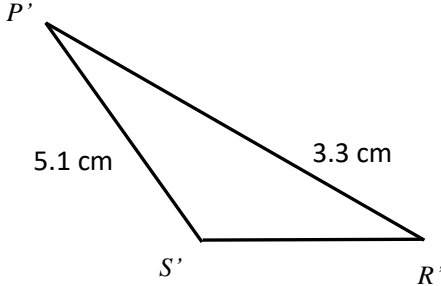
<b>9 (a)</b>	<table border="1"> <thead> <tr> <th><math>x</math></th> <th>4</th> <th>6</th> <th>8</th> <th>10</th> <th>12</th> <th>14</th> </tr> </thead> <tbody> <tr> <td><math>\log_{10} y</math></td> <td>1.16</td> <td>1.0</td> <td>0.84</td> <td>0.66</td> <td>0.51</td> <td>0.34</td> </tr> </tbody> </table>	$x$	4	6	8	10	12	14	$\log_{10} y$	1.16	1.0	0.84	0.66	0.51	0.34	N1
	$x$	4	6	8	10	12	14									
$\log_{10} y$	1.16	1.0	0.84	0.66	0.51	0.34										
	$\log_{10} y = \log_{10} p - 2x \log_{10} q$ $c = \log_{10} p = 1.5$ $p = 31.62$ $m = -2 \log_{10} q = \frac{1.5 - 1.0}{0 - 6}$ $q = 1.101$	P1 K1 N1  K1 N1														
<b>9 (b)</b>	$\log_{10} y = 0.78$ $y = 6.03$	N1														



<b>11 (a)</b>	$12 = 10\theta$ $1.2 \text{ radian} = \theta$	K1 N1
<b>11 (b)</b>	$2\pi - 1.2 \text{ rad} = 5.08 \text{ rad}$ $s = 4(5.08)$ $= 20.33$ Perimeter = $20.33 + 6 + 6 + 12$ $= 44.33$	K1 K1 N1 N1
<b>11 (c)</b>	$= \frac{1}{2}(10)^2(1.2) + \frac{1}{2}(4)^2(5.08)$ $= 60 + 40.67$ $= 100.67$	K1K1 K1 N1
<b>10 (a)(i)</b>	$p = \frac{3}{5}, q = \frac{2}{5}$ $P(X = 4) = {}^9C_4 \left(\frac{3}{5}\right)^4 \left(\frac{2}{5}\right)^5$ $= 0.1672$	K1 K1 N1
<b>10 (a)(ii)</b>	$P(X \geq 7) = {}^9C_7 \left(\frac{3}{5}\right)^7 \left(\frac{2}{5}\right)^2 + {}^9C_8 \left(\frac{3}{5}\right)^8 \left(\frac{2}{5}\right)^1 + {}^9C_9 \left(\frac{3}{5}\right)^9 \left(\frac{2}{5}\right)^0$ $= 0.2318$	K1 N1
<b>10 (b)(i)</b>	$P(56 \leq X \leq 72)$ $= P\left(\frac{56 - 65}{7.5} \leq Z \leq \frac{72 - 65}{7.5}\right)$ $= P(-1.2 \leq Z \leq 0.933)$ $= 0.7096$ $n(s) = \frac{250}{0.7097} = 352$	K1 K1 N1
<b>10 (b)(ii)</b>	$\frac{X - 65}{7.5} = 1.645$ $X = 77.34 \text{ kg}$	K1 N1



<p><b>12 (a) (i)</b></p>	$8 - 2t = 0$ $t = 4$ $v = \int 8 - 2t \, dt$ $= 8t - t^2 + c$ $v = 8t - t^2 + 20$ $v_{\max} = 8(4) - (4)^2 + 20 = 36$	<p>K1</p>
<p><b>12 (a)(ii)</b></p>	$8t - t^2 + 20 = 0$ $t^2 - 8t - 20 = 0$ $(t - 10)(t + 2) = 0$ $t = 10 \quad t = -2$	<p>K1</p>
<p><b>12 (b)</b></p>	<p>Zarah berhenti selepas <math>k=10</math> saat.</p>	<p>N1</p>
	 $\int_0^{10} -t^2 + 8t + 20 \, dt$ $= \left[ -\frac{t^3}{3} + \frac{8t^2}{2} + 20t \right]_0^{10}$ $= -\frac{(10)^3}{3} + \frac{8(10)^2}{2} + 20(10)$ $= 266\frac{2}{3}$	<p>K1</p> <p>K1</p> <p>K1</p> <p>K1</p> <p>N1</p>

<b>13(a)(i)</b>  <b>13 (a)(ii)</b>	$7.7^2 = 5.6^2 + 3.3^2 - 2(5.6)(3.3) \cos \angle STR$ $\angle STR = \angle PTQ = 117.45$ $\frac{\sin \angle SPT}{5.6} = \frac{\sin 62.55}{5.1}$ $\angle SPT = 77.01$ $\frac{PT}{\sin 40.44} = \frac{5.1}{\sin 62.55}$ $PT = 3.728$	K1 N1 K1 K1 NI
<b>13 (a)(iii)</b>	$\frac{PQ}{\sin 40.44} = \frac{5.1}{\sin 31.275} \text{ or } \frac{PQ}{\sin 40.44} = \frac{5.1}{\sin 31.28}$ $PQ = 6.372 / 6.371$	K1 K1 N1
<b>13 (b)(i)</b>		N1
<b>13 (b)(ii)</b>	$\frac{\sin \angle PSR}{7.028} = \frac{\sin 77.01}{7.7}$ $\angle P'S'R' = 180 - 62.79 = 117.21$	K1 N1
<b>14 (a)</b>  <b>14 (b)</b>  <b>14 (c)(i)</b>	$\frac{6}{x} \times 100 = 125$ $x = 4.80$ $\frac{z}{y} \times 100 = 110$ $z = y + 0.40$ $\frac{y + 0.40}{y} \times 100 = 110$ $y = 4, z = 4.40$ $\frac{125(3) + 160(1) + 125(2) + 110(m)}{3 + 1 + 2 + m} = 122.5$ $m = 4$	K1 N1 K1 K1 N1 K1K1 N1

<b>15 (a)</b>	$x + y \geq 40$ $y \leq 2x$ $120x + 80y \leq 7200$	N1 N1 N1
<b>15 (b)</b>	Paksi dan satu graf garis lurus betul Semua graf garis lurus betul Kawasan berlorek betul	K1 N1 N1
<p>The graph shows a coordinate system with x and y axes. The x-axis is labeled from 0 to 70 in increments of 10, with grid lines every 1 unit. The y-axis is labeled from 0 to 90 in increments of 10, with grid lines every 1 unit. Three lines are plotted: <math>x + y = 40</math> (intercepting x at 40, y at 40), <math>y = 2x</math> (intercepting x at 0, y at 0), and <math>120x + 80y = 7200</math> (intercepting x at 60, y at 90). The feasible region R is the shaded area bounded by these lines and the x-axis. The vertices of R are (0,0), (40,0), (26,14), and (14,26).</p>		
<b>15 (c)(i)</b>	bilangan minimum 30 bilangan maksimum 53	P1 P1
<b>15 (c)(ii)</b>	$120(14) + 80(26)$ $= 3760$	K1 N1
		<b>10 m</b>

