

**Matematik Tambahan Kertas 2**

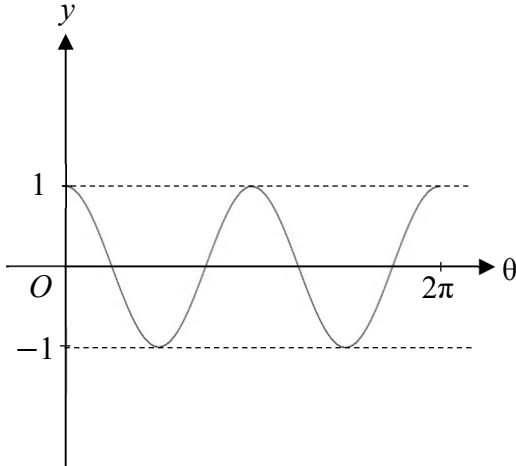
**SPMRSM 2024**

**SKEMA JAWAPAN**

| No.     | Skema Pemarkahan                                                                                                                     | Sub Markah                                        | Jumlah Markah                             |
|---------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------|
| 1(a)    | $gf(10) = \frac{2}{10-6} @ g(5) = \frac{2}{5-1}$<br>$\frac{1}{2}$                                                                    | <br>1<br><br>1                                    |                                           |
| (b)(i)  | <div> </div> <p>Lengkung yang betul</p> <p>Pintasan-<math>y = p</math></p> <p><math>x \geq 0</math></p> | <br>1<br><br>1<br><br><br><br>1<br><br>1<br><br>1 | <br><br><br><br><br><br><br><br><br><br>7 |
| (b)(ii) | $a^2 + b = 8$<br>$a = \sqrt{8-b}$                                                                                                    |                                                   |                                           |

| No.  | Skema Pemarkahan                                                                                                                                                                                          | Sub Markah                   | Jumlah Markah |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------|
| 2(a) | $[AB : BC =] 14 : 21$ atau setara<br><br>$\frac{21(8)+14x}{21+14} = 4 @ \frac{21(-5)+14y}{21+14} = -1$<br><br>$(-2,5)$                                                                                    | 1<br><br>1<br><br>1          | 7             |
| (b)  | $\frac{-5-(-1)}{8-4} = \frac{-2-0}{h-9}$<br><br>$-1 = \frac{-2}{h-9}, h = 11$<br><br>$m_2 = \frac{-5-(-2)}{8-11} = 1$<br><br>$-1 \times 1 = -1$ <b>DAN</b> ya                                             | 1<br><br>1<br><br>1<br><br>1 |               |
| 3(a) | $\alpha + \beta = -\frac{7}{2}$ <b>DAN</b> $\alpha\beta = -\frac{5}{2}$<br><br>$*\left(-\frac{7}{2}\right) + 6 @ *\left(-\frac{5}{2}\right) + 3*\left(-\frac{7}{2}\right) + 9$<br><br>$2x^2 - 5x - 8 = 0$ | 1<br><br>1<br><br>1          | 6             |
| (b)  | $9x^2 - 6x + m + n = 0$ atau setara<br><br>$*(-6) - 4*(9)*(m+n) = 0$<br><br>$m = 1 - n$                                                                                                                   | 1<br><br>1<br><br>1          |               |

| No.                | Skema Pemarkahan                                                                                                                                                                                                                                                                | Sub Markah                            | Jumlah Markah |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------|
| 4(a)               | $\{r \Rightarrow 3$<br><br>$\frac{a(*3^4 - 1)}{*3 - 1}$ <b>DAN</b> $\frac{a(*3^2 - 1)}{*3 - 1}$ @ $a + 3a + 9a + 27a$ <b>DAN</b> $a + 3a$<br><br>$40a = 10(4a)$<br>$S_4 = 10S_2$                                                                                                | 1<br><br>1<br><br>1                   | 7             |
| (b)(i)<br><br>(ii) | $a = 1125$<br>$r = \frac{1}{4}$<br><br>$\frac{*1125}{1 - *\left(\frac{1}{4}\right)}$<br><br>1500                                                                                                                                                                                | 1<br>1<br><br>1<br><br>1              |               |
| 5                  | $y = -2x - 2$ @ $x = \frac{-2 - y}{2}$<br><br>$-2x - 2 = x^2 + x - 12$ @ $y = \left(\frac{-2 - y}{2}\right)^2 + \left(\frac{-2 - y}{2}\right) - 12$<br><br>$(x + 5)(x - 2) = 0$ @ $(y + 6)(y - 8) = 0$<br><br>$x = -5, x = 2$ @ $y = -6, y = 8$<br><br>$Q(-5, 8)$<br>$R(2, -6)$ | 1<br><br>1<br><br>1<br><br>1<br><br>1 | 6             |

| No.    | Skema Pemarkahan                                                                                                                                                                                                         | Sub Markah  | Jumlah Markah |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|
| 6(a)   | $1 - \sin^2 \theta = \cos^2 \theta$<br>LHS = RHS                                                                                                                                                                         | 1<br>1      | 7             |
| (b)(i) |  <p>Bentuk graf kosinus</p> <p>2 kitaran untuk <math>0 \leq \theta \leq 2\pi</math></p> <p>Amplitud = 1</p> <p>(Mak = 1, min = -1)</p> | 1<br>1<br>1 |               |
| (ii)   | $m(\pi) - 1 > *1 @ m > \frac{*1 - (-1)}{\pi - 0}$                                                                                                                                                                        | 1           |               |
|        | $m > \frac{2}{\pi}$ <b>DAN</b> $m < 0$                                                                                                                                                                                   | 1           |               |

| No.    | Skema Pemarkahan                              | Sub Markah | Jumlah Markah |
|--------|-----------------------------------------------|------------|---------------|
| 7a)(i) | $-\frac{70(t+1)^{-1}}{-1(1)} + c$             | 1          | 10            |
|        | $180 = \frac{70}{(0+1)} + c$                  | 1          |               |
|        | $T = \frac{70}{t+1} + 110$                    | 1          |               |
| (ii)   | $\frac{70}{t+1} + 110 \leq 113$               | 1          |               |
|        | $22\frac{1}{3} // \frac{67}{3} // 22.33$      | 1          |               |
| (b)    | $P(x) = 100x - (100\,000 + 50x + 0.0025x^2)$  | 1          | 10            |
|        | $\frac{d^*P}{dx} = 50 - 0.005x$               | 1          |               |
|        | $50 - 0.005x = 0$                             | 1          |               |
|        | $P(x) = -0.0025(10000)^2 + 50(10000) - 10000$ | 1          |               |
|        | Tidak kerana<br>$150\,000 < 200\,000$         | 1          |               |

| No.     | Skema Pemarkahan                                                                                                                                                                                                                                                                                                                                                                            | Sub Markah | Jumlah Markah |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| 8(a)(i) | <p>Tulis dan guna hukum segitiga bagi</p> $\overrightarrow{QT} = \overrightarrow{QP} + \overrightarrow{PT} @$ $\overrightarrow{PR} = \overrightarrow{PS} + \overrightarrow{SR} @$ $\overrightarrow{PW} = \overrightarrow{PQ} + \overrightarrow{QW} @$ $\overrightarrow{PW} = \overrightarrow{PT} + \overrightarrow{TW} @$ $\overrightarrow{QW} = \overrightarrow{QP} + \overrightarrow{PW}$ | 1          | 10            |
|         | $-9\underline{u} + 6\underline{v}$                                                                                                                                                                                                                                                                                                                                                          | 1          |               |
| (ii)    | $6\underline{u} + 12\underline{v}$                                                                                                                                                                                                                                                                                                                                                          | 1          |               |
| (b)     | $\overrightarrow{PW} = 6k\underline{u} + 12k\underline{v} @ \overrightarrow{QW} = -9h\underline{u} + 6h\underline{v}$                                                                                                                                                                                                                                                                       | 1          |               |
|         | $\overrightarrow{PW} = (9 - 9h)\underline{u} + 6h\underline{v} @ \overrightarrow{QW} = (6k - 9)\underline{u} + 12k\underline{v}$                                                                                                                                                                                                                                                            | 1          |               |
| (c)     | $6k = 9 - 9h \text{ DAN } 12k = 6h$                                                                                                                                                                                                                                                                                                                                                         | 1          |               |
|         | $h = 2k, 6k = 9 - 9(2k)$                                                                                                                                                                                                                                                                                                                                                                    | 1          |               |
|         | $k = \frac{3}{8}, h = \frac{3}{4}$                                                                                                                                                                                                                                                                                                                                                          | 1          |               |
|         | $135 = \frac{1}{2} \times 45 \times t$                                                                                                                                                                                                                                                                                                                                                      | 1          |               |
|         | 6                                                                                                                                                                                                                                                                                                                                                                                           | 1          |               |

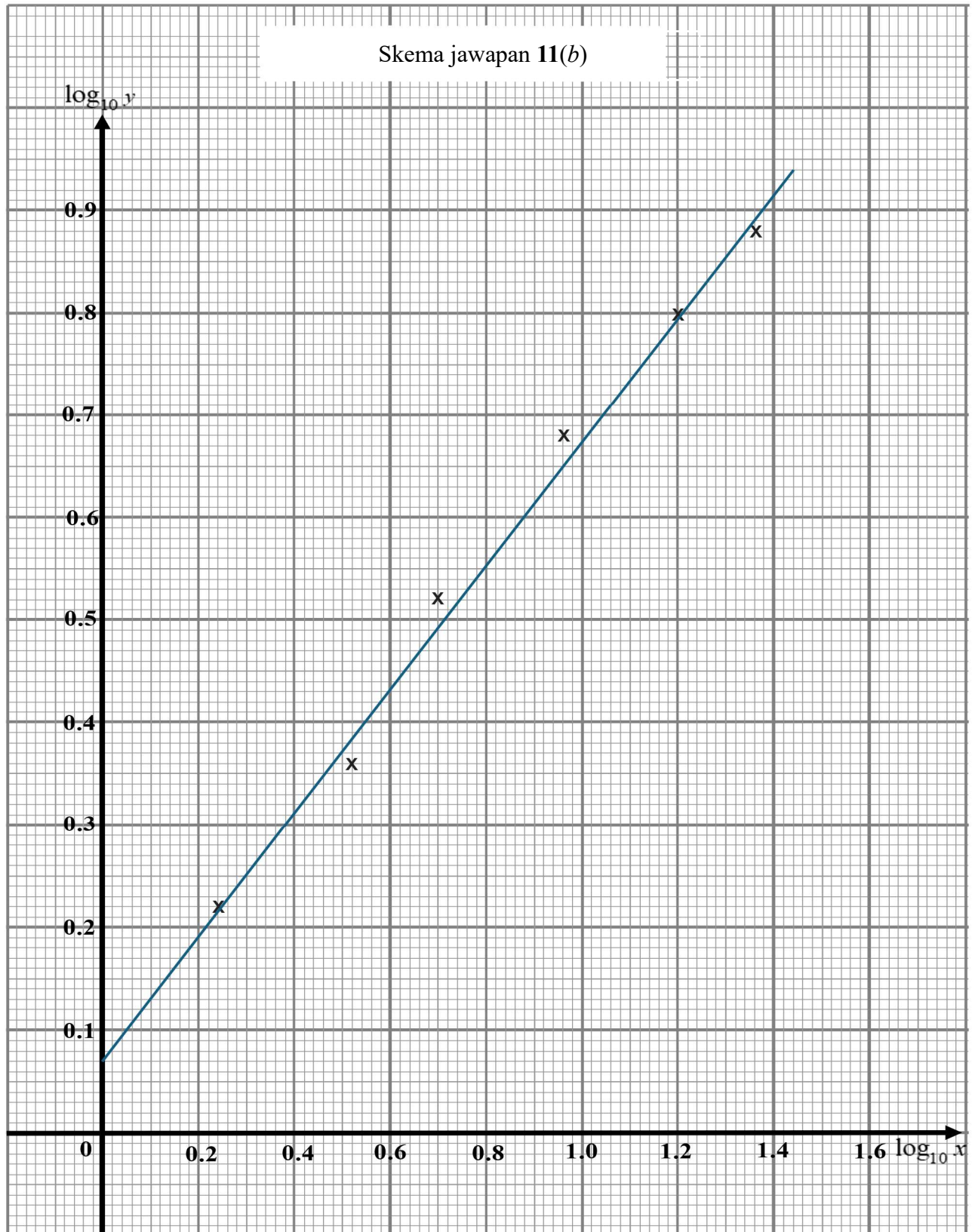
| No.     | Skema Pemarkahan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sub Markah | Jumlah Markah |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| 9(a)(i) | $P\left(Z \geq \frac{1.68 - m}{0.12}\right) = 0.0082$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1          | 10            |
|         | $\frac{1.68 - m}{0.12} = 2.40$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1          |               |
|         | 1.392                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1          |               |
| (ii)    | $1 - 0.0082 - P\left(Z < \frac{1.26 - *1.392}{0.12}\right)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1          |               |
|         | 0.8561                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1          |               |
| (iii)   | 431//432                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1          |               |
| 9(b)(i) | ${}^nC_0 \left(\frac{2}{5}\right)^0 \left(\frac{3}{5}\right)^{n-0} = \frac{729}{15625}$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1          | 10            |
|         | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1          |               |
| (ii)    | $1 - {}^6C_0 \left(\frac{3}{5}\right)^0 \left(\frac{2}{5}\right)^6 - {}^6C_1 \left(\frac{3}{5}\right)^1 \left(\frac{2}{5}\right)^{6-1} @$ ${}^6C_2 \left(\frac{3}{5}\right)^2 \left(\frac{2}{5}\right)^{6-2} + {}^6C_3 \left(\frac{3}{5}\right)^3 \left(\frac{2}{5}\right)^{6-3} + {}^6C_4 \left(\frac{3}{5}\right)^4 \left(\frac{2}{5}\right)^{6-4} + {}^6C_5 \left(\frac{3}{5}\right)^5 \left(\frac{2}{5}\right)^{6-5} + {}^6C_6 \left(\frac{3}{5}\right)^6 \left(\frac{2}{5}\right)^{6-6}$ $@ 1 - {}^6C_5 \left(\frac{2}{5}\right)^5 \left(\frac{3}{5}\right)^{6-5} - {}^6C_6 \left(\frac{2}{5}\right)^6 \left(\frac{3}{5}\right)^{6-6} @$ ${}^6C_0 \left(\frac{2}{5}\right)^0 \left(\frac{3}{5}\right)^{6-0} + {}^6C_1 \left(\frac{2}{5}\right)^1 \left(\frac{3}{5}\right)^{6-1} + {}^6C_2 \left(\frac{2}{5}\right)^2 \left(\frac{3}{5}\right)^{6-2} + {}^6C_3 \left(\frac{2}{5}\right)^3 \left(\frac{3}{5}\right)^{6-3} + {}^6C_4 \left(\frac{2}{5}\right)^4 \left(\frac{3}{5}\right)^{6-4}$ | 1          |               |
|         | $\frac{2997}{3125} // 0.9590$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1          |               |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |               |
|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |               |

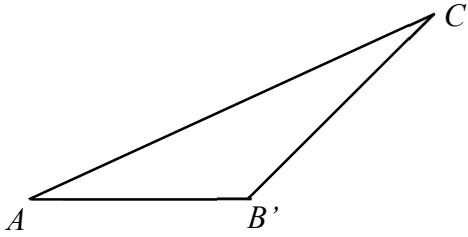
| No.   | Skema Pemarkahan                                                                                                       | Sub Markah | Jumlah Markah |
|-------|------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| 10(a) | $\frac{dy}{dx} = 6 - 2(0)$                                                                                             | 1          | 10            |
|       | $y - 0 = 6(x - 0)$ <b>DAN</b> $y = 6(3)$                                                                               | 1          |               |
|       | $N(3,18)$                                                                                                              | 1          |               |
| (b)   | $\left[ \frac{6x^2}{2} - \frac{x^3}{3} \right]_0^6$                                                                    | 1          |               |
|       | $\left[ \left( \frac{6(6)^2}{2} - \frac{(6)^3}{3} \right) - \left( \frac{6(0)^2}{2} - \frac{(0)^3}{3} \right) \right]$ | 1          |               |
|       | 36                                                                                                                     | 1          |               |
| (c)   | $\pi \left[ \frac{(-6(6) + 36)^3}{-18} - \frac{(-6(3) + 36)^3}{-18} \right]$                                           | 1          |               |
|       | $\pi \left[ \left( 12(6)^3 - 3(6)^4 + \frac{6^5}{5} \right) - \left( 12(3)^3 - 3(3)^4 + \frac{3^5}{5} \right) \right]$ | 1          |               |
|       | $324\pi - \frac{648}{5}\pi$                                                                                            | 1          |               |
|       | $194.4\pi @ 194\frac{2}{5}\pi$                                                                                         | 1          |               |





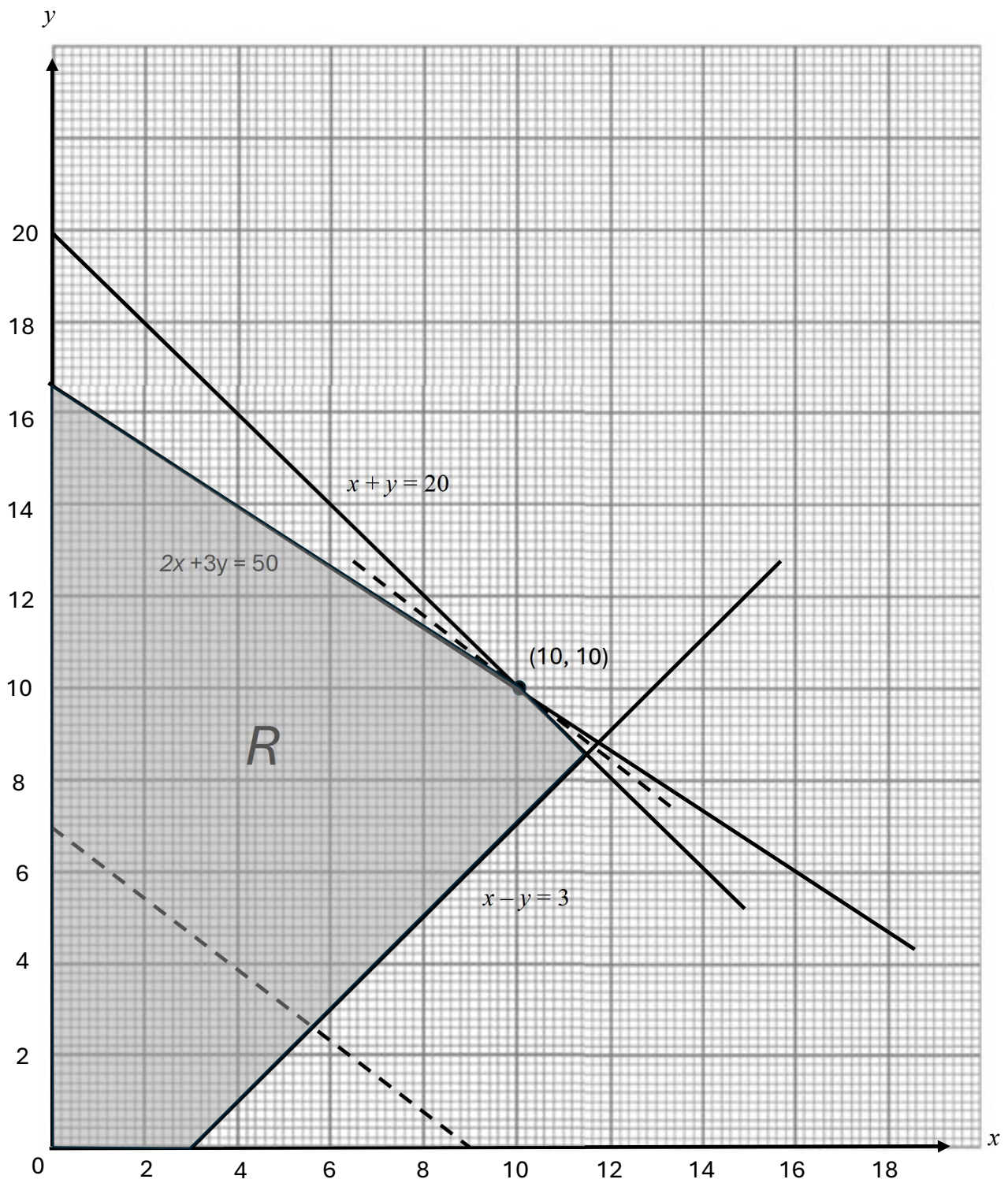
| No.                                         | Skema Pemarkahan                                                                                                                                                                                                                                                | Sub Markah    | Jumlah Markah |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------|------|------|------|------|------|---------------|------|------|------|------|------|------|---|--|
| 11                                          | (a)                                                                                                                                                                                                                                                             |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             | <table><tr><td><math>\log_{10} x</math></td><td>0.24</td><td>0.52</td><td>0.70</td><td>0.96</td><td>1.20</td><td>1.36</td></tr><tr><td><math>\log_{10} y</math></td><td>0.22</td><td>0.36</td><td>0.52</td><td>0.68</td><td>0.80</td><td>0.88</td></tr></table> | $\log_{10} x$ | 0.24          | 0.52 | 0.70 | 0.96 | 1.20 | 1.36 | $\log_{10} y$ | 0.22 | 0.36 | 0.52 | 0.68 | 0.80 | 0.88 | 1 |  |
|                                             | $\log_{10} x$                                                                                                                                                                                                                                                   | 0.24          | 0.52          | 0.70 | 0.96 | 1.20 | 1.36 |      |               |      |      |      |      |      |      |   |  |
|                                             | $\log_{10} y$                                                                                                                                                                                                                                                   | 0.22          | 0.36          | 0.52 | 0.68 | 0.80 | 0.88 |      |               |      |      |      |      |      |      |   |  |
|                                             |                                                                                                                                                                                                                                                                 | 1             |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             | (b)                                                                                                                                                                                                                                                             |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             | Graf garis lurus $\log_{10} y$ melawan $\log_{10} x$ dilukis                                                                                                                                                                                                    | 1             |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             | <div><div>- Paksi-paksi betul dan skala seragam<br/>dari titik pertama sehingga titik terakhir</div><div>- Sekurang-kurangnya satu *titik diplot betul</div></div>                                                                                              |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             |                                                                                                                                                                                                                                                                 | 1             |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             | Garis lurus penyuaian terbaik<br>[Sekurang-kurangnya 5 *titik diplot]                                                                                                                                                                                           | 1             |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
|                                             |                                                                                                                                                                                                                                                                 |               | 10            |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| (c)                                         |                                                                                                                                                                                                                                                                 |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| $\log_{10} y = k \log_{10} x + \log_{10} a$ | 1                                                                                                                                                                                                                                                               |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| Cari $m = k$<br>(2 titik pada *garis)       | 1                                                                                                                                                                                                                                                               |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| $k = 0.6042$                                | 1                                                                                                                                                                                                                                                               |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| $c = \log_{10} a$                           | 1                                                                                                                                                                                                                                                               |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| $a = 1.20$                                  | 1                                                                                                                                                                                                                                                               |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |
| Syarat:<br>$0.06 \leq c \leq 0.08$          |                                                                                                                                                                                                                                                                 |               |               |      |      |      |      |      |               |      |      |      |      |      |      |   |  |



| No.    | Skema Pemarkahan                                                                                            | Sub Markah          | Jumlah Markah |
|--------|-------------------------------------------------------------------------------------------------------------|---------------------|---------------|
| 12(a)  | $\widehat{BD} = 6.6$<br><br>$AD^2 = 9.12^2 + 6.6^2 - 2(9.12)(6.6)\cos 48.3^\circ$<br><br>6.830              | 1<br><br>1<br><br>1 | 10            |
| (b)(i) | $\frac{\sin \angle BAE}{4.3} = \frac{\sin 83.3^\circ}{9.12}$<br><br>27.92°                                  | 1<br><br>1          |               |
| (ii)   | <br><br>20.38°           | 1<br><br>1          |               |
| (c)    | $\frac{6.6 + 9.12 + 6.83}{2}$ $\sqrt{11.28(11.28 - 6.6)(11.28 - 9.12)(11.28 - 6.83)}$<br><br>22.53 // 22.47 | 1<br><br>1<br><br>1 |               |

| No.   | Skema Pemarkahan                                                                                                                              | Sub Markah | Jumlah Markah |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| 13(a) | $x + y \leq 20$ atau setara                                                                                                                   | 1          | 10            |
|       | $10x + 15y \leq 250$ atau setara                                                                                                              | 1          |               |
|       | (b) $x - y \leq 3$ atau setara                                                                                                                | 1          |               |
|       | Bilangan jam kelas tarian melebihi kelas renang<br>selebih-lebihnya 3 jam                                                                     | 1          |               |
|       | (c) Lukis dengan betul sekurang-kurangnya satu garis<br>lurus dan *ketaksamaan yang melibatkan $x$ dan $y$                                    | 1          |               |
|       | Lukis dengan betul (SEMUA)*garis lurus<br>dan *ketaksamaan yang melibatkan $x$ dan/atau $y$<br>Nota : Terima garis putus-putus dan garis padu | 1          |               |
|       | Rantau dilabel R dengan betul                                                                                                                 | 1          |               |
|       | (d) Melukis fungsi objektif<br>$K = 350x + 450y$ dengan betul                                                                                 | 1          |               |
|       | $K = 350(10) + 450(10)$                                                                                                                       | 1          |               |
|       | 8000                                                                                                                                          | 1          |               |

## Soalan 13(c)



| No.                     | Skema Pemarkahan                                                                                                                      | Sub Markah | Jumlah Markah |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| <b>14(a)</b><br>(i)(ii) | $\frac{12.10}{P_{2018}} \times 100 = 121$ atau $\frac{P_{2022}}{15.00} \times 100 = 90$                                               | 1          | <b>10</b>     |
|                         | 10{00}                                                                                                                                | 1          |               |
|                         | 13.50                                                                                                                                 | 1          |               |
|                         | (b)                                                                                                                                   |            |               |
|                         | $100 + 3m = \frac{130 \times 130}{100}$                                                                                               | 1          |               |
|                         | 23                                                                                                                                    | 1          |               |
|                         | (c) (i)                                                                                                                               |            |               |
|                         | 110, 130, 100, 90                                                                                                                     | 1          |               |
|                         | $\frac{110(7) + 130(7) + 100(2) + 90(4)}{7 + 7 + 2 + 4}$                                                                              | 1          |               |
|                         | 112                                                                                                                                   | 1          |               |
| (ii)                    | $\left(40 - \left(\frac{112}{100} \times 30\right)\right) \times \left(\frac{26322.40}{\frac{112}{100} \times 30}\right)$ atau setara | 1          |               |
|                         | Tercapai kerana keuntungan yang diperoleh<br>$50\,137.60 > 40\,000$                                                                   | 1          |               |

| No           | Skema Pemarkahan                                                                                                                                   | Sub Markah | Jumlah Markah |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------|---------------|
| <b>15(a)</b> | $(3t - 2)(t - 4) = 0$                                                                                                                              | 1          |               |
|              | $\frac{2}{3}, 4$                                                                                                                                   | 1          |               |
|              |                                                                                                                                                    |            |               |
|              |                                                                                                                                                    |            |               |
|              |                                                                                                                                                    |            |               |
| (b)(i)       | $a = 6(0) - 14$                                                                                                                                    | 1          |               |
|              | -14                                                                                                                                                | 1          |               |
| (ii)         | $3 * \left(\frac{7}{3}\right)^2 - 14 * \left(\frac{7}{3}\right) + 8$                                                                               | 1          |               |
|              | $-\frac{25}{3}$                                                                                                                                    | 1          |               |
|              |                                                                                                                                                    |            |               |
| <b>15(c)</b> | $s = t^3 - 7t^2 + 8t$                                                                                                                              | 1          | <b>10</b>     |
|              | $S_4 = (4)^3 - 7 * (4)^2 + 8 * (4) @ S_{\frac{2}{3}} = \left(\frac{2}{3}\right)^3 - 7 * \left(\frac{2}{3}\right)^2 + 8 * \left(\frac{2}{3}\right)$ | 1          |               |
|              | $2S_{\frac{2}{3}} +  S_{*4}  @$                                                                                                                    | 1          |               |
|              | $\left  S_{\frac{2}{3}} - S_{*0} \right  + \left  S_{*4} - S_{\frac{2}{3}} \right $                                                                |            |               |
|              | $@ \int_0^{\frac{2}{3}} v dt + \left  \int_{\frac{2}{3}}^4 v dt \right $                                                                           |            |               |
|              | $\frac{568}{27} // 21.04$                                                                                                                          | 1          |               |

