



KEMENTERIAN PENDIDIKAN MALAYSIA

i-MODUL KECEMERLANGAN SPM SMKA DAN SABK 2021

SIJIL PELAJARAN MALAYSIA 2021 (SET 2)

MATEMATIK TAMBAHAN

Kertas 2

PERATURAN PEMARKAHAN

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.

Peraturan pemarkahan ini mengandungi 10 halaman bercetak

CADANGAN PERATURAN PEMARKAHAN (SKEMA)

Kertas 2

Soalan	Butiran	Markah
1 (a)(i)	$10^2 = 6^2 + 6^2 - 2(6)(6)\cos \theta$	1
	$\theta = 112.89^\circ$	1
	$= 1.9705\text{rad}$	
1 (a)(ii)	$\frac{1}{2}6^2(1.9705) - \frac{1}{2}6^2 \sin(112.89)$	1
	$= 18.89$	1
1 (b)	$\frac{1}{2}5^2\left(\frac{\pi}{2}\right) - \frac{1}{2}5^2$	1
	$= \frac{25}{4}\pi - \frac{25}{2}$	1
	$\left(\frac{25}{4}\pi - \frac{25}{2}\right) \times 8$	1
	$= 50\pi - 100$	
		7
2 (a)	$y = -\frac{7}{2}x + 7; y = \frac{1}{2}x^2 + 3$	
	$-\frac{7}{2}x + 7 = \frac{1}{2}x^2 + 3$	1
	$x = -8 \quad x = 1$	
	$y = 35 \quad y = \frac{7}{2}$	
	$P(-8, 35) \quad Q\left(1, \frac{7}{2}\right)$	2
2 (b)	Luas trapezium – Luas B	
	$\frac{1}{2}(35 + 3.5) \times 9 - \int_{-8}^1 \frac{1}{2}x^2 + 3 dx$	2
	$= 173.5 - \left[\frac{x^3}{3} + 3x\right]_{-8}^1$	1
	$= 173.5 - 113.5$	
	$= 59.75$	1
		7

3 (a)	$ar^2 = 1405, ar^6 = 1700$ $a = \frac{1405}{r^2}, a = \frac{1700}{r^6}$ $\frac{1405}{r^2} = \frac{1700}{r^6}, r = 1.1$ $a = \frac{1405}{1.1^2}$ $a = 1161.16$ $T_{15} = 1161.61(1.1)^{14}$ $= 4409.50$	 1 1 1 1 1
3 (b)	$S_{42} = \frac{1161.16(1.1^{42} - 1)}{1.1 - 1}$ $= 62452.45$	 1 1
		7
4 (a)(i)	$\cos 2A = 1 - 2 \sin^2 A$ $\cos 2(25) = 1 - 2 (\sin 25)^2$ $= 1 - 2y^2$	 1 1
4 (a)(ii)	$\sin (A-B) = \sin A \cos B - \cos A \sin B$ $\sin (45-25) = \sin 45 \cos 25 - \cos 45 \sin 25$ $= (\sqrt{1-x^2})(\sqrt{1-y^2}) - xy$ $= (1-x^2)(1-y^2) - xy$	 1 1
4 (b)	$\frac{2}{\cos x} = 2 \left(\frac{\sin x}{\cos x} \right) - \left(\frac{\cos x}{\sin x} \right)$ $\frac{2}{\cos x} = \frac{2\sin^2 x - \cos^2 x}{\cos x \sin x}$ $\frac{2\cos x \sin x}{\cos x} = 2\sin^2 x - \cos^2 x$ $2\sin x = 2\sin^2 x - (1 - \sin^2 x)$ $2\sin x = 3\sin^2 x - 1$ $3\sin^2 x - 2\sin x - 1 = 0$ $(3\sin x + 1)(\sin x - 1) = 0$ $\sin x = -\frac{1}{3} \quad \sin x = 1$ $\alpha = 19.47 \quad \alpha = 90$ $x = 90^\circ, 199.47^\circ, 340.53^\circ$	 1 1 1 1
		8

5	$20x + 2y = 152$ $2xy + 12x^2 = 480$ $y = 76 - 10x$ $2x(76 - 10x) + 12x^2 = 480$ $152x - 20x^2 + 12x^2 = 480$ $8x^2 - 152x + 480 = 0$ $x^2 - 19x + 60 = 0$ $(x - 15)(x - 4) = 0$ $x = 15 \quad x = 4$ $y = 76 - 10(15) = -74$ $y = 76 - 10(5) = 26$ Panjang dan lebar kedai ialah 26 meter dan 8 meter masing-masing.	1 1 1 1 1 1
		6
6 (a)(i)	$g : x \rightarrow \frac{x+1}{2}$	1
6 (a)(ii)	$g^{-1}(x) = 2x - 1$ $fgg^{-1}(x) = (2x - 1)^2 + 2(2x - 1) + 4$ $= 4x^2 + 3$	1 1 1
6 (b)	$g^{-1}g(p - 3) = f(p - 4)$ $p - 3 = \frac{p - 4}{p - 4 - p}$ $-4p + 12 = p - 4$ $p = \frac{16}{5}$	1+1 1
		7
7 (a)	$\overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{BC} + \overrightarrow{CD}$ $= k\tilde{x} + h\tilde{y} + h\tilde{x}$ $= (k + h)\tilde{x} + h\tilde{y}$ $k + h = 3 \quad \frac{1 - k}{2} = h$ $h = 3 - k \quad 1 - k = 2(3 - k)$ $h = 3 - 5 \quad 1 - k = 6 - 2k$ $h = -2 \quad k = 5$	1 1 1 1+1
7 (b)	$\overrightarrow{AB} = 5\tilde{x}$ $\overrightarrow{DC} = 2\tilde{x}$ AB:DC = 5:2	1

7 (c)	$\frac{1}{2} \times 5 x \times t = 85$ $t = \frac{34}{ x }$ $\frac{1}{2} \times 3 x \times \frac{34}{ x } = 51 \text{ unit}^2$	1 1
		8
8 (a)(i)	$\mu = np$ $= 20 (0.1)$ $= 2$ $\sigma = \sqrt{npq}$ $= \sqrt{(20)(0.1)(0.9)}$ $= 1.342$	1 1
8 (a)(ii)	$P(X \geq 2) = 1 - {}^{20}C_0(0.1)^0(0.9)^{20} + {}^{20}C_1(0.1)^1(0.9)^{19}$ $= 0.6083$	1 1
8 (b)(i)	$z = \frac{X - \mu}{\sigma}$ $2 = \frac{k - 55}{12}$ $k = 79$	1
8 (b)(ii)	$\frac{70 - 55}{12} = 1.25$ $P(70 \leq X \leq 79) = P(1.25 \leq Z \leq 2)$ $= 0.0829$ $0.0829 \times 152 = 12.6$ <p>Seramai 13 murid dianggarkan mendapat markah antara 70 hingga 79.</p>	1 1
		10
9 (a)	$\frac{dy}{dx} = 3x^2 - 6x - 9$ $3(0)^2 - 6(0) - 9 = -9$	1
9 (b)	$\frac{dy}{dx} = 3x^2 - 6x - 9 = 0$ $3(x-3)(x+1) = 0$ $x = 3 \quad x = -1$ $y = (-1)^3 - 3(-1)^2 - 9(-1) + 5 = 10$ <p>Q(-1,10)</p> $\frac{d^2y}{dx^2} = 6x - 6$ $6(-1) - 6 = -12 < 0$ <p>Maka Q adalah titik maksimum.</p>	1 1
		1

9 (c)

$$y = 5^3 - 3(5)^2 - 9(5) + 5 = 10$$

$$\frac{dy}{dx} = 3x^2 - 6x - 9$$

$$\delta y \approx \frac{dy}{dx} \times \delta x$$

$$= (3(5)^2 - 6(5) - 9) \times \left(\frac{3}{100} \times 5 \right)$$

$$= 5.4$$

$$\frac{\delta y}{y} \times 100 = \frac{5.4}{10} \times 100$$

$$= 54$$

1

1

1

10

10 (a)

$\log_{10}(x+2)$	0.477	0.602	0.699	0.778	0.845
------------------	-------	-------	-------	-------	-------

$\log_{10}y$	-0.38	-0.67	-0.89	-1.08	-1.24
--------------	-------	-------	-------	-------	-------

1

1

10 (b)

Paksi dan 1 titik diplot betul

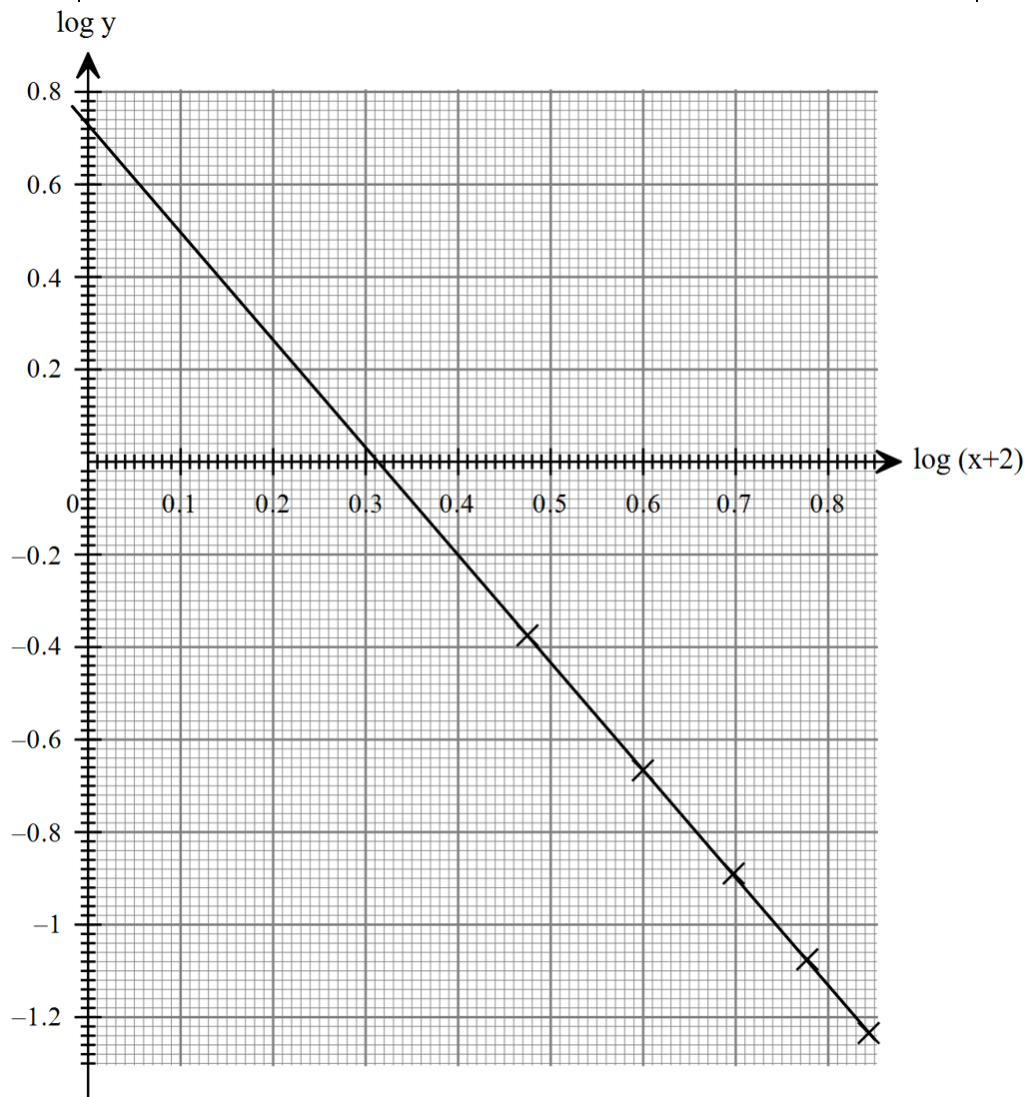
Semua titik ditanda betul

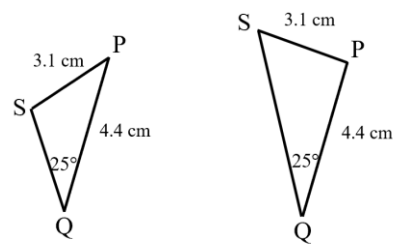
Garis lurus penyuaian terbaik

1

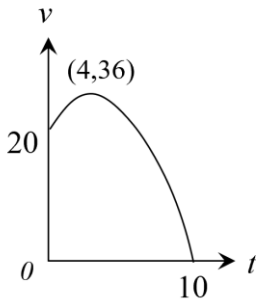
1

1



10 (c)	$\log_{10} y = \log_{10} p - q \log_{10}(x + 2)$ Pintasan- $y = \log_{10} p = 0.73$ $p = 5.37$ Kecerunan $= -q = \frac{-1.24 - (-0.38)}{0.85 - 0.48}$ $-q = -2.32$ $q = 2.32$	1 1 1 1 1
		10
11 (a)	$m = \frac{1}{6}$ $y - 8 = \frac{1}{6}(x - 3)$ $y = \frac{1}{6}x + \frac{15}{2}$	1 1
11 (b)	$F(x, y) = \left(\frac{3(3) + 1(5)}{1 + 3}, \frac{3(8) + 1(-4)}{1 + 3} \right)$ $= \left(\frac{14}{4}, \frac{20}{4} \right)$ $= \left(\frac{7}{2}, 5 \right)$	2
11 (c)	$= \frac{1}{2} \begin{vmatrix} 3 & 0 & 3/8 & 3 \\ 8 & 0 & 5 & 8 \end{vmatrix}$ $= \frac{1}{2} 13 $ $= 6.5 \text{ unit}^2$	1 1 1
11 (d)	$6 = \sqrt{(x - 5)^2 + (y - (-4))^2}$ $36 = x^2 - 10x + 25 + y^2 + 8y + 16$ $x^2 + y^2 - 10x + 8y + 5 = 0$	1 1
		10
12 (a)(i)	$10.9^2 = 4.4^2 + 12.7^2 - 2(4.4)(12.7)\cos\angle PQR$ $\angle PQR = 56.40^\circ$	1 1
12 (a)(ii)	$4.4^2 = 10.9^2 + 12.7^2 - 2(10.9)(12.7)\cos\angle PRQ$ $\angle PRQ = 19.65^\circ$	1 1
12 (b)(i)		1 1
12 (b)(ii)	$\frac{\sin PSQ}{4.4} = \frac{\sin 25}{3.1}$ $PSQ = 36.86^\circ$ dan $PSQ = 143.14^\circ$	1 1

12 (c)	$\frac{1}{2}(10.9)(12.7)\sin 19.65 + \frac{1}{2}(3.1)(4.4)\sin(180 - 25 - 143.14)$ $= 24.68$	1 1
		10
13 (a)	$\frac{3.10}{D_{19}} \times 100 = 121$ $D_{19} = 2.56$	2 1
13 (b)	$164.85 = \frac{(121 \times 50) + (106 \times 35) + (y \times 15)}{50 + 35 + 15}$ $16485 = 9760 + 15y$ $y = 448.33$	1 1
13 (c)	$129 = \frac{448.33 \times x}{129}$ $x = 28.77$	1 1
13 (d)	$I_{23/19} = \frac{130 \times 448.33}{100}$ $= 582.33$ $P_{23} = \frac{582.23 \times 10.20}{100}$ $P_{23} = 59.45$	1 1 1
		10

14 (a)(i)	$8 - 2t = 0$ $t = 4$ $v = \int 8 - 2t \, dt$ $= 8t - t^2 + c$ $v = 8t - t^2 + 20$ $v_{\max} = 8(4) - (4)^2 + 20 = 36$	1 1 1 1
14 (a)(ii)	$8t - t^2 + 20 = 0$ $t^2 - 8t - 20 = 0$ $(t - 10)(t + 2) = 0$ $t = 10 \quad t = -2$ <p>Zarah berhenti selepas $k=10$ saat.</p>	1
14 (b)	 $\int_0^{10} -t^2 + 8t + 20 \, dt$ $= \left[-\frac{t^3}{3} + \frac{8t^2}{2} + 20t \right]_0^{10}$ $= -\frac{(10)^3}{3} + \frac{8(10)^2}{2} + 20(10)$ $= 266\frac{2}{3}$	1 1 1
		10

15 (a)	I : $12x + 16y \leq 960$ II : $x > 10$ III : $y \geq 10 + x$	1 1 1
15 (b)	Paksi dan satu graf garis lurus betul Semua graf garis lurus betul Kawasan berlorek betul	1 1 1
15 (c)(i)	jumlah bilangan buku maksimum $x + y = k$ $28 + 39 = 67$	1 1
15 (c)(ii)	kos belian buku yang minimum $12x + 16y = k$ $12(11) + 16(21) = 468$	1 1
		10