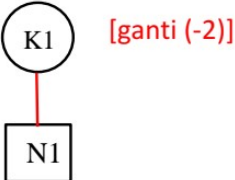
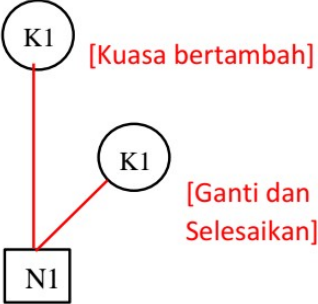


MODUL PENINGKATAN PRESTASI
TINGKATAN 5
TAHUN 2025

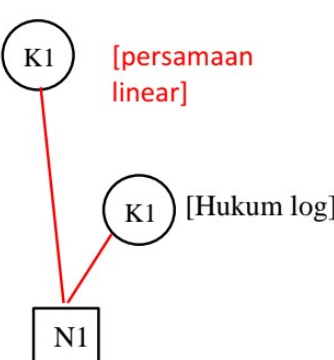
MATEMATIK TAMBAHAN
KERTAS 1
PERATURAN PEMARKAHAN

Peraturan Pemarkahan ini mengandung **18** halaman bercetak

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
1 (a)	$px^2 + 4 = 16$ $p(-2)^2 + 4 = 16$ $p = 3$ 	2	5
1 (b)	$\int (3x^2 + 4) dx$ $h(x) = \frac{*3x^{2+1}}{2+1} + 4x + c$ $-11 = (-2)^3 + 4(-2) + c \quad \& \quad c = 5$ $h(x) = x^3 + 4x + 5$ 	3	

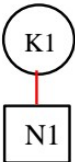
BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
2 (a) (i)	$\frac{n!}{n} = \frac{n(n-1)!}{n}$ $(n-1)!$ N1	1	7
2 (a) (ii)	$(6-1)! = 120$ N1	1	
2 (b)	$\left({}^5C_3 \times {}^6C_6\right) @ \left({}^5C_4 \times {}^6C_5\right) @ \left({}^5C_5 \times {}^6C_4\right)$ $\left({}^5C_3 \times {}^6C_6\right) + \left({}^5C_4 \times {}^6C_5\right) + \left({}^5C_5 \times {}^6C_4\right)$ $= 55$ K1 N1	2	
2 (c) (i)	${}^{11}P_9 = 19958400$ N1	1	
2 (c) (ii)	Jumlah krew, $n = 11$ Pilih/susun seorang pengemudi = ${}^3C_1 @ {}^3P_1$ Pilih dan susun 4 pendayung di kanan = ${}^2C_2 \times {}^6C_2 \times 4!$ Pilih dan susun pendayung di sebelah kiri, 4P_4 Kes 1: Susunan LRLRLRLR $= {}^3C_1 \times {}^2C_2 \times {}^6C_2 \times 4! \times {}^4P_4$ $= 25920$ Kes 2: Susunan RLRLRLRL Bilangan cara susunan: $= {}^3C_1 \times {}^2C_2 \times {}^6C_2 \times 4! \times {}^4P_4$ $= 25920$ ${}^2C_2 \times {}^6C_2 \times 4! @ {}^4P_4 @ {}^3C_1 \times {}^2C_2 \times {}^6C_2 \times 4! \times {}^4P_4$ Bilangan cara = 2×25920 $= 51840$ K1 N1	2	

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah										
3 (a)	${}^3C_0 (0.35)^0 (0.65)^3 = 0.2746 @$${}^3C_1 (0.35)^1 (0.65)^2 = 0.4436 @$${}^3C_2 (0.35)^2 (0.65)^1 = 0.2389 @$${}^3C_3 (0.35)^3 (0.65)^0 = 0.0429$ <table><tr><td>r</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>$P(X = r)$</td><td>0.2746</td><td>0.4436</td><td>0.2389</td><td>0.0429</td></tr></table> N2 Semua betul N1 Salah maksimum 2 K1 [guna rumus betul]	r	0	1	2	3	$P(X = r)$	0.2746	0.4436	0.2389	0.0429	3	6
r	0	1	2	3									
$P(X = r)$	0.2746	0.4436	0.2389	0.0429									
3 (b) (i)	$P(X \leq 2) = 1 - P(X = 3)$$= 1 - 0.0429$$= 0.9571$ K1 N1	2											
3 (b) (ii)	$P(X = 0) = 0.2746$ N1	1											

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
4	$m = -\frac{1}{2}$ $Y = mX + c$ $\log y = \left(-\frac{1}{2}\right) \log x + 1$ $\log y = \log \frac{1}{\sqrt{x}} + \log 10$ $\log y = \log \frac{10}{\sqrt{x}}$ $y = \frac{10}{\sqrt{x}}$ P1 [boleh tersirat] 	4	4

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
5	$\frac{1}{\log_{ab} b} - \frac{1}{\log_{ab} a}$ $= \frac{1}{\left(\frac{\log_a b}{\log_a ab}\right)} - \frac{1}{\left(\frac{\log_a a}{\log_a ab}\right)}$ @ $\log_b ab - \log_a ab$ @ $\frac{1}{\left(\frac{\log_b b}{\log_b ab}\right)} - \frac{1}{\left(\frac{\log_b a}{\log_b ab}\right)}$ $= \frac{\log_a ab}{\log_a b} - \frac{\log_a ab}{1}$ $= \frac{\log_a a + \log_a b}{\sqrt{5}} - \frac{\log_a a + \log_a b}{1}$ $= \frac{1 + \sqrt{5}}{\sqrt{5}} - \frac{1 + \sqrt{5}}{1}$ $= \frac{1 - 5}{\sqrt{5}}$ $= -\frac{4}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ $= -\frac{4\sqrt{5}}{5}$ K1 [Hukum log] K1 [Hukum log] K1 [Menisbahkan penyebut] N1	4	4

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
6 (a)	ALTERNATIF A <i>LHS :</i> $(\sin(90 - \beta))^2 + (\cos(90 - \beta))^2$ $= (\sin 90 \cos \beta - \cos 90 \sin \beta)^2 + (\cos 90 \cos \beta + \sin 90 \sin \beta)^2$ K1 $= ((1) \cos \beta - (0) \sin \beta)^2 + ((0) \cos \beta + (1) \sin \beta)^2$ $= \cos^2 \beta + \sin^2 \beta$ $= \sin^2 \beta + \cos^2 \beta$ $= 1 \text{ [semua kiraan di atas betul]}$ N1 ALTERNATIF B $\sin \beta = -\frac{h}{1} \quad \cos \beta = \frac{k}{1} \quad \text{[Semua kiraan betul]}$ $= -h \quad = k$ K1 Menggunakan teoram Pithagoras, $(-h)^2 + k^2 = 1^2$ $\sin^2 \beta + \cos^2 \beta = 1$ N1	2	5
6 (b)	$\frac{\sin^2 x}{1 + \cos x} = 2$ $\frac{1 - \cos^2 x}{1 + \cos x} = 2$ P1 $\frac{(1 - \cos x)(1 + \cos x)}{1 + \cos x} = 2$ $1 - \cos x = 2$ $\cos x = -1$ Ganti $\cos x = -1$ pada penyebut persamaan $\frac{\sin^2 x}{1 + \cos x}$; $1 + \cos x = 1 + (-1) = 0$ K1 $\frac{\sin^2 x}{1 + \cos x} \text{ adalah } \mathbf{tidak \text{ tertakrif }} \text{ ATAU}$ $\frac{\sin^2 x}{1 + \cos x} = 2 \text{ } \mathbf{tidak \text{ mempunyai penyelesaian }} \text{ dalam domain}$ $0 \leq x \leq 2\pi .$ [$1 + \cos x = 1 + (-1) = 0$ dan “tidak mempunyai penyelesaian” dilihat] N1	3	

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
7 (a)	$(-4)^2 - 4(3)(c) < 0$ $c > 1.333$ atau $c > \frac{4}{3}$ $C_1 = 2$ dan $C_2 = 3$ 	2	4
7 (b)	$(-4)^2 - 4(3)(1)$ $= 4 > 0$ Dua punca nyata dan berbeza 	2	

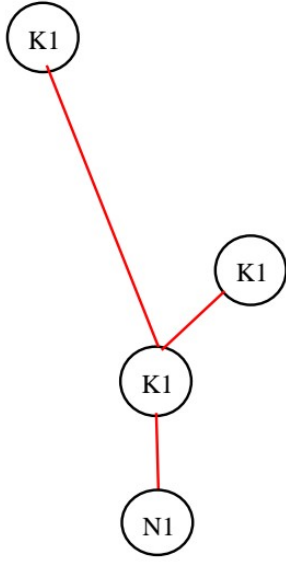
BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah																				
8 (a)	Jarak PB = $\sqrt{25+x^2}$ Jarak BC = $6-x$ Masa untuk ber kayak P ke B = $\frac{\sqrt{25+x^2}}{2}$ @ Masa untuk berjalan B ke C = $\frac{6-x}{4}$ Jumlah masa , $T = \frac{\sqrt{25+x^2}}{2} + \frac{6-x}{4}$ $T = \frac{2\sqrt{25+x^2} + 6-x}{4}$	2																					
8 (b)	$\frac{dT}{dx} = \frac{x}{2\sqrt{25+x^2}} - \frac{1}{4}$ $\frac{x}{2\sqrt{25+x^2}} - \frac{1}{4} = 0$ $x = -2.887$ (abaikan) $x = 2.887$ [kuasa berkurang] [$\frac{dT}{dx} = 0$] [both for x] <table border="1"> <tr> <td>x</td><td>$x < 2.887$ Cth $x = 0$</td><td>2.887</td><td>$x > 2.887$ Cth $x = 4$</td></tr> <tr> <td>$\frac{dT}{dx}$</td><td>$-\frac{1}{4}$</td><td>0</td><td>0.0623</td></tr> <tr> <td>Tanda $\frac{dT}{dx}$</td><td>-</td><td>0</td><td>+</td></tr> <tr> <td>Lakaran Tangen</td><td></td><td></td><td></td></tr> <tr> <td>Lakaran graf</td><td colspan="3"></td></tr> </table> [Semua 13 kotak jawapan betul] Maka, 2.89 ialah minimum $T = \frac{2\sqrt{25+2.89^2} + 6 - 2.89}{4}$ $T = 3.67$ jam	x	$x < 2.887$ Cth $x = 0$	2.887	$x > 2.887$ Cth $x = 4$	$\frac{dT}{dx}$	$-\frac{1}{4}$	0	0.0623	Tanda $\frac{dT}{dx}$	-	0	+	Lakaran Tangen				Lakaran graf				4	6
x	$x < 2.887$ Cth $x = 0$	2.887	$x > 2.887$ Cth $x = 4$																				
$\frac{dT}{dx}$	$-\frac{1}{4}$	0	0.0623																				
Tanda $\frac{dT}{dx}$	-	0	+																				
Lakaran Tangen																							
Lakaran graf																							

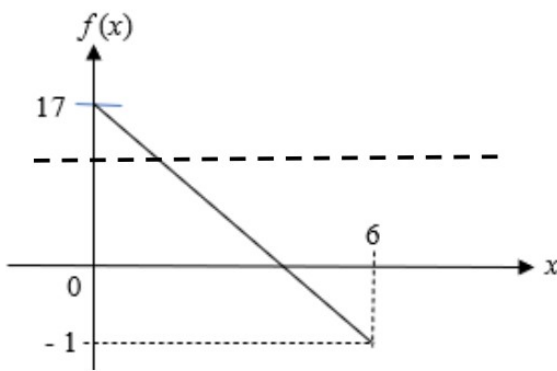
BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
9	P1 Hasil darab semua sebutan untuk hapuskan satu pemboleh ubah $x/y/z$ OR Ungkapkan x dalam sebutan y dan z @ Ungkapkan y dalam sebutan x dan z @ Ungkapkan z dalam sebutan x dan y K1 Hapuskan pemboleh ubah pertama kaedah dengan penggantian @ penghapusan. K1 Hapuskan pemboleh ubah kedua dengan penggantian @ penghapusan. N1 $x = 39$ @ $y = 33$ @ $z = -31$ N1 $y = 33$ & $z = -31$ @ $x = 39$ & $z = -31$ @ $x = 39$ & $y = 33$	5	5

CONTOH PEMARKAHAN KAEDAH PENGANTIAN		
$4x - 3y + 2z = -5$	$-(1)$	
$5x - y + 5z = 7$	$-(2)$	
$-4y + 3z + 6x = 9$	$-(3)$	
$y = 5x + 5z - 7$	$-(4)$	P1
Gantikan (4) dalam (1)		
$4x - 3(5x + 5z - 7) + 2z = -5$		K1
$-11x - 13z = -26$	@	
$x = \frac{26 - 13z}{11}$	$-(5)$	
Gantikan (4) dalam (3)		
$-4(5x + 5z - 7) + 3z + 6x = 9$		
$-14x - 17z = -19$	$-(6)$	
Gantikan (5) dalam (6)		
$-14\left(\frac{26 - 13z}{11}\right) - 17z = -19$		K1
$z = -31$		N1
$x = \frac{26 - 13(-31)}{11}$		
$x = 39$		N1
$y = 5(39) + 5(-31) - 7$		
$y = 33$		

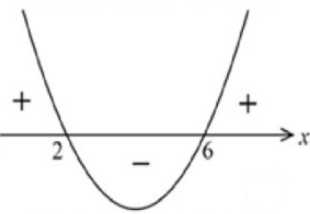
CONTOH KAEDAH PENGHAPUSAN		
$4x - 3y + 2z = -5$	...(1)	
$5x - y + 5z = 7$	...(2)	
$6x - 4y + 3z = 9$	...(3)	
(2) $\times$ 3: Hapus y		
$15x - 3y + 15z = 21$	...(4)	
$4x - 3y + 2z = -5$	...(1)	
$11x + 13z = 26$	...(5)	
(2) $\times$ 4: Hapus y		
$20x - 4y + 20z = 28$	...(6)	
$6x - 4y + 3z = 9$	...(3)	
$14x + 17z = 19$	...(7)	
$11x + 13z = 26$ atau $14x + 17z = 19$ atau setara		K1
(5) $\times$ 14: Hapus x		
$154x + 182z = 364$	...(8)	
(7) $\times$ 11		
$154x + 187z = 209$	...(9)	
(8) $-$ (9):		
$-5z = 155$		K1
$z = -31$		N1
Ganti $z = -31$ dalam (5)		
$11x + 13(-31) = 26$		
$x = 39$		N1
Ganti $x = 39$ dan $z = -31$ dalam (2)		
$5(39) - y + 5(-31) = 7$		
$y = 33$		N1

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
10 (a)	$PE = PD$ $\sqrt{(x-2)^2 + (y-3)^2} = \sqrt{(x-6)^2 + (y-9)^2}$ $2x + 3y - 26 = 0$ K1 N1	2	6
10 (b)	$M_{ED} = \frac{9-3}{6-2} = \frac{3}{2}$ & $y - (-4) = \frac{3}{2}(x - 4) \quad @ \quad -4 = \frac{3}{2}(4) + c$ $c = -10$ $y = \frac{3}{2}x - 10$ K1 [Kec. ED & Selesaikan] N1	2	
10 (c)	$2x + 3\left(\frac{3}{2}x - 10\right) - 26 = 0$ $x = \frac{112}{13}$ $y = \frac{3}{2}\left(\frac{112}{13}\right) - 10 = \frac{38}{13}$ $B\left(\frac{112}{13}, \frac{38}{13}\right)$ [Ganti psmn. AC dalam lokus titik P] K1 N1	2	

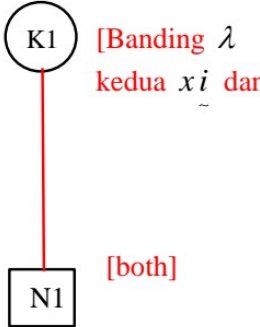
BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
11 (a)	$\angle AOB = 60^\circ$ N1	2	5
11 (b)	Luas sektor AOB , $L_1 = \frac{1}{2} r^2 \theta$ $= \frac{1}{2} \times (6)^2 \times \frac{\pi}{3}$ $= 6\pi \text{ m}^2$ Luas segi tiga AOB , $L_2 = \frac{1}{2} r^2 \sin \theta$ $= \frac{1}{2} \times (6)^2 \times \sin 60^\circ$ $= 15.59$ Luas tembereng ABT = $6\pi - 15.59$ $= *3.260 \text{ m}^2$ *Terima jawapan 3.258 - 3.264 	4	

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
12 (a)	$gf(x) = x$ $gff^{-1}(x) = f^{-1}(x)$ $gff^{-1}(x) = g(x)$ maka, $g(x) = f^{-1}(x)$ $f^{-1}(x) = \frac{p-x}{3}$ $g(2) = \frac{p-2}{3}$ $5 = \frac{p-2}{3}$ $p = 17$ P1 K1 K1 N1	4	7
12 (b)	 - Lakaran graf garis lurus dalam domain $0 \leq x \leq 6$. K1 Garis mengufuk hanya memotong pada satu titik. K1 - Garis mengufuk hanya memotong satu titik ATAU - Jenis fungsi graf ialah hubungan satu dengan satu. DAN - Fungsi songsang bagi $f(x)$ adalah wujud N1	3	

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
13 (a)	$r_1 = \frac{m^4}{m^2} \quad @ \quad r_2 = \frac{m^6}{m^4} \quad @ \quad r_3 = \frac{m^8}{m^6}$ $= m^2 \quad = m^2 \quad = m^2$ P1 $r_1 = r_2 = r_3 = m^2 \quad \&$ N1 Janjang geometri	2	8
13 (b)	A : $a = 5200$ & $r = 0.88$ @ B : $a = 4500$ & $r = 0.91$ P1 [Boleh tersirat] $T_n(A) < T_n(B)$ $(5200)(0.88)^{n-1} < (4500)(0.91)^{n-1}$ $\frac{5200}{4500} < \left(\frac{0.91}{0.88}\right)^{n-1}$ $\log_{10}(1.1556) < \log_{10}(1.0341)^{n-1}$ $\log_{10}(1.1556) < (n-1)\log_{10}(1.0341)$ $n-1 > 4.301$ $n > 5.301$ $n = 6$ Tahun ke 2031 K1 K1 K1 N1 N1 [Hukum log] [$n > 5.301$]	6	

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
14 (a)	$U(x) = -2x^2 + 16x - 24$ $U(x) \geq 0$ $-2x^2 + 16x - 24 \geq 0$ $x^2 - 8x + 12 \leq 0$ $(x-2)(x-6) \leq 0$  $\text{RM } 2000 \leq x \leq \text{RM } 6000$ @ $2 \leq x \leq 6$ P1 [≥ 0 dilihat] K1 K1 N1	4	
14 (b)	ALTERNATIF A (CTS) $U(x) = -2(x^2 - 8x + 12)$ $U(x) = -2\left(x^2 - 8x + \left(\frac{-8}{2}\right)^2 - \left(\frac{-8}{2}\right)^2 + 12\right)$ K1 $U(x) = -2(x^2 - 8x + (-4)^2 - (-4)^2 + 12)$ $U(x) = -2[(x-4)^2 - 4]$ $U(x) = -2(x-4)^2 + 8$ N1 Harga optimum = RM 4000/ 4 ribu N1 Keuntungan maksimum = RM 8,000,000 / 8 JUTA N1 ALTERNATIF B (garis simetri) $x = -\frac{16}{2(-2)}$ K1 Harga optimum = RM 4000 N1 $U(4) = -2((4)^2 - 8(4) + 12)$ K1 Keuntungan maksimum = RM 8,000,000 N1	4	8

BIL	SKEMA PEMARKAHAN	Sub Markah	Jumlah Markah
15 (a) (i)	$\vec{RS} = \vec{RO} + \vec{OS}$ P1 [Guna hukum segi tiga] $\vec{RS} = -\vec{OR} + \vec{OS}$ $\vec{RS} = -2\hat{x} + 3\hat{x} + 3\hat{y}$ $\vec{RS} = \hat{x} + 3\hat{y}$ N1	2	8
15 (a) (ii)	$\vec{OP} = \vec{OA} + \vec{AP}$ $= 4\hat{x} + 6\hat{y}$ N1	1	
15 (b)	ALTERNATIF A $\vec{OB} = 4\hat{x} + 4\hat{y}$ P1 $\vec{OS} = 3\hat{x} + 3\hat{y}$ $mOB = nOS$ $m(4(\hat{x} + \hat{y})) = n(3(\hat{x} + \hat{y}))$ $4m\hat{x} + 4m\hat{y} = 3n\hat{x} + 3n\hat{y}$ $4m = 3n$ $\frac{m}{n} = \frac{3}{4}$ $m : n = 3 : 4$ K1 [Selesai sehingga $\frac{m}{n} = \frac{3}{4}$] N1 ALTERNATIF B $\vec{OB} = 4\hat{x} + 4\hat{y}$ P1 $\vec{OS} = 3\hat{x} + 3\hat{y}$ $\vec{OS} = \lambda \vec{OB}$ $3\hat{x} + 3\hat{y} = \lambda(4\hat{x} + 4\hat{y})$ $\lambda = \frac{3}{4}$ $m = \frac{3}{4}n$ $m : n = 3 : 4$ K1 [Selesai sehingga $\lambda = \frac{3}{4}$] N1	3	

15 (c)	ALTERNATIF A $\vec{RP} = \vec{RO} + \vec{OP}$ $\vec{RP} = -2\hat{x} + 4\hat{x} + 6\hat{y}$ $\vec{RP} = 2\hat{x} + 6\hat{y}$ $\vec{RP} = \lambda \vec{RS}$ $2\hat{x} + 6\hat{y} = \lambda(\hat{x} + 3\hat{y})$ $\lambda = 2 \quad \& \quad 6 = 3\lambda$ $\lambda = 2$ $\vec{RP} = 2\vec{RS}$ R, S dan P berada dalam satu garis lurus. ALTERNATIF B $\vec{RP} = \vec{RO} + \vec{OP}$ $\vec{RP} = -2\hat{x} + 4\hat{x} + 6\hat{y}$ $\vec{RP} = 2\hat{x} + 6\hat{y}$ $\vec{RP} = 2(\hat{x} + 3\hat{y})$ $\vec{RP} = 2\vec{RS}$ R, S dan P berada dalam satu garis lurus dengan $\lambda = 2$ SS-1 jika tatatanda vektor langsung tidak digunakan 	2	
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TAMAT