PROGRAM GEMPUR KECEMERLANGAN
SIJIL PELAJARAN MALAYSIA 2020
NEGERI PERLIS

SIJIL PELAJARAN MALAYSIA 2020 **3472/1(PP)**
MATEMATIK TAMBAHAN
Kertas 1
Peraturan Pemarkahan
Oktober

UNTUK KEGUNAAN PEMERIKSA SAHAJA

Peraturan pemarkahan ini mengandungi 10 halaman bercetak

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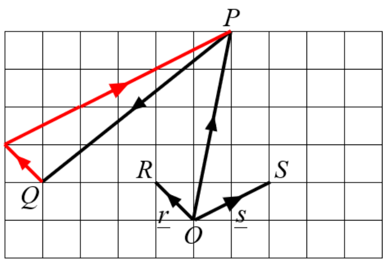
No.	Solution and Mark Scheme		Sub Marks	Total Marks
1(a)	$\dfrac{5+2+5+2+2+6+x+y}{8}=4$ $\dfrac{22+x+y}{8}=4$ $\therefore x+y=10 \quad (\text{Proved})$	B1 : $\dfrac{5+2+5+2+2+6+x+y}{8}=4$ $x+y=10 \quad (\text{Proved})$	**1**	
(b)(i)	$x=y=\{x=5,\ y=5\}$ $\therefore$ Mode $=5$	5	**1**	
(ii)	$x\neq y=\begin{Bmatrix} x: 0,\ 1,\ 2,\ 3,\ 4,\ 6,\ 7,\ 8,\ 9,\ 10 \\ y: 10,\ 9,\ 8,\ 7,\ 6,\ 4,\ 3,\ 2,\ 1,\ 0 \end{Bmatrix}$ $\therefore$ Mode $=2$	2	**1**	**3**
2(a)	New range, $10-1=9$ $\therefore$ Range increase from 7 to 9	Increase from 7 to 9	**1**	
(b)	$\therefore$ Interquartile range do not change	Do not change	**1**	
(c)	$\therefore$ Variance will decrease as data dispersion decreases	Decrease	**1**	**3**
3(a)	${}^5P_3=\dfrac{5!}{(5-3)!}=\dfrac{5!}{2!}$ $=\dfrac{5\times4\times3\times \cancel{2\times1}}{\cancel{2\times1}}=60$	60	**1**	
(b)	${}^5C_3=\dfrac{5!}{(5-3)!\,3!}=\dfrac{5!}{2!\,3!}$ $=\dfrac{5\times4\times\cancel{3\times2\times1}}{(2\times1)(\cancel{3\times2\times1})}=10$	10	**1**	
	${}^5P_3={}^5C_3\times3!$ $\dfrac{5!}{2!}=\dfrac{5!}{2!\,\cancel{3!}}(\cancel{3!})$ $\therefore \dfrac{5!}{2!}=\dfrac{5!}{2!}$	B1 : $\dfrac{5\times4\times3\times2\times1}{2\times1}$ *or* $\dfrac{5\times4\times3\times2\times1}{(2\times1)(3\times2\times1)}$ B1 : $\dfrac{5!}{2!\,3!}(3!)$	**1** **1**	**4**

No.	Solution and Mark Scheme		Sub Marks	Total Marks
4(*a*)	$Z=\left\{\frac{1}{4},\frac{1}{6},\frac{1}{8},\frac{3}{4},\frac{3}{6},\frac{3}{8},\frac{5}{4},\frac{5}{6},\frac{5}{8}\right\};\ n(Z)=9$	B1 : $Z=\left\{\frac{1}{4},\frac{1}{6},\frac{1}{8},\frac{3}{4},\frac{3}{6},\frac{3}{8},\frac{5}{4},\frac{5}{6},\frac{5}{8}\right\}$	**1**	
	$A\in Z=\left\{A<\frac{1}{3}:\frac{1}{4},\frac{1}{6},\frac{1}{8}\right\};\ n(A)=3$ $\therefore P(A)=\frac{3}{9}=\frac{1}{3}$	$\frac{1}{3}$	**1**	
(*b*)	$B\in Z=\left\{B>\frac{3}{4}:\frac{5}{4},\frac{5}{6}\right\};\ n(B)=2$ $\therefore P(B)=\frac{2}{9}$	$\frac{2}{9}$	**1**	
(*c*)	$P(A\cup B)=P(A)+P(B)$ $\therefore P(A\cup B)=\frac{3}{9}+\frac{2}{9}=\frac{5}{9}$	$\frac{5}{9}$	**1**	**4**
5(*a*)	$P(k\le Z\le 0)=0.5-(1-0.76)=0.26$	0.26	**1**	
(*b*)	$\sigma=15$; Mean $=\mu$; $k=-0.707$ $\frac{57.7-\mu}{15}=-0.707$ $\therefore \mu=68.305$	68.305 B1 : $\frac{57.7-\mu}{15}=-0.707$	**2**	**3**
6(*a*)	$m_1\times m_2=-1$ $3\times q=-1$ $\therefore q=-\frac{1}{3}$	$-\frac{1}{3}$	**1**	
(*b*)	$y_1=3x+4$; $y_2=-\frac{1}{3}x-6$ $y_1=y_2$: $3x+4=-\frac{1}{3}x-6$ $10x=-30$ $x=-3$ $y=-5$ $\therefore F(-3,-5)$	$(-3,-5)$ B1 : $10x=-30$ *or* $\frac{10}{3}y=-\frac{50}{3}$	**2**	**3**

No.	Solution and Mark Scheme		Sub Marks	Total Marks
7(*a*)	$P(6, 0)$; $Q(0, -8)$ $\therefore$ Gradient of $PQ = \frac{0-(-8)}{6-0} = \frac{4}{3}$	$\frac{4}{3}$	1	
(*b*)	Midpoint of $PQ = (3, -4)$ $m_1 \times m_2 = -1$ $\frac{4}{3} \times m_2 = -1$ $m_2 = -\frac{3}{4}$ $y-(-4) = -\frac{3}{4}(x-3)$ $\therefore y = -\frac{3}{4}x - \frac{7}{4}$	$y = -\frac{3}{4}x - \frac{7}{4}$ B1 : $y-(-4) = *-\frac{3}{4}(x-3)$	2	3
8(*a*)	$\therefore \lvert \overrightarrow{OP} \rvert = \sqrt{1^2+5^2} = \sqrt{26}$ // 5.099	$\sqrt{26}$ // 5.099	1	
(*b*)	 $\therefore \overrightarrow{PQ} = -\underline{r} - 3\underline{s}$	$-\underline{r} - 3\underline{s}$	1	2
9	$\overrightarrow{PR} = \overrightarrow{PQ} + \overrightarrow{QR}$ $= \underline{m} + (p-3)\underline{m}$ $= (p-2)\underline{m}$ $\overrightarrow{PQ} = \frac{2}{3}\overrightarrow{PR}$ $\underline{m} = \frac{2}{3}(p-2)\underline{m}$ $1 = \frac{2}{3}(p-2)$ $\therefore p = \frac{7}{2}$	$\frac{7}{2}$ B2 : $1 = \frac{2}{3}(p-2)$ B1 : $\overrightarrow{PR} = (p-2)\underline{m}$	3	3
10(*a*)	$\therefore$ Codomain $= \{a, b, c\}$	Codomain $= \{a, b, c\}$	1	
(*b*)	The relation is not a function because object p has more than one images in the codomain.	Not a function Object p has more than one images in the codomain.	1 1	2

No.	Solution and Mark Scheme		Sub Marks	Total Marks
11(*a*)	Let $f(x)=y$ Then $f^{-1}(y)=x$ $y-7=x$ $y=x+7$ $f(x)=x+7$ $\therefore f(5)=12$	12	**1**	
(*b*)	$gf(x)=(x+7)^2+9(x+7)-25$ $gf(x)=x^2+14x+49+9x+63-25$ $\therefore gf(x)=x^2+23x+87$	$x^2+23x+87$ B1 : $(x+7)^2+9(x+7)-25$	**2**	**3**
12(*a*)	$g(x)=8x-x^2$ $g(x)=-x^2+8x$ $=-\left[x^2-8x+\left(-\frac{8}{2}\right)^2-\left(-\frac{8}{2}\right)^2\right]$ $=-(x-4)^2+16$ $\therefore V(4,16)$	$(4,16)$ B1 : $-\left[x^2-8x+\left(-\frac{8}{2}\right)^2-\left(-\frac{8}{2}\right)^2\right]$	**2**	
(*b*)	$h(x)=a(x-4)^2+32$ $0=a(8-4)^2+32$ $a=-2$ $\therefore h(x)=-2(x-4)^2+32$	$-2(x-4)^2+32$ B1 : $a(8-4)^2+32=0$	**2**	**4**
13	Use b^2-4ac $=(-2mn)^2-4(m^2+1)(n^2)$ $=-4n^2$ $\therefore b^2-4ac<0$ OR $-4n^2$ $\therefore$ Does not have any real roots for any value of *m* and of *n*.	$-4n^2$ *and* $b^2-4ac<0$ *or* $-4n^2$ *and* Does not have any real roots for any value of *m* and of *n*. B1 : $(-2mn)^2-4(m^2+1)(n^2)$	**2**	**2**
14	Substitute, $x=-2$ $(-2)^2+2p-16=0$ $2p=12$ $\therefore p=6$ $x^2-6x-16\le 0$ $(x+2)(x-8)\le 0$ $\therefore q=8$	$p=6$ *and* $q=8$ B2 : $p=6$ *or* $q=8$ B1 : $(-2)^2+2p-16=0$	**3**	**3**

No.	Solution and Mark Scheme	Sub Marks	Total Marks
15(*a*)	SOR : $\alpha+\beta=-\dfrac{b}{a}$ POR : $\alpha+\beta$ $\alpha^2+\beta^2=(\alpha+\beta)^2-2\alpha\beta$ $=\left(-\dfrac{b}{a}\right)^2-2\left(\dfrac{c}{a}\right)$ $\therefore \alpha^2+\beta^2=\dfrac{b^2-2ac}{a^2}$ $\dfrac{b^2-2ac}{a^2}$	**1**	
(*b*)	SOR : $\alpha^2+\beta^2=\dfrac{b^2-2ac}{a^2}$ POR : $\alpha^2\beta^2=\left(\dfrac{c}{a}\right)^2=\dfrac{c^2}{a^2}$ $x^2-\left(\dfrac{b^2-2ac}{a^2}\right)x+\dfrac{c^2}{a^2}=0$ $a^2x^2-(b^2-2ac)x+c^2=0$ $\therefore a^2x^2+(2ac-b^2)x+c^2=0$ $a^2x^2+(2ac-b^2)x+c^2=0$ B1 : $x^2-{}^*\left(\dfrac{b^2-2ac}{a^2}\right)x+\dfrac{c^2}{a^2}=0$	**2**	**3**
16	$y=\dfrac{4}{x}+\dfrac{5x}{2}$ $\dfrac{dy}{dx}=-\dfrac{4}{x^2}+\dfrac{5}{2}$ Gradient of tangent at point (1, 5) $\dfrac{dy}{dx}=-\dfrac{4}{1^2}+\dfrac{5}{2}=-\dfrac{3}{2}$ $y-5=-\dfrac{3}{2}(x-1)$ $\therefore y=-\dfrac{3}{2}x+\dfrac{13}{2}$ $y=-\dfrac{3}{2}x+\dfrac{13}{2}$ B2 : $y-5=-\dfrac{3}{2}(x-1)$ *or* equivalent B1 : Find $\dfrac{dy}{dx}$ and substitute $x=1$ $-\dfrac{3}{2}$	**3**	**3**
17	$2\log_y x=\dfrac{8}{\log_y x}$ $(\log_y x)^2=4$ $\log_y x=2$ $\log_y x=2\log_y y$ $\log_y x=\log_y y^2$ $\log_y x=2$ $\therefore x=y^2$ $x=y^2$ B2 : $\log_y x=2$ B1 : Change to base y $2\log_y x=\dfrac{8}{\log_y x}$	**3**	**3**

No.	Solution and Mark Scheme	Sub Marks	Total Marks
18	$16^m = 4^{m+1} - 4$ $\left(4^2\right)^m = \left(4^m\right)(4) - 4$ $\left(4^m\right)^2 - 4\left(4^m\right) + 4 = 0$ $\left(4^m - 2\right)\left(4^m - 2\right) = 0$ $4^m - 2 = 0$ $4^m = 2$ $2^{2m} = 2$ $2m = 1$ $\therefore m = \frac{1}{2}$ $\frac{1}{2}$ B2 : Use factorisation $\left(4^m - 2\right)\left(4^m - 2\right) = 0$ B1 : Change to base 4 *or* equivalent $\left(4^2\right)^m = \left(4^m\right)(4) - 4$	**3**	**3**
19	$2\cos\theta - \sin\theta = 2\sin\theta - 2\cos\theta$ $4\cos\theta = 3\sin\theta$ $\frac{\sin\theta}{\cos\theta} = \frac{4}{3}$ $\tan\theta = \frac{4}{3}$ (Proved) $\tan\theta = \frac{4}{3}$ (Proved) B2 : $2\cos\theta - \sin\theta = 2\sin\theta - 2\cos\theta$ B1 : $2\cos\theta - \sin\theta$ *or* $2\sin\theta - 2\cos\theta$	**3**	**3**
20(*a*)	$S_5 = \frac{5}{2}\left[3(5) + 1\right]$ $\therefore S_5 = 40$ 40	**1**	
(*b*)	$T_5 = S_5 - S_4$ $S_4 = \frac{4}{2}\left[3(4) + 1\right]$ $= 26$ $T_5 = 40 - 26$ $\therefore T_5 = 14$ 14 B1 : Find S_4 and use $T_5 = S_5 - S_4$ $S_4 = \frac{4}{2}\left[3(4) + 1\right]$ *and* $T_5 = 40 - 26$	**2**	**3**

No.	Solution and Mark Scheme		Sub Marks	Total Marks
21(*a*)	$\log_2 y = \log_2 \frac{8^x}{h}$ $\log_2 y = \log_2 8^x - \log_2 h$ $\log_2 y = \log_2 2^{3x} - \log_2 h$ $\log_2 y = \log_2 8^x - \log_2 h$ $\therefore \log_2 y = 3x - \log_2 h$	$\log_2 y = 3x - \log_2 h$	1	
(*b*)	$\frac{m-2}{4-0} = 3$ $\therefore m = 14$ $-\log_2 h = 2$ $\log_2 h = \log_2 2^{-2}$ $\log_2 h = \log_2 \left(\frac{1}{4}\right)$ $\therefore h = \frac{1}{4}$	$m = 14$ *and* $h = \frac{1}{4}$ B2 : $m = 14$ *or* $h = \frac{1}{4}$ B1 : Use $m = {*3}$ *or* $c = -\log_2 h$ $\frac{m-2}{4-0} = 3$ *or* $-\log_2 h = 2$	3	4
22	$y = x\sqrt{1+x^2} = x(1+x^2)^{\frac{1}{2}}$ Let $u = x$, then $\frac{du}{dx} = 1$ Let $v = (1+x^2)^{\frac{1}{2}}$, then $\frac{dv}{dx} = \frac{1}{2}(1+x^2)^{-\frac{1}{2}}(2x) = \frac{x}{(1+x^2)^{\frac{1}{2}}}$ $\frac{dy}{dx} = x\left(\frac{x}{(1+x^2)^{\frac{1}{2}}}\right) + (1+x^2)^{\frac{1}{2}}(1)$ $\frac{dy}{dx} = \frac{1+2x^2}{(1+x^2)^{\frac{1}{2}}} = \frac{1+2x^2}{\sqrt{1+x^2}}$ When $x = \sqrt{3}$, $\frac{dy}{dx} = \frac{1+2(\sqrt{3})^2}{\sqrt{1+(\sqrt{3})^2}} = \frac{1+2(3)}{\sqrt{1+3}}$ $\therefore \frac{dy}{dx} = \frac{7}{2}$ // $3\frac{1}{2}$	$\frac{1+2x^2}{\sqrt{1+x^2}}$ B1 : $x\left(\frac{x}{(1+x^2)^{\frac{1}{2}}}\right) + (1+x^2)^{\frac{1}{2}}(1)$ $\frac{7}{2}$ // $3\frac{1}{2}$ B1 : $\frac{1+2(\sqrt{3})^2}{\sqrt{1+(\sqrt{3})^2}}$	2 2	4

No.	Solution and Mark Scheme	Sub Marks	Total Marks
23	$\dfrac{3x^2-4\sqrt{x}}{x}=3x-4x^{-\frac{1}{2}}$ $\dfrac{d}{dx}\left(3x-4x^{-\frac{1}{2}}\right)=3-\left(-\dfrac{1}{2}\right)4x^{-\frac{3}{2}}=3+2x^{-\frac{3}{2}}$ $\left(3+2x^{-\frac{3}{2}}\right)\times\left(\dfrac{x^2}{x^2}\right)=3\left(\dfrac{x^2}{x^2}\right)+2x^{-\frac{3}{2}}\left(\dfrac{x^2}{x^2}\right)$ $\therefore \dfrac{d}{dx}\left(3x-4x^{-\frac{1}{2}}\right)=\dfrac{3x^2+2\sqrt{x}}{x^2}$ $\int_1^9 \dfrac{3x^2+2\sqrt{x}}{2x^2}\,dx$ $=\dfrac{1}{2}\int_1^9 \dfrac{3x^2+2\sqrt{x}}{x^2}\,dx=\dfrac{1}{2}\left[\dfrac{3x^2-4\sqrt{x}}{x}\right]_1^9$ $=\dfrac{1}{2}\left[\left(\dfrac{3(9)^2-4\sqrt{9}}{9}\right)-\left(\dfrac{3(1)^2-4\sqrt{1}}{1}\right)\right]$ $=\dfrac{1}{2}\left[\dfrac{231}{9}-(-1)\right]$ $\therefore \int_1^9 \dfrac{3x^2+2\sqrt{x}}{2x^2}\,dx=\dfrac{40}{3}$ // $13\dfrac{1}{3}$ $3+2x^{-\frac{3}{2}}$ B1 : $3(1)-\left(-\dfrac{1}{2}\right)4x^{-\frac{1}{2}-1}$ $\dfrac{40}{3}$ // $13\dfrac{1}{3}$ B1 : $\dfrac{1}{2}\left[\left(\dfrac{3(9)^2-4\sqrt{9}}{9}\right)-\left(\dfrac{3(1)^2-4\sqrt{1}}{1}\right)\right]$	2 2	4
24	$5\tan^2 x=\sec^2 x+3\tan x$ $5\tan^2 x=(1+\tan^2 x)+3\tan x$ $4\tan^2 x-3\tan x-1=0$ $(4\tan x+1)(\tan x-1)=0$ $4\tan x+1=0$ $\tan x-1=0$ $\tan x=-\dfrac{1}{4}$ $\tan x=1$ $\alpha=14.04^\circ$ (Quad. II & IV) $\alpha=45^\circ$ (Quad. I & III) $\therefore x=45^\circ, 225^\circ, 165.96^\circ, 345.94^\circ$ $45^\circ, 225^\circ, 165.96^\circ, 345.94^\circ$ B2 : $\alpha=14.04^\circ$ *or* $\alpha=45^\circ$ B1 : Use $\sec^2 x=1+\tan^2 x$ $5\tan^2 x=(1+\tan^2 x)+3\tan x$	3	3

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No.	Solution and Mark Scheme		Sub Marks	Total Marks
25(*a*)	$75^\circ \times \frac{\pi}{180^\circ} = 1.309\,\text{rad}$ Area of the shaded region, $13.09 = \frac{1}{2}\left[(3k)^2 - (2k)^2\right](1.309)$ $13.09 = \frac{6.545k^2}{2}$ $k^2 = 4$ $\therefore k = 2$	2 B1 : $13.09 = \frac{1}{2}\left[(3k)^2 - (2k)^2\right](*1.309)$	**2**	
(*b*)	Perimeter of the shaded region, $= 2 + 2 + 6(1.309) + 4(1.309)$ $= 17.09\,\text{cm}$	17.09 B1 : $2 + 2 + 6(*1.309) + 4(*1.309)$	**2**	**4**

PERATURAN PEMARKAHAN TAMAT

