SPM 2019

MATEMATIK TAMBAHAN
KERTAS 2

UNTUK KEGUNAAN PEMERIKSA SAHAJA

SKEMA
PEMARKAHAN

MARKS SCHEME ADDITIONAL MATHEMATICS MODULE 2019

NO	SOLUTION	SUB MARKS	MARKS
1.	$m = 2n - 1$ $\qquad$ or $\quad n = \dfrac{m+1}{2}$	K1	
	$n(2n-1) + 4(2n-1) = 3 - 2n^2$ $\qquad$ $m\left(\dfrac{m+1}{2}\right) + 4m = 3 - 2\left(\dfrac{m+1}{2}\right)^2$	K1	
	$n = \dfrac{-7 \pm \sqrt{7^2 - 4(4)(-7)}}{2(4)}$ $\qquad$ $n = \dfrac{-11 \pm \sqrt{11^2 - 4(2)(-5)}^{\,2}}{2(2)}$	K1	5
	$n = 0.7111,\ -2.461$ $\qquad\qquad$ $m = 0.4221,\ m = -5.922$	N1	
	$m = 0.4222,\ -5.922$ $\qquad\qquad$ $n = 0.7111,\ n = -2.461$	N1	
2(a)	$\dfrac{2\sin x\, kos\, x}{1 - (1 - 2\sin^2 x)}$	K1	
	$= \dfrac{kos\, x}{\sin x}$		
	$= \cot x$	N1	
(b)			8
	Shape and cycle	P1	
	Amplitude	P1	
	Shipted	P1	
	$y = \dfrac{3x}{4\pi} - 1$	N1	
	Draw straight line $y = \dfrac{3x}{4\pi} - 1$	K1	
	No of solutions: 2	N1	

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3(a)	$2\pi j, 2\pi(j+1), 2\pi(j+2),...$ or $\pi d, \pi(d+2), \pi(d+4),...$	P1	
	$\dfrac{10}{2}\left[2(\pi d)+9(2\pi)\right]=125\pi$ OR $\dfrac{10}{2}\left[2(2\pi r)+9(2\pi)\right]=125\pi$	K1	
	diameter $= 3.5$ cm	N1	6
(b)	$d = 2\pi$	P1	
	$3.5\pi + (n-1)(2\pi) = 19.5\pi$	K1	
	$n = 9$, tidak mencukupi /not enough (Both)	N1	
4.(a)	$p = 0.25$ or $q = 0.75$		
	$P(X=3) = {}^{10}C_3 (0.25)^3 (0.75)^7$	K1	
	0.2503	N1	
(b) (i)	$P(X>60) = P\left(Z > \dfrac{60-54}{12}\right)$	K1	
	$= 0.3085$	N1	7
(ii)	0.524 or -0.524	P1	
	$\dfrac{m-54}{12} = -0.524$	K1	
	$m = 47.71$	N1	
5(a)(i)	$\overrightarrow{RB} = \overrightarrow{RC} + \overrightarrow{CB}$	P1	
	$3\underline{a} - 6\underline{b}$	N1	
(ii)	$10a - 4b$	N1	
(b)	$\overrightarrow{RQ} = 3m\underline{a} - 6m\underline{b}$	K1	
	$\overrightarrow{QP} = -5n\underline{a} - 4n\underline{b}$	K1	8
	$-5n\underline{a} - 4n\underline{b} = (6m-4)\underline{b} - (3m+2)\underline{a}$	K1	
	$3m+2 = 5n$ @ $6m-4 = -4n$	K1	
	$m = \dfrac{2}{7}$, $n = \dfrac{4}{7}$ (both)	N1	

6	$y^2 = -5y + 14$	K1 N1	
	$A(4,2)$		
	$\pi\left[\dfrac{x^2}{2}\right]_0^4$ or $\dfrac{1}{3}\pi(2)^2(10)$	K1	
	$\pi\left[\dfrac{(4)^2}{2} - \dfrac{0^2}{2}\right]$	K1	6
	$\pi\left[\dfrac{(4)^2}{2} - \dfrac{0^2}{2}\right] + \dfrac{1}{3}\pi(2)^2(10)$	K1	
	$\dfrac{64}{3}\pi$, Success (both)	N1	
7	REFER TO THE GRAPH		10
8(a)	$\dfrac{dy}{dx} = 3ax^2 + 2bx$	K1 K1	
	$0 = 3a(1)^2 + 2b$		
	$2 = a(1)^3 + b(1)^2$	N1	
	$a = -4,\ b = 6$ (both)		
(b)(i)	$\displaystyle\int_{-2}^{2}\left(4 - x^2\right)dx$		
	$\left[4x - \dfrac{x^3}{3}\right]_{-2}^{2}$	K1	10
	$\left(4(2) - \dfrac{2^3}{3}\right) - \left(4(-2) - \dfrac{(-2)^3}{3}\right)$	K1	
	$10\dfrac{2}{3}$	N1	

(ii)	$\pi\left[4y-\dfrac{y^2}{2}\right]_0^4$ or $\dfrac{1}{3}\pi(2)^2(4)$	K1	
	$\pi\left[(4(4)-\dfrac{4^2}{2})-0\right]$	K1	
	$\pi\left[(4(4)-\dfrac{4^2}{2})-0\right]-\dfrac{16}{3}\pi$	K1	
	$\dfrac{8}{3}\pi$	N1	
9(a)	$22, 27, 32, 37, 42$	P1	
	$32.6 = \dfrac{22(10)+27(22)+32(29)+37(p)+42(15)}{10+22+29+p+15}$	K1	
	$p = 24$	N1	
(b)	$\left(\dfrac{22^2(10)+27^2(22)+32^2(29)+37^2(\overset{*}{}24)+42^2(15)}{10+22+29+24+15}-(32.6)^2\right)$	K1K1	
	36.14	N1	10
(c)	$L_{K1}=24.5$ or $L_{K3}=34.5$	P1	
	$K_1 = 24.5+\left(\dfrac{\frac{1}{4}(100)-10}{22}\right)(5)$ or $K_3 = 34.5+\left(\dfrac{\frac{3}{4}(100)-61}{24}\right)(5)$	K1	
	$K_1 = 27.909$ $K_3 = 37.417$		
	$Interquartile\ range = 37.417 - 27.909$	K1	
	$= 9.508$	N1	
10 (a)	Area of OPQ $=\dfrac{1}{2}\begin{vmatrix}0 & -3 & 6 & 0\\0 & 4 & -2 & 0\end{vmatrix}$ or equivalent		
	$=\dfrac{1}{2}\left|(0)(4)+(-3)(-2)+(6)(0)-(0)(-2)-(6)(4)-(-3)(0)\right|$	K1	
	$=\dfrac{1}{2}\left|-18\right|$		
	$= 9$ unit^2	N1	

10 (b)	$x = \dfrac{(-3)(2) + (6)(3)}{3+2}$ or $y = \dfrac{(4)(2) + (-2)(3)}{3+2}$	K1	10
	$R\left(\dfrac{12}{5}, \dfrac{2}{5}\right)$	N1	
c (i)	$TP = 2TQ$		
	$\sqrt{(x+3)^2 + (y-4)^2} = 2\sqrt{(x-6)^2 + (y+2)^2}$	K1 K1	
	$3x^2 + 3y^2 - 54x + 24y + 135 = 0$		
	$x^2 + y^2 - 18x + 8y + 45 = 0$	N1	
	$x = 0, \quad y^2 + 8y + 45 = 0$	K1	
(ii)	$(8)^2 - 4(1)(45)$ *[use $b^2 - 4ac$]	K1	
	-116, no root $\to$ not intersect.	N1	
11(a)	$\sin \angle FOA = \dfrac{8}{10}$	K1	
	$\angle FOA = 53.13^0$		
	$\dfrac{53.13^0}{180^0} \times \pi$		
	0.9274 rad	N1	
(b)	Arc Length of CA $= (10)(0.9274)$	K1	10
	$DE = 4$	P1	
	Perimeter of AOEDC $= 10 + 10 + 4 + 8 + (10)(0.9274)$	K1	
	$= 41.274$	N1	
(c)	Area of trapezium $= \dfrac{1}{2}(6+10) \times 8$	K1	
	Area of sector $= \dfrac{1}{2}(10)^2 0.9274$	K1	
	$2\left(\dfrac{1}{2} \times (6+10) \times 8\right) - 2\left(\dfrac{1}{2}(10)^2(0.9274)\right)$	K1	
	31.26	N1	

12(a) (i)	$\dfrac{P_{2018}}{30.00} \times 100 = 120$	K1	
	Harga R = RM36.00	N1	
(ii)	$\dfrac{I_{2018}}{I_{2010}} = \dfrac{125 \times 140}{100}$	K1	
	$= 175$	N1	
(b)(i)	$120 = \dfrac{(2 \times x) + (4 \times 140) + (3 \times 120) + (5 \times 110)}{2 + 4 + 3 + 5}$	K1K1	10
	$120 = \dfrac{1470 + 2x}{14}$		
	$x = 105$	N1	
(ii)	120	P1	
	$I_{2020/2016} = \dfrac{120 \times 120}{100}$	K1	
	$= 144$	N1	
13	REFER TO THE GRAPH		
14(a)	$PR^2 = 18^2 + 20^2 - 2(18)(20)\cos 80^0$	K1	
	$PR = 24.474 \ cm$	N1	
(b)	$\dfrac{sin \angle PSR}{24.474} = \dfrac{sin 40^0}{16}$	K1	
	$sin \angle PSR = 79.44^0, 100.56^0 \ (\text{both})$	N1	10
(c) (i)	$\angle SPR = 180^0 - 40^0 - 79.44^0$	P1	
	$= 60.56^0$		
	$\dfrac{RS}{sin 60.56^0} = \dfrac{16}{sin 40^0}$ or $RS^2 = 16^2 + 24.47^2 - 2(16)(24.47)\cos 60.56^0$	K1	
	$RS = 21.677 \ cm$	N1	
(ii)	$\dfrac{1}{2}(20)(18)sin 80^0$ or $\dfrac{1}{2}(21.677)(24.474)sin 40^0$	K1	
	$\dfrac{1}{2}(20)(18)sin 80^0 + \dfrac{1}{2}(21.677)(24.474)sin 40^0$	K1	
	$347.77 \ cm^2$	N1	

15 (a)	$12 - 4t = 0$	K1	
	$t = 3$	K1	
	$V_{max} = 12(3) - 2(3)^2$		
	$V_{max} = 18 \, \text{ms}^{-1}$	N1	
(b)	$12t - 2t^2 < 0$	K1	
	$t > 6$	N1	
(c)	$12t - 2t^2 = 0$	K1	10
	$t = 6$	N1	
(d)	$\displaystyle\int_0^3 \left(12t - 2t^2\right) dt$		
	$\left[6t^2 - \dfrac{2t^3}{3} \right]_0^3$	K1	
	$\left[\left[6(3)^2 - \dfrac{2(3)^3}{3} \right] - 0 \right]$	K1	
	$= 36 \, \text{m}$	N1	

No.13
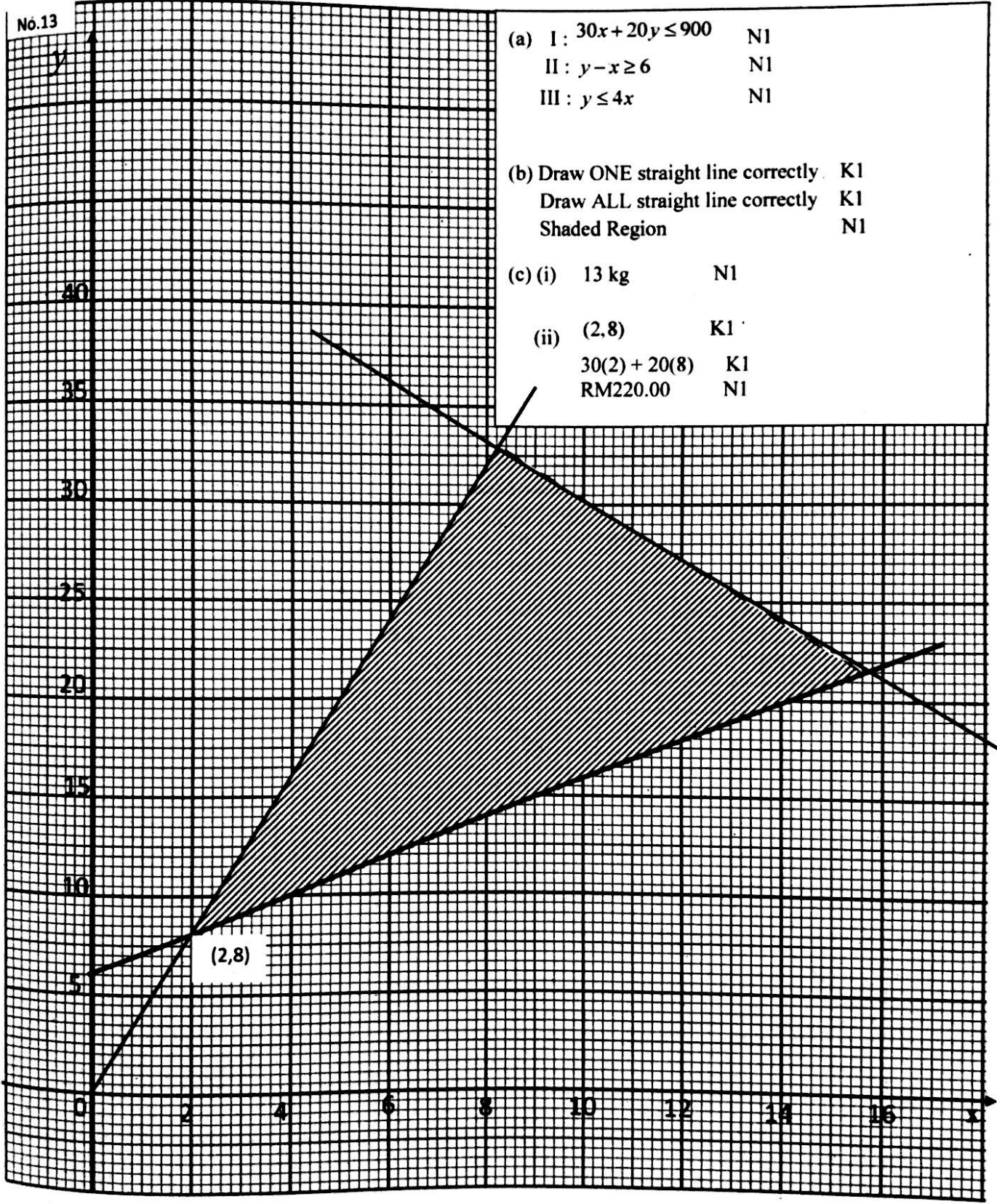
(a) I : $30x + 20y \leq 900$ N1

   II : $y - x \geq 6$ N1

   III : $y \leq 4x$ N1

(b) Draw ONE straight line correctly K1
   Draw ALL straight line correctly K1
   Shaded Region N1

(c) (i) 13 kg N1

   (ii) (2,8) K1

   $30(2) + 20(8)$ K1

   RM220.00 N1

(2,8)

No.7

x	1	2	3	5	6	7.4
$\dfrac{y}{x}$	3.8	5.6	6.83	10.12	11.8	14

N1

$$\frac{y}{x} = kx + p \qquad \text{P1}$$

b(i) $p = y - \text{intercept} = 2.2$ N1

(ii) $k = \dfrac{11.8 - 3.8}{6 - 1}$ K1

      $= 1.6$ N1

(iii) $\dfrac{y}{x} = 5$ K1

      $x = 1.7$ N1

Correct axes and uniform scale	K1
All points are plotted correctly	N1
Line of best fit	N1