

SULIT  
3472/1  
Additional Mathematics  
2019

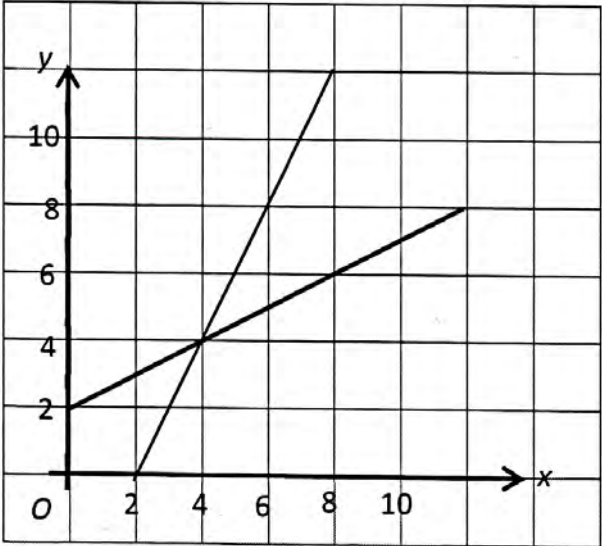


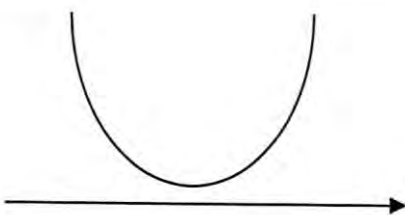
MAJLIS PENGETUA SEKOLAH MENENGAH MALAYSIA  
CAWANGAN NEGERI SEMBILAN DARUL KHUSUS

**PROGRAM PENINGKATAN AKADEMIK TINGKATAN 5  
SEKOLAH-SEKOLAH MENENGAH NEGERI SEMBILAN 2019**

**PERATURAN PERMARKAHAN  
ADDITIONAL MATHEMATICS PAPER 1**

NO	MARKING SCHEME	MARKS	FULL MARKS
1	$p = -36$ $\frac{1}{2}[-6(8) + 4(-4) + 5p - (5(4) + 8p + (-4)(-6))] = 0$ OR $\frac{8-5}{4+6} = \frac{8-(-4)}{4-p}$ or equivalent.	2  B1	2
2	$p = 3q - 2$ $-p + 3q - 2 = 0$ or $-\left(\frac{p}{3p}\right) + \left(\frac{3q-2}{q-9}\right)$	2  B1	2
3	$m = \frac{3}{7}n$ $\frac{3}{10} - \frac{m}{m+n} = 0$ $\overrightarrow{EF} = -\frac{m}{m+n}\underline{b} + \frac{1}{2}\left(\underline{a} + \frac{3}{5}\underline{b}\right)$ $\overrightarrow{AC} = \underline{a} + \frac{3}{5}\underline{b}$	4  B3  B2  B1	4
4	$r = 2$ $(3r + 2)(r - 2) = 0$ $3r^2 = 4 + 4r$	3  B2  B1	3
5	$4 - 2n$ $5(n + 1) - (n + 1)^2 - [5n - n^2]$	2  B1	2
6	a) $\cos 65^\circ$ b) $\cot \theta = -\frac{\sqrt{1-t^2}}{t}$ Seen $\sqrt{1-t^2}$	1  2  B1	3
7	$x = 120^\circ, 240^\circ$ $\cos x = -\frac{1}{2}$ $(5 \sec x - 1)(\sec x + 2) = 0$	3  B2  B1	3
8	$\frac{n-m}{2m+1}$ $\frac{\log_p 5 - \log_p 2}{2\log_p 2 + \log_p p}$ $\frac{\log_p \frac{5}{2}}{\log_p 4p}$	3  B2  B1	3

NO	MARKING SCHEME	MARKS	FULL MARKS
9	$m = 2^{\frac{1}{p}}$ $m^p = 2$ $(m^p)^2$	3 B2 B1	3
10	a) 1.185 b) 0.882 $0.5 + 0.382$ or $1 - 0.118$	1 2 B1	3
11	$k = \frac{h}{2}$ $2\left(3k - \frac{1}{2}x\right) - h = 3k - \frac{1}{2}(2x - h)$ $2\left(3k - \frac{1}{2}x\right) - h$ or $3k - \frac{1}{2}(2x - h)$	3 B2 B1	3
12	a)  b) $x = 4$	1  1	2
13	$\frac{13}{\frac{2700N + 3350}{N+1}} = 2750$ $2700N$ or $2750$	3 B2 B1	3
14	a) 0 b) $\frac{3}{2}$ $2\left[\frac{4}{3}(k)^3 + 4(k)^2 - 2k - \left[\frac{4}{3}(-k)^3 + 4(-k)^2 - 2(-k)\right]\right] = 4k$ or $k^2 = \frac{9}{4}$ or equivalent $\frac{4x^3}{3} + \frac{8}{2}x^2 - 2x$	1 3 B2 B1	4

NO	MARKING SCHEME	MARKS	FULL MARKS
15	$k = \frac{3p}{2}$ $\frac{3p}{4} = \frac{k}{2}$ $2(x - \frac{3p}{4})^2 - 2(\frac{-3p}{4})^2 + 4$ or $(x - \frac{k}{2})^2 - (\frac{-k}{2})^2 - 2$ OR $4x - 3p = 0$ or $2x - k = 0$ or equivalent	3 B2 B1	3
16	a) Mean / median because data is balanced/evenly distributed Seen mean or median. b) Median since there is an extreme data. Seen median	2 B1 2 B1	4
17	$u = \frac{1}{2}, v = 2$ (Both) $u = \frac{1}{2}$ or $v = 2$ $1 - \frac{1}{8u^3} = 0$	3 B2 B1	3
18	$p(x) = \frac{5}{6}(x - 3)^2 + 0.5$ or $p(x) = \frac{5}{6}(x + 3)^2 + 0.5$ or $p(x) = \frac{5}{6}x^2 + 0.5$ or $p(x) = \frac{5}{6}x^2$ $a = \frac{5}{6}$ or $8 = a(3)^2 + 0.5$ $a(x)^2 + 0.5$ or Min point = (0, 0.5) or (3, 0.5) or equivalent	3 B2 B1	3
19	a) <div style="text-align: center;">  </div> b) $k^2 + 4$ $(k - 2)^2 - 2(-2k)$ $\alpha + \beta = k - 2$ or $\alpha\beta = -2k$	1 3 B2 B1	4
20	a) $q = \frac{1}{2}$ b) $u = \frac{43}{2}, v = \frac{7}{8}$ $u = \frac{43}{2}$ or $v = \frac{7}{8}$ $\frac{1}{y} = \frac{5}{12}(\frac{1}{x}) + \frac{1}{24}$	1 3 B2 B1	4

NO	MARKING SCHEME	MARKS	FULL MARKS
21	$\frac{10}{7}$ $\frac{1}{14\pi} \times \frac{200\pi}{10}$ $\frac{6}{4}\pi(9) + \frac{1}{2}\pi$ or $14\pi$ $\frac{6\pi x}{4} + \frac{1}{2}\pi$ or $\frac{200\pi}{10}$	4 B3 B2 B1	4
22	a) 6 b) 40 $\lim_{t \rightarrow \infty} \left( \frac{120 + \frac{480}{t}}{3 + \frac{80}{t}} \right)$	1 2 B1	3
23.	a) 5040 ${}^8C_3 \times {}^6C_4 \times {}^4C_2$ or ${}^8C_3$ or ${}^6C_4$ or ${}^4C_2$ b) 4320 $6! 3!$	2 B1 2 B1	4
24	a) 0 b) $\frac{17}{216}$ $\frac{45}{360} \times \frac{1}{6} + \frac{80}{360} \times \frac{1}{6} + \frac{45}{360} \times \frac{1}{6}$ or equivalent $\frac{45}{360} \times \frac{1}{6}$ or $\frac{80}{360} \times \frac{1}{6}$	1 3 B2 B1	4
25	11 11.88 and 19.81 $\frac{210}{5 \times \frac{1}{2} \pi (1.5)^2}$ or $\frac{210}{5 \times \frac{1}{2} (1.5)^2 \left( \frac{108}{180} \times \pi \right)}$ or $\frac{210}{5 \times \frac{108}{360} \times \pi (1.5)^2}$ $\frac{1}{2} \pi (1.5)^2$ or $\frac{1}{2} (1.5)^2 \left( \frac{108}{180} \times \pi \right)$ or $\frac{108}{360} \pi (1.5)^2$	4 B3 B2 B1	4

SULIT  
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2019



**MAJLIS PENGETUA SEKOLAH MENENGAH MALAYSIA  
CAWANGAN NEGERI SEMBILAN DARUL KHUSUS**

**PROGRAM PENINGKATAN AKADEMIK TINGKATAN 5  
SEKOLAH-SEKOLAH MENENGAH NEGERI SEMBILAN 2019**

**PERATURAN PERMARKAHAN  
ADDITIONAL MATHEMATICS PAPER 2**

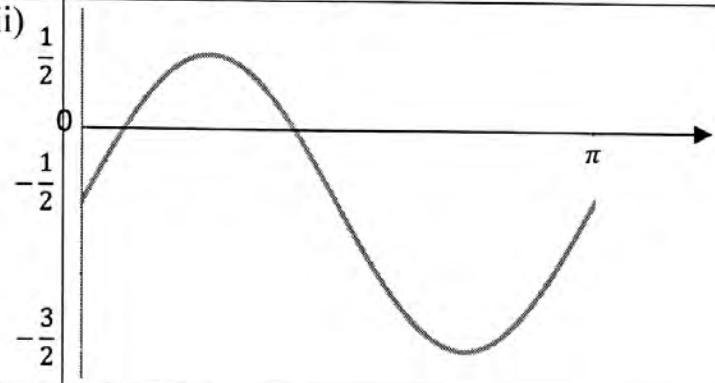
NO.	SCHEME	MARKAH
1 (a)(i)	$\log_u v = \log_u \left( \frac{1}{u^4} \right)$ or $\frac{3 \log_u u}{\log_u v}$ [from question a (ii)] -10	K1 N1
(ii)	$-\frac{3}{4}$	N1
(b)	$2^{4x} \times 2^y$ or $7 + 2^{4x}$  $hk = 7 + h$ or equivalent $h = \frac{7}{k-1}$	K1 K1 N1
		6 MARKS
2	$x + y = 23$ or $xy = 45 + 5x$ or equivalent $y = 23 - x$ $x(23 - x) - 5x = 45$ $(x - 15)(x - 3) = 0$ $x = 15$ , $x = 3$ $y = 8$ , $y = 20$	P1 P1 K1 K1 N1 N1
		6 MARKS
3(a)	$p = 2$	P1
(ii)	$H(0,15)$	P1
(b)	$-2x = \frac{1}{2}x + 15$ or $E(-6, 12)$ $0 = \frac{2(-6)+1(x)}{3}$ and $15 = \frac{2(12)+1(y)}{3}$ $F(12, 21)$	K1 K1 N1
(c)	$\left( \frac{y-21}{x-12} \right) \left( \frac{1}{2} \right) = -1$ $y + 2x + 45 = 0$ or equivalent	K1 N1
		6 MARKS



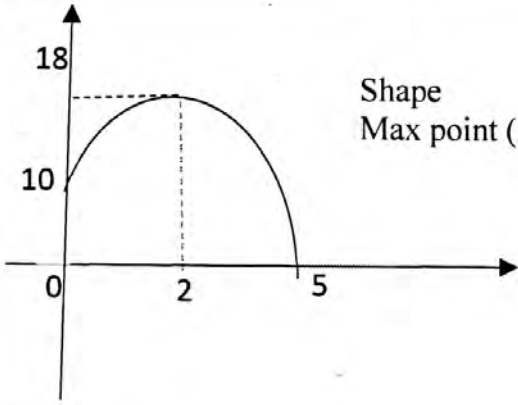
NO.	SCHEME	MARKAH
4(a)	$15 - \text{Zahidah's mark} = 7$ or $\frac{68+h}{7} = 11$ , $h = \text{Naliza's mark}$ Zahidah's mark = 8 and Naliza's mark = 9	K1 N1
(b)	$\sigma = \sqrt{\frac{6^2 + 8^2 + 8^2 + 9^2 + 13^2 + 15^2 + 18^2}{7} - 11^2}$ 4.071	K1 N1
(c)	New mean = 22 New variance = 66.29	N1 N1
		6 MARKS
5(a)(i)	$80 + (n-1)(-5) = 0$ or $d + (n-1)(-2) = 0$ $n = 17$ and $d = 32$	K1 N1
(ii)	$S_{17} = \frac{17}{2} [2(80) + 16(-5)]$ or $S_{17} = \frac{17}{2} [2(32) + 16(-2)]$ 48	K1 N1
(b)(i)	$S_6 = \frac{240000[1.12^6 - 1]}{1.12 - 1}$ RM 1 947 645.37	K1 N1
(ii)	$240\,000(1.12)^{n-1} > 3\,000\,000$ $n = 24$	K1 N1
		8 MARKS
6(a)	$\cos \theta = \frac{6}{12}$ or $\theta = \frac{\pi}{3} = 1.047$ rad $6(\pi - 1.047)$ or $18\left(\frac{\pi}{2} - 1.047\right)$ or $18\left(\frac{\pi}{2} - 1.047\right)(2)$ $18\left(\frac{\pi}{2} - 1.047\right)(2) + 2(6)(\pi - 1.047)$ 43.99	P1 K1 K1 N1
(b)	$\frac{1}{2}(18)^2 \left[\left(\frac{\pi}{2} - 1.047\right)(2)\right]$ or $\frac{1}{2}(6)\sqrt{108}$ or $\frac{1}{2}(6^2)(\pi - 1.047)$ $\frac{1}{2}(18)^2 \left[\left(\frac{\pi}{2} - 1.047\right)(2)\right] - 2 \left[\frac{1}{2}(6^2)(\pi - 1.047)\right] - 6\sqrt{108}$ 31.89 ~ 31.96	K1 K1 N1
		6 MARKS



NO.	SCHEME	MARKS
7(a)	$\overrightarrow{AD} = \overrightarrow{AB} + \overrightarrow{BD}$ $= -\underline{y} + 4\underline{x}$ $\overrightarrow{BF} = \overrightarrow{BA} + \overrightarrow{AF}$ $\overrightarrow{BF} = \overrightarrow{BA} + \frac{1}{3}\overrightarrow{AD}$ $= \underline{y} + \frac{1}{3}(-\underline{y} + 4\underline{x})$ $= \frac{2}{3}\underline{y} + \frac{4}{3}\underline{x}$ $\overrightarrow{CA} = \overrightarrow{CB} + \overrightarrow{BA}$ $= -\underline{x} + \underline{y}$ $\overrightarrow{CE} = \frac{1}{3}\overrightarrow{CA}$ $= -\frac{1}{3}\underline{x} + \frac{1}{3}\underline{y}$	<p style="text-align: center;">N1</p> <p style="text-align: center;">K1</p> <p style="text-align: center;">K1</p> <p style="text-align: center;">N1</p>
(b)	$\overrightarrow{BE} = \overrightarrow{BC} + \overrightarrow{CE}$ $= \underline{x} - \frac{1}{3}\underline{x} + \frac{1}{3}\underline{y}$ $= \frac{2}{3}\underline{x} + \frac{1}{3}\underline{y} \text{ or } \frac{1}{3}(2\underline{x} + \underline{y})$ $\overrightarrow{BF} = \frac{2}{3}\underline{y} + \frac{4}{3}\underline{x} \text{ or } \frac{2}{3}(2\underline{x} + \underline{y})$ $\overrightarrow{BF} = 2\overrightarrow{BE}$ <p><math>\overrightarrow{BF}</math> and <math>\overrightarrow{BE}</math> are parallel and <math>B</math> is a common point. Therefore points <math>B</math>, <math>E</math> and <math>F</math> are collinear.</p>	<p style="text-align: center;">K1</p> <p style="text-align: center;">K1</p> <p style="text-align: center;">N1</p> <p style="text-align: center;">N1</p>
(c)	$5 \times 4$ $20$	<p style="text-align: center;">K1</p> <p style="text-align: center;">N1</p>
		10 MARKS

NO.	SCHEME	MARKS
8(a)(i)	$np = 36$ or $npq = \left(\frac{5\sqrt{5}}{2}\right)^2$ $q = 0.8681$ $p = 0.1319$ and $n = 272$	K1 P1 N1
(a)(ii)	$P(X = 5) + P(X = 6)$ ${}^6C_5 (0.8681)^5 (0.1319)^1 + {}^6C_6 (0.8681)^6 (0.1319)^0$ 0.8181	K1 N1
(b)(i)	$\frac{k-155}{5} = -1$ 150	K1 N1
(b)(ii)	$P\left(Z > \frac{158-155}{5}\right)$ 0.2743 0.2743 x 100 27	K1 K1 N1
		10 MARKS
9(a)	$\frac{2 \tan x}{1 + \tan^2 x} = \frac{2 \sin x}{\cos x} \times \frac{1}{\sec^2 x}$ $= \frac{2 \sin x}{\cos x} \times \cos^2 x$ $= 2 \sin x \cos x$ $= \sin 2x$	P1 N1
(b)(i)	$\sin 2x = \frac{1}{2}$ $2x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}$ $x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$	K1 K1 N1
(b)(ii)		Shape of $\sin x$ graph – P1 Shape of $\sin 2x$ graph – P1 Seen $0, \pi$ – P1 All correct – P1
(b)(iii)	$k = -\frac{1}{2}$	N1
		10 MARKS

NO.	SCHEME	MARKS														
10(a)	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td><math>x^2</math></td> <td>0.25</td> <td>1.00</td> <td>1.56</td> <td>2.25</td> <td>3.06</td> <td>4.00</td> </tr> <tr> <td><math>\frac{y}{x}</math></td> <td>4.40</td> <td>3.55</td> <td>2.95</td> <td>2.20</td> <td>1.30</td> <td>0.25</td> </tr> </table> $y + hx = kx^3$ $\frac{y}{x} = kx^2 - h$	$x^2$	0.25	1.00	1.56	2.25	3.06	4.00	$\frac{y}{x}$	4.40	3.55	2.95	2.20	1.30	0.25	P1 P1
$x^2$	0.25	1.00	1.56	2.25	3.06	4.00										
$\frac{y}{x}$	4.40	3.55	2.95	2.20	1.30	0.25										
(b)(i)	$h = -4.65$ $k = \frac{4.65-0}{0-4.25}$	K1 N1														
(b)(ii)	$k = -1.094$	N1														
(b)(iii)	$\frac{y}{x} = 2$ $x^2 = 2.4$ $x = 1.549$	K1  N1														
		10 MARKS														
11(a)	$(y - 3)^2 = y + 9$ $y(y - 7) = 0$ $h = 7$	K1  N1														
(b)	$\int_0^7 (y + 9) dy - \int_0^7 (y - 3)^2 dy$ $= \left[ \frac{y^2}{2} + 9y \right]_0^7 - \left[ \frac{(y-3)^3}{3} \right]_0^7$ $= \frac{7^2}{2} + 9(7) - 0 - \left[ \frac{(7-3)^3}{3} - \frac{(0-3)^3}{3} \right]$ $= 57\frac{1}{6} \text{ or } 57.17$	K1 K1 K1 N1														
(c)	$(0, 3)$ $\pi \int_0^3 (y - 3)^4 dy$ $= \pi \left[ \frac{(y-3)^5}{5} \right]_0^3$ $= \pi \left[ \frac{(3-3)^5}{5} - \frac{(0-3)^5}{5} \right]$ $= \frac{243\pi}{5}$	K1 K1 K1 N1														
		10 MARKS														

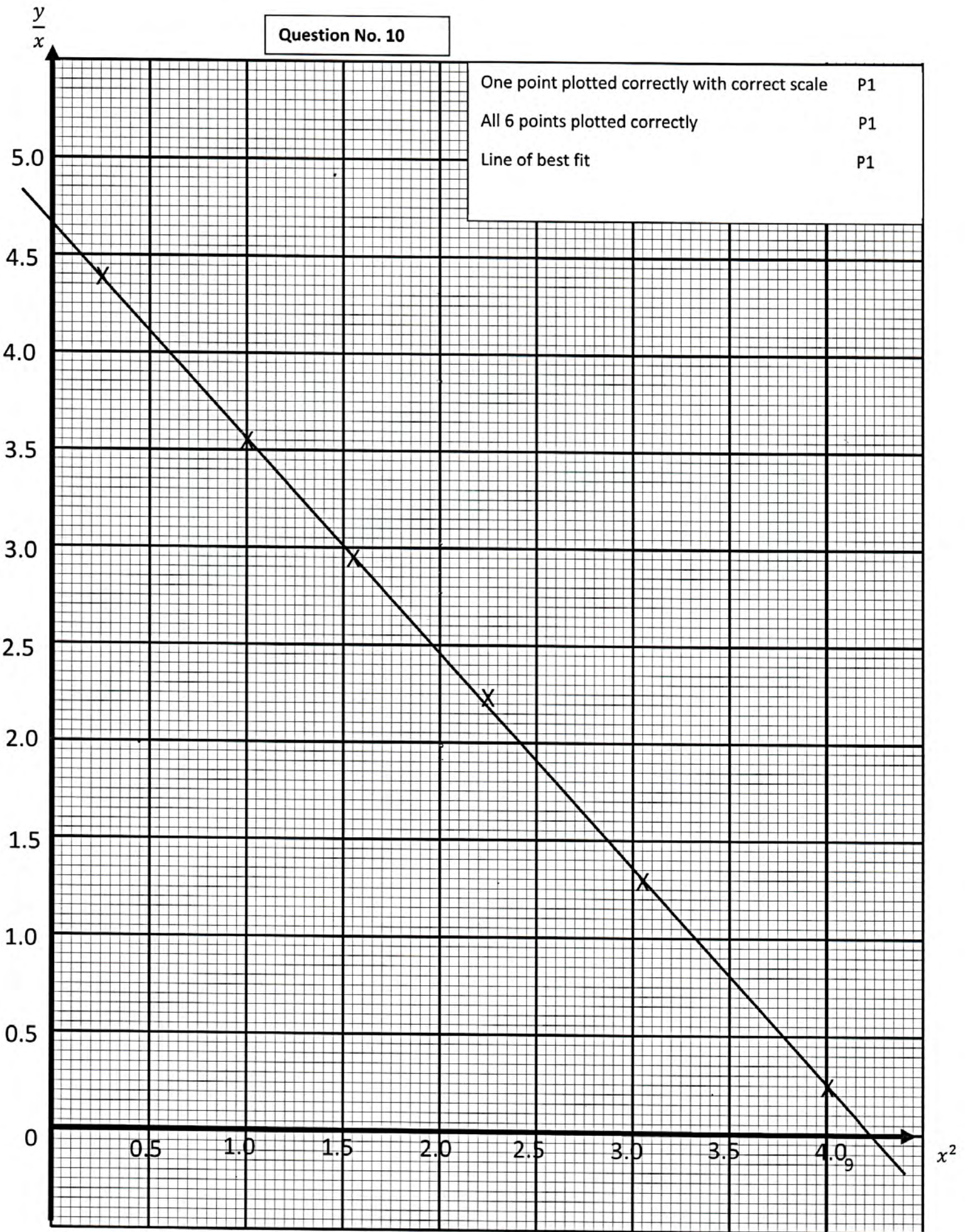
BIL.	SKEMA	MARKAH
12 (a)	$8 \text{ ms}^{-2}$	P1
(b)	$t = 2$ $v = 8t - 2t^2 + 10$ $v = 18 \text{ ms}^{-1}$	K1 K1 N1
(c)	$(t - 5)(t + 1) = 0$ $h = 5$	K1 N1
(d)(i)		K1 N1
(ii)	$\left[ \frac{-2t^3}{3} + 4t^2 + 10t \right]_0^5$ $\frac{200}{3} \text{ m}$	K1 N1
		10 MARKS
13(a)(i)	$BD^2 = 15^2 + 8^2 - 2(15)(8)\cos 110^\circ$ $BD = 19.26$	K1 N1
(ii)	$\frac{\sin \angle ADB}{12} = \frac{\sin 70^\circ}{19.26}$ $\angle ADB = 35.84^\circ$ $\angle ABD = 180^\circ - 35.84^\circ - 70^\circ = 74.16^\circ$	K1 K1 N1
(b)(i)	$\frac{1}{2}(12)(19.26) \sin 74.16^\circ$ or $\frac{1}{2}(15)(8) \sin 110^\circ$ $\frac{1}{2}(12)(19.26) \sin 74.16^\circ + \frac{1}{2}(15)(8) \sin 110^\circ$ $167.55 \text{ cm}^2$	K1 K1 N1
(ii)	$\frac{1}{2}(19.26)(t) = \frac{1}{2}(15)(8) \sin 110^\circ$ $5.855 \text{ cm}$	K1 N1
		10 MARKS

N0.	SCHEME	MARKS
14(a)(i)	$p = 6$	P1
(a)(ii)	$\frac{5.00}{Q_{2017}} \times 100 = 110$ RM4.55	K1 N1
(b)(i)	$\frac{145 \times 100}{128.95}$ 112.4	K1 N1
(ii)	$\frac{Q}{270} \times 100 = 145$ RM391.50	K1 N1
(c)	$\frac{110(12) + 130(36) + \frac{625(28)}{x} + 105(24)}{100} = 128.95$ or $\frac{125(12) + \frac{750(36)}{x} + 140(28) + 20y(24)}{100} = 145.7$ $x = 4$ and $y = 5$	K1  N1 N1
		10 MARKS
15(a)	$40x + 50y \leq 1800$	P1
	$20x + 15y \geq 240$	P1
(b)	The number of Kebaya $B$ is not more than $\frac{3}{2}$ times the number of Kebaya $A$ or equivalent	P1
(c)	graph	
(d)(i)	$y = 15$	P1
(ii)	Point (16, 23)	P1
	$P = RM50(16) + RM80(23)$	K1
	RM2640	N1
		10 MARKS



Question No. 10

One point plotted correctly with correct scale P1  
All 6 points plotted correctly P1  
Line of best fit P1





Question No. 15

