

SULIT
3472/1
Matematik
Tambahan
Kertas 1
Ogos
2017
2 jam



3472/1

MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2017

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

Kertas 1

Dua jam

UNTUK KEGUNAAN PEMERIKSA SAHAJA

AMARAN

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SULIT

3472/1

**KEKUNCI SKIM PEMARKAHAN
PEPERIKSAAN SIJIL PENDIDIKAN MRSM 2017
MATEMATIK TAMBAHAN
KERTAS 1 (3472/1)**

1, 2, 3 atau 4

Markah penuh 1, 2, 3, atau 4 jika jawapan sama seperti dalam skim

B1, B2 atau B3

Markah B1 atau B2 atau B3 diberi jika pengiraan sampai ke tahap yang ditunjukkan dalam skim

()

Jika perkara dalam kurungan tertinggal, beri markah penuh seperti yang tercatat dalam skim

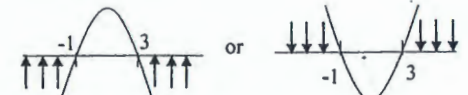
PERHATIAN : Sila ikut skim pemarkahan yang disediakan supaya perbandingan antara MRSM boleh dilakukan.

MARKING SCHEME PAPER 1

NO.	Answer	Marks
1	$(-5, 4)$	3
	$\frac{2a+5(3)}{2+3}=1$ and $\frac{2b+9(3)}{2+3}=7$	B2
	$\frac{2a+5(3)}{2+3}=1$ or $\frac{2b+9(3)}{2+3}=7$ or equivalent	B1
2	a) $x^2 + y^2 - 10x + 16 = 0$ $\sqrt{(x-5)^2 + (y-0)^2} = 3$	2 B1
	b) $(2, 0), (8, 0)$ $x^2 - 10x + 16 = 0$	2 B1
3	$\sqrt{20}$	2
	$2i + 4j$ or equivalent	B1
4	$(1, 13)$	3
	$\begin{pmatrix} 1 \\ 13 \end{pmatrix}$ or $i + 13j$	B2
	$\begin{pmatrix} 2 \\ 4 \end{pmatrix} - \begin{pmatrix} 1 \\ -9 \end{pmatrix}$ or $2i + 4j - i + 9j$	B1
6	(a) 4060	1
	(b) 1424	3
	${}^8C_3 \times {}^4C_3 + {}^4C_3 \times {}^6C_3 + {}^1C_3 \times {}^6C_3$	2
	${}^8C_3 \times {}^4C_3$ or ${}^4C_3 \times {}^6C_3$ or ${}^8C_3 \times {}^6C_3$	B1

5	$\frac{31}{45}$	3
	$\left(\frac{5}{10} \times \frac{3}{9}\right) + \left(\frac{5}{10} \times \frac{2}{9}\right) + \left(\frac{3}{10} \times \frac{5}{9}\right) + \left(\frac{3}{10} \times \frac{2}{9}\right) + \left(\frac{2}{10} \times \frac{5}{9}\right) + \left(\frac{2}{10} \times \frac{3}{9}\right)$	B2
	OR $1 - \left(\frac{5}{10} \times \frac{4}{9} + \frac{3}{10} \times \frac{2}{9} + \frac{2}{10} \times \frac{1}{9}\right)$	
	$\left(\frac{5}{10} \times \frac{3}{9}\right)$ or $\left(\frac{5}{10} \times \frac{2}{9}\right)$ or $\left(\frac{3}{10} \times \frac{5}{9}\right)$ or $\left(\frac{3}{10} \times \frac{2}{9}\right)$ or $\left(\frac{2}{10} \times \frac{5}{9}\right)$ or $\left(\frac{2}{10} \times \frac{3}{9}\right)$ OR $\left(\frac{5}{10} \times \frac{4}{9} + \frac{3}{10} \times \frac{2}{9} + \frac{2}{10} \times \frac{1}{9}\right)$ or equivalent	B1
7	(a) 33	1
	(b) 144 3^2 or 4^2 OR 3×4	2 B1
8	$k = 0.03502$	4
	$\frac{(1+k)-1}{0.02} = 1.751$ or $\frac{(1-k)-1}{0.02} = -1.751$	B3
	1.751	B2
	0.04 or $\frac{(1+k)-1}{0.02}$ or $\frac{(1-k)-1}{0.02}$	B1
9	$\alpha = 2p + 2$	3
	$\frac{32p}{\alpha - 2} = 24$ or equivalent	B2
	$\frac{dy}{dx} = 4x + 8$ Note: method of substitution and subtraction are not accepted	B1

10	$y = -\frac{1}{6}x + \frac{13}{6}$ or equivalent $2 = -\frac{1}{6}(1) + c$ or $y - 2 = -\frac{1}{6}(x - 1)$ $m = 6$	3 B2 B1
11	$\frac{77}{30} // 2\frac{17}{30} // 2.5667$ $\left[(2)^2 + \frac{2}{2(2(2)^3 - 1)} \right] - \left[(1)^2 + \frac{1}{2(2(1)^3 - 1)} \right]$ x^2 or $\frac{1}{6} \left(\frac{3x}{2x^3 - 1} \right)$	3 B2 B1
12	-16 $2x - 8$ $\frac{2}{3} \times 12$ or 8 or 16	3 B2 B1
13	$30^\circ, 90^\circ, 150^\circ, 270^\circ$ $30^\circ, 150^\circ$ or $90^\circ, 270^\circ$ or $\cos x = 0$ and $\sin x = \frac{1}{2}$ $\cos x = 2\cos^2 \frac{x}{2} - 1$ or equivalent	3 B2 B1
14	$36.13 \leftrightarrow 36.23$ $\frac{1}{2}(25)^2 \sin(1.402) - \frac{1}{2}(25)^2(0.87)$ $\frac{1}{2}(25)^2 \sin(1.402)$ or $\frac{1}{2}(25)^2(0.87)$	3 B2 B1
15	$k > 16$ $(-8)^2 - 4(1)(k) < 0$ or $(8)^2 - 4(-1)(-k) < 0$ $5x - k = x^2 - 3x$	3 B2 B1

16	(a) $x = 1$	1
	(b) 2 $2p - 1 = 3$	2 B1
17	$x < -1$ or $x > 3$ $(-x - 1)(-x + 3) < 0$ or $(x + 1)(x - 3) > 0$ or  or equivalent method such as correct line number etc. $-x^2 + 2x + 3 < 0$ or $x^2 - 2x - 3 > 0$ Note : Accept any symbol : =, >, <, ≤, ≥ for B1 only	3 B2 B1
18	$y = \frac{2}{7}$ $3^{4-3y} = 3^{2(2y+1)}$ OR $\log 81 + \log 1 - y \log 27 = (2y + 1) \log 9$ 3^4 or 3^{3y} or $3^{2(2y+1)}$ OR $\log 81 + \log 1 - \log 27^y$ or $(2y + 1) \log 9$	3 B2 B1
19	$m = 2$ $\frac{(m+2)^2}{m+6} = m$ or equivalent $\log_m \frac{(m+2)^2}{m+6} = 1$ or $\log_m \frac{(m+2)^2}{m+6} = \log_m m$ or equivalent $\log_m m$ or $\log_m (m+2)^2$	4 B3 B2 B1
20	$n = 24$ $n > 23.25$ or $4n > 93$ OR 89, 85, 81, 77, 73, 69, 65, 61, 57, 53, 49, 45, 41, 37, 33, 29, 25, 21, 17, 13, 9, 5, 1, -3 $89 + (n - 1)(-4)$	3 B2 B1

21	8 $\log_{10} 0.5^n < \log_{10} 0.00541$ or $\log_{10} 0.5^n < \log_{10} 0.00528$ $\frac{6.4\pi(1-0.5^n)}{1-0.5} > 40$ $a = 6.4\pi$ or $r = 0.5$	4 B3 B2 B1
22	$\frac{334}{275}$ $\frac{0.0045}{1-0.01}$ $a = 0.0045$ or $r = 0.01$	3 B2 B1
23	$p = \frac{8}{3}$ and $q = 6$ $p = \frac{8}{3}$ or $q = 6$ $\frac{y}{x} = -3x + 12$ OR $4p = 12p - 3p^2$ or $-6q = 12(6) - 3(6)^2$	3 B2 B1
24	$2x + 5$ $6\left(\frac{y-4}{3}\right) + 13$ or $6\left(\frac{x-4}{3}\right) + 13$ OR $2(3x+4) + 5$ $\frac{y-4}{3}$ or $\frac{x-4}{3}$	3 B2 B1
25.	(a) 5 $41 = \frac{9}{5}C + 32$	2 B1
	(b) $\frac{9x}{5} - \frac{2297}{5}$ $\frac{9}{5}(x-273) + 32$	2 B1

SULIT
3472/2
Matematik
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Ogos
2017
2½ jam

3472/2



MAKTAB RENDAH SAINS MARA

PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM 2017

PERATURAN PEMARKAHAN

MATEMATIK TAMBAHAN

Kertas 2

Dua jam tiga puluh minit

UNTUK KEGUNAAN PEMERIKSA SAHAJA

AMARAN

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SULIT

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KEKUNCI SKIM PERMARKAHAN
PEPERIKSAAN SIJIL PENDIDIKAN MRSM 2017
MATEMATIK TAMBAHAN
KERTAS 2 (3472/2)

- P1 1 markah diberi berdasarkan pengetahuannya
- N1 1 markah diberi untuk jawapan daripada kaedah sah dalam bentuk nilai atau ungkapan
- (K1) Markah kaedah, 1 markah diberi jika pelajar mencuba buat langkah pengiraan atau tunjuk kaedah yang sah menghasilkan jawapan yang betul.
- (N1) 1 markah diberi bagi jawapan yang jitu / tepat seperti dalam skim
- (N1) 1 markah diberi bagi jawapan yang didapati dengan menggunakan nilai yang kurang tepat daripada bahagian soalan. Biasanya diikuti dengan tanda \surd dengan catatan kuantiti yang salah yang diperoleh lebih awal
- () Jika perkara dalam kurungan ini tertinggal, beri markah penuh seperti yang tercatat dalam skim.

PERHATIAN : Sila ikut skim pemarkahan yang disediakan supaya perbandingan antara MRSM boleh dilakukan.

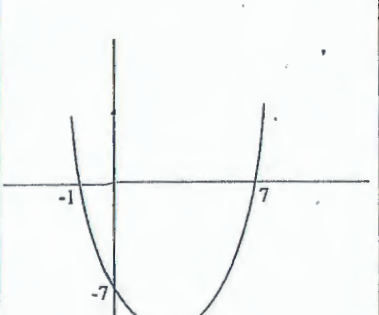
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SULIT

WORKING SCHEME TRIAL SPMRSM ADDITIONAL MATHEMATICS 2017 (PAPER 2)

No	Solution	Scheme	Sub marks	Marks
I (a)	$\text{Median} = 50.5 + \left[\frac{\frac{30}{2} - 2}{16} \right] 50$ $= 91.125$	<p>PI $L=50.5, f_m = 16, C=50$ (any two seen)</p> <p>K1 Use median formula with L corresponding to F and f_m</p> <p>N1 91.125</p>	3	
(b)	$\sigma = \sqrt{\frac{341707.5}{30} - (98.83)^2} = 40.28$	<p>PI 2, 16, 8, 4 or implied or seen in (a)</p> <p>Use formula sd or var correct</p> $\sigma = \sqrt{\frac{341707.5}{30} - (98.83)^2}$ <p>K1 Use mean formula</p> $\bar{x} = \frac{\sum fx}{\sum f}$ $\bar{x} = \frac{2965}{30}$ $= 98.83$ <p>K1 Or</p> $\sqrt{\frac{48666.667}{30}}$ <p>N1 40.28</p> <p>Note :</p> <p>(i) OW-1 if answer correct without any working</p>	4	7

2	$y = 8 - 2x$ or $x = \frac{8-y}{2}$ or $4x^2 + 3(8 - 2x)^2 = 52$ or $4\left(\frac{8-y}{2}\right)^2 + 3y^2 = 52$ $(2x - 7)(2x - 5) = 0$ or $(y - 1)(y - 3) = 0$ $x = 3.5, x = 2.5$ $y = 1, y = 3$ Or $y = 1, y = 3$ $x = 3.5, x = 2.5$	<p>PI implied</p> <p>K1 Substitute value x or y to other</p> <p>K1 Solve quadratic equation using valid methods</p> <p>N1 First set of values</p> <p>N1 Second set of values</p> <p>Note: OW - 1 if method of solving quadratic equation not shown. SS - 1 for correct answers if improper factorisation is shown.</p>	5	5
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<p>3 (a)</p>	$f(x) = x^2 - 2px - q$ $= x^2 - 2px + \left(\frac{-2p}{2}\right)^2 - \left(\frac{-2p}{2}\right)^2 - q$ $= (x-p)^2 - p^2 - q$ $p = q - 4$ $-p^2 - q = -7 - p^2$ $q = 7$ $p = 3$	<p>Method of completing the square</p> <p>K1 $(x-p)^2$ seen</p> <p>Comparing the value of x with</p> $q - 4 = p$ <p>or</p> <p>K1 $-p^2 - q = -7 - p^2$</p> <p>N1 $q = 7$</p> <p>N1 $p = 3$</p>	<p>4</p>	<p>6</p>
<p>(b)</p>		<p>P1 Minimum parabola shape</p> <p>P1 Label minimum point *(3, -16) and two more *correct points</p>	<p>2</p>	<p>6</p>
<p>Note : SS - 1 if x-intercept or y-intercept wrongly labelled</p>				

<p>4 (a)</p>	$\cos \angle LNP = \frac{3}{5}$ $\angle LNP = 53.13^\circ$ $= 0.9274 \text{ rad}$	<p>K1 Use ratio of trigonometry or equivalent</p> <p>N1 0.927</p> <p>Note : accept any answer when rounded to 3 dp = 0.927</p>	<p>2</p>	<p>6</p>
<p>(b)</p>	<p>$KN = 10$</p> <p>$PL = 6(*0.927)$</p> <p>$= 5.5642$</p> <p>OR</p> <p>$NM = 10(*0.644)$</p> <p>$= 6.444$</p> <p>$P = 6 + *5.564 + *2 + *6.44$</p> <p>$= 20 \text{ cm}$</p>	<p>P1 Implied or seen in (a)</p> <p>K1 Use $s = r\theta$ to find length of PL or NM</p> <p>K1 Perimeter = $NP + PL + LM + NM$</p> <p>N1 20 cm</p> <p>Note : accept any answer when rounded to 2 dp = 20 cm</p>	<p>4</p>	<p>6</p>
<p>5 (a)</p>	$\sqrt{(h-5)^2 + (2h-6)^2} = \sqrt{32}$ $5h^2 - 34h + 29 = 0$ $(5h - 29)(h - 1) = 0$ $h = \frac{29}{5}, h = 1$ $\frac{2-0}{1-3} = \frac{k-0}{-2-3} \text{ or } \frac{2-0}{1-3} = \frac{k-2}{-2-1}$ $k = 5$	<p>K1 Use distance formula and equate to $\sqrt{32}$</p> <p>N1 $h = 1$</p> <p>K1 Use gradient BM equal to gradient BD (or gradient MD)</p> <p>N1 $k = 5$</p>	<p>4</p>	<p>6</p>

(b) (i)	<p>$(m_{AM} \times m_{DM})$ or $(m_{AM} \times m_{BD})$ or $(m_{AM} \times m_{MD})$</p> <p>$1 \times -1 = -1$</p> <p><u>Alternative Method</u></p> <p>$(\sqrt{32})^2 + (\sqrt{8})^2$ and $(\sqrt{40})^2$</p> <p>or</p> <p>$(\sqrt{32})^2 + (\sqrt{18})^2$ and $(\sqrt{50})^2$</p> <p>$(\sqrt{32})^2 + (\sqrt{8})^2 = (\sqrt{40})^2$</p> <p>or</p> <p>$(\sqrt{32})^2 + (\sqrt{18})^2 = (\sqrt{50})^2$</p>	<p>K1 Use $m_1 \times m_2 = -1$</p> <p>N1 Product of gradient = -1 and AM is the shortest distance</p> <p>K1 Find $(AM^2 + MB^2)$ and AB^2</p> <p>or</p> <p>$(AM^2 + MD^2)$ and AD^2</p> <p>N1 $(AM^2 + MB^2) = AB^2$</p> <p>or</p> <p>$(AM^2 + MD^2) = AD^2$</p>	2	8
(ii)	<p>$= \frac{1}{2} \{ (5 \times 0) + (3 \times -4) + (-5 \times 5) + (-2 \times 6) - (6 \times 3) - (0 \times -5) - (-4 \times -2) - (-5 \times 5) \}$</p> <p>$= \frac{1}{2} \{ (-49) - (51) \}$</p> <p>$= \frac{1}{2} 100$</p> <p>$= 50$</p>	<p>K1 Use area formula for quadrilateral $ABCD$ or $\triangle ABD$ and $\triangle BCD$ OR $\triangle ACD$ and $\triangle ABC$</p> <p>N1 50</p>	2	8

6 (a)	<p>$r^2 = 25 - h^2$</p> <p>$V = \frac{1}{3} \pi (25 - h^2) h$</p> <p>$V = \frac{1}{3} \pi (25 - h^2) h$ or $V = \frac{25}{3} \pi h - \frac{1}{3} \pi h^3$</p>	<p>P1 Express r in terms of h</p> <p>K1 Substitute $*r$ or $*r^2$ into $V = \frac{1}{3} \pi r^2 h$</p> <p>N1 $V = \frac{1}{3} \pi (25 - h^2) h$ or $V = \frac{25}{3} \pi h - \frac{1}{3} \pi h^3$</p>	3	8
(b)	<p>$\frac{25}{3} \pi - \pi h^2 = 0$</p> <p>$h = 2.887$ or $h = \sqrt{\frac{25}{3}}$</p> <p>$r = \sqrt{25 - 2.887^2}$</p> <p>$r = 4.082$ or $\sqrt{\frac{50}{3}}$</p> <p>$x = 2\pi(4.082)$</p> <p>$x = 25.65$</p>	<p>K1 Use $*\frac{dv}{dh} = 0$</p> <p>N1 2.887</p> <p>N1 Find r 4.082 or $\sqrt{\frac{50}{3}}$</p> <p>K1 Use $x = 2\pi r$</p> <p>N1 25.65</p>	5	8

Alternative Method

$$h = \sqrt{25 - \frac{x^2}{4\pi^2}}$$

$$V = \frac{25}{3}\pi(25 - \frac{x^2}{4\pi^2})^{\frac{1}{2}} - \frac{1}{3}\pi(25 - \frac{x^2}{4\pi^2})^{\frac{3}{2}}$$

$$\frac{dV}{dx} = \frac{25}{6}\pi(25 - \frac{x^2}{4\pi^2})^{-\frac{1}{2}}(-\frac{x}{2\pi^2}) - \frac{1}{2}\pi(25 - \frac{x^2}{4\pi^2})^{\frac{1}{2}}(-\frac{x}{2\pi^2})$$

$$\frac{-x}{2\pi}(\frac{25}{6\sqrt{25 - \frac{x^2}{4\pi^2}}} - \frac{1}{2}\sqrt{25 - \frac{x^2}{4\pi^2}}) = 0$$

$$x = 25.65$$

(K1) Express V in terms of x

(N1)

(K1) Differentiate V with respect to x

(K1) Solve $\frac{dV}{dx} = 0$

(N1) 25.65

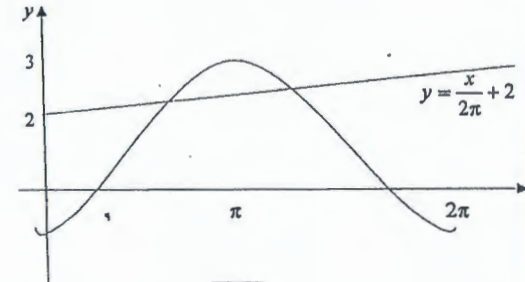
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(a)

$$\begin{aligned} \text{LHS} &= \frac{4(1 - \cos^2 x) - 3}{2 \cos x + 1} && \text{(K1) Use } \sin^2 x = 1 - \cos^2 x \\ &= \frac{4 - 4 \cos^2 x - 3}{2 \cos x + 1} \\ &= \frac{1 - 4 \cos^2 x}{2 \cos x + 1} \\ &= \frac{(1 + 2 \cos x)(1 - 2 \cos x)}{2 \cos x + 1} && \text{(K1) Factorise and simplify} \\ &= 1 - 2 \cos x \\ &= \text{RHS} \end{aligned}$$

(N1)

(b)



Shape of cosine graph

(P1)

Amplitude = 2

(P1)

Reflection in the x-axis

(P1)

Shift upward +1

(P1)

(c)

$$y = \frac{x}{2\pi} + 2$$

(N1)

Sketch straight line $y = \frac{x}{2\pi} + 2$ with *gradient property or *y-intercept property correct

(K1)

Number of solutions = 2

(N1)

3

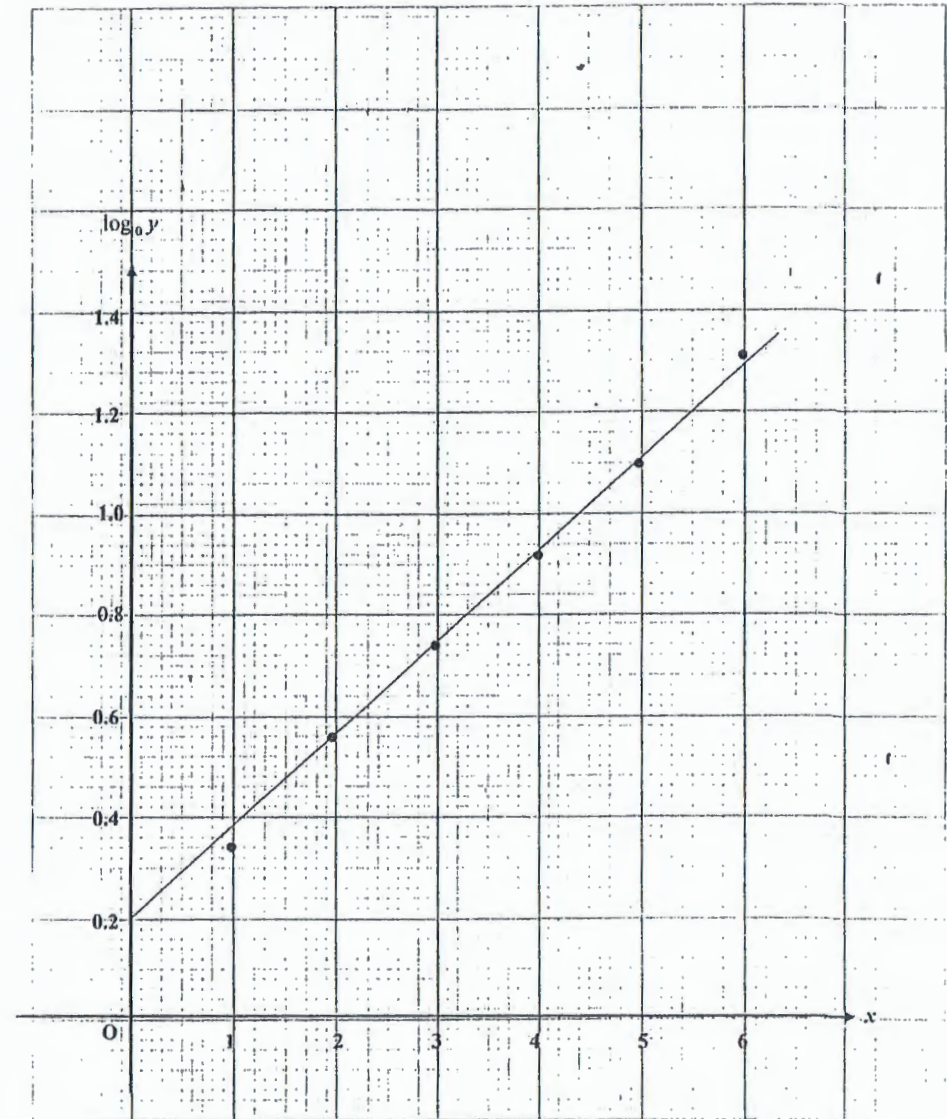
4

3

10

8									
(a)	$\log_{10} y$	0.34	0.56	0.74	0.92	1.10	1.31	N1	1
								Note : at least two d.p.	
(b)	Correct axes and uniform scale All points are correct							K1 Plot $\log_{10} y$ against x with correct axes and uniform scale.	
	*6 points plotted correctly							N1	
	Draw line of best fit							N1 Line of best fit	3
(c)	$\log_{10} y = x \log_{10}(1 - b) + \log_{10} a$							P1 $\log_{10} y = x \log_{10}(1 - b) + \log_{10} a$	
	* $m = \log_{10}(1 - b)$, $c = \log_{10} a$								
(i)	$\log_{10} a = 0.15 \leftrightarrow 0.2$							K1 Use * $c = \log_{10} a$	
	$a = 1.40 \leftrightarrow 1.58$							N1 1.40 \leftrightarrow 1.58	
(ii)	$\log_{10}(1 - b) = *m = \frac{1.1 - 0.56}{5 - 2}$							K1 Use * $m = \log_{10}(1 - b)$	
	$(1 - b) = 1.5135$								
	$b = -0.51 \leftrightarrow -0.23$							N1 -0.51 \leftrightarrow -0.23	
(iii)	$y = 10.2 \leftrightarrow 12.6$							N1 10.2 \leftrightarrow 12.6	6
								Note : SS - 1 if part of the scale is not uniform at the x-axis and/or the log-axis from the first point to the last point or does not use the given scale or does not use graph paper	10

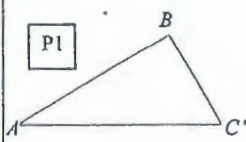
Graph for Question 7



9					
(a)					
(i)	${}^{10}C_0(0.7)^0(0.3)^{10}$ or ${}^{10}C_1(0.7)^1(0.3)^9$ or ${}^{10}C_2(0.7)^2(0.3)^8$ ${}^{10}C_0(0.7)^0(0.3)^{10} + {}^{10}C_1(0.7)^1(0.3)^9 +$ ${}^{10}C_2(0.7)^2(0.3)^8$ 0.00159	K1 Use ${}^nC_r(0.7)^r(0.3)^{n-r}$ K1 Use $P(x=0) + P(x=1) + P(x=2)$ N1 0.00159			
(ii)	$n(0.7) = 280$ $n = 400$	K1 Use $np = 280$ N1 400	5		
(b)					
(i)	$z = 1.406$ $*1.406 = \frac{70-m}{5}$ $m = 62.97$	N1 Value of $z = 1.406$ K1 Use $*z = \frac{70-m}{5}$ N1 62.97			
(ii)	$z = \frac{50 - *62.97}{5}$ 0.00474	K1 Use $z = \frac{50 - *m}{5}$ N1 0.00474	5	10	

10					
(a)	$\overline{OE} = \overline{OC} + \overline{LE}$ or $\overline{AD} = \overline{AO} + \overline{OD}$ (i) $\overline{OE} = 3\underline{v} + \underline{u}$ (ii) $\overline{AD} = 2\underline{v} - 4\underline{u}$	K1 Use triangle law to find \overline{OE} or \overline{AD} N1 $3\underline{v} + \underline{u}$ N1 $2\underline{v} - 4\underline{u}$			3
(b)					
(i)	$\overline{OF} = h(3\underline{v} + \underline{u})$ (ii) $\overline{OF} = 4\underline{u} + (-4k\underline{u} + 2k\underline{v})$ $\overline{OF} = (4 - 4k)\underline{u} + 2k\underline{v}$	N1 $h(3\underline{v} + \underline{u})$ K1 Use $\overline{OF} = \overline{OA} + k * \overline{AD}$ N1 $(4 - 4k)\underline{u} + 2k\underline{v}$			3
(c)	$3h = 2k$ or $h = 4 - 4k$ $3(4 - 4k) = 2k$ $k = \frac{6}{7}$ $h = \frac{4}{7}$	K1 Equate the coefficients of \underline{u} and of \underline{v} K1 Solve simultaneous equation for h or k N1 $k = \frac{6}{7}$ N1 $h = \frac{4}{7}$			4
					10

<p>11</p> <p>(a)</p> $\frac{dy}{dx} = 6(1-2x)(-2) = m = -12$ <p>$P = (0,3)$</p> $y = -12x + 3$ <p>(b)</p> $A_1 = \left[\frac{3(1-2x)^3}{-6} \right]_{\frac{1}{2}}^{\frac{3}{2}} = 4$ $A_2 = \frac{1}{2} \times 12 \times \frac{3}{2} = 9$ <p>Area of shaded region = $4 + 9$</p> <p>= 13</p> <p>(c)</p> $\left(\frac{\pi}{2} \right) \int [3(1-2x)^2]^2 dx$ $\pi \left[\frac{9(1-2x)^5}{-10} \right]$ $\left(\frac{\pi}{2} \right) (0) - \left(\frac{\pi}{2} \right) \left[\frac{9(1)^5}{-10} \right]$ $\frac{9}{10} \pi$	<p>K1 Differentiate $y = 3(1-2x)^2$</p> <p>K1 Find coordinate of P and use $y = mx + c$</p> <p>N1 $y = -12x + 3$</p> <p>K1 Integrate and use limit $\frac{1}{2}, \frac{3}{2} = A_1$</p> <p>K1 Find area of triangle = A_2</p> <p>K1 $*A_1 + *A_2$</p> <p>N1 13</p> <p>K1 Integrate $\left(\frac{\pi}{2} \right) \int [3(1-2x)^2]^2 dx$</p> <p>K1 Use limit 0, $\frac{1}{2}$, into $\left(\frac{\pi}{2} \right) * \left[\frac{9(1-2x)^5}{-10} \right]$</p> <p>N1 $\frac{9}{10} \pi$</p>	<p>3</p> <p>4</p> <p>3</p>	<p>10</p>
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<p>12</p> <p>(a)</p> <p>(i)</p> $30^2 = x^2 + (3x)^2 - 2(x)(3x)\cos 60^\circ$ <p>$x = 11.34$</p> $3x = 34.017$ <p>(ii)</p> $\frac{34.017}{\sin C} = \frac{30}{\sin 60^\circ}$ <p>$C = 100.89^\circ$</p> <p>(iii)</p> $\frac{1}{2} * (34.02)(30)\sin * 19.13$ or $\frac{1}{2} * (34.02) * (11.35)\sin 60^\circ$ or $\frac{1}{2} * (11.35)(30)\sin * 100.87$ <p>(b)</p> <p>(i)</p> <p>Sketch $\triangle ABC$</p> <p>(ii)</p> $\sin 60 = \frac{h}{* 34.02}$	<p>K1 Use cosine rule</p> <p>N1 11.34</p> <p>N1 34.017</p> <p>K1 Use sine rule</p> <p>N1 100.89°</p> <p>K1 Use $\frac{1}{2} ab \sin C$ to find area of $\triangle ABC$</p> <p>N1 167.2</p> <p>P1 </p> <p>K1 Use $\sin 60 = \frac{h}{* AB}$</p> <p>N1 $h = 29.46$</p>	<p>7</p> <p>3</p>	<p>10</p>
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13 (a)	$4(2-t) = 0$ $8-4t = 0$ $t = 2$ $V = \int (8-4t) dt$ $= 8t - 2t^2 + c$ $= 8t - 2t^2 + 10$ $V_{max} = 8(2) - 2(2)^2 + 10$ $= 18$	<p>K1 Use $a = 0$ to find r</p> <p>K1 Integrate $\int (8-4t) dt$ and substitute $t = 2$ into V</p> <p>N1 18 ms⁻¹</p>	3	
(b)	$8t - 2t^2 + 10 = 0$ $2t^2 - 8t - 10 = 0$ $t^2 - 4t - 5 = 0$ $(t-5)(t+1) = 0$ $t = 5$ $S = \int (8t - 2t^2 + 10) dt$ $= 4t^2 - \frac{2}{3}t^3 + 10t$ $= 4(5)^2 - \frac{2}{3}(5)^3 + 10(5)$ $= 66\frac{2}{3}$	<p>K1 Use $v = 0$ to find t</p> <p>K1 Integrate $\int (8t - 2t^2 + 10) dt$</p> <p>K1 Substitute $t = 5$ into S</p> <p>N1 66$\frac{2}{3}$ m</p>	4	
(c)	$t = 8, S = 4(8)^2 - \frac{2}{3}(8)^3 + 10(8)$ $= -5\frac{1}{3}$ <p>Total Distance</p> $= \left -5\frac{1}{3} - 66\frac{2}{3} \right + \left 66\frac{2}{3} \right $ $= 138\frac{2}{3} \text{ m}$	<p>K1 Find S_8</p> <p>K1 $S_8 - S_5 + S_5 - S_0$</p> <p>N1 138$\frac{2}{3}$ m</p>	3	10

14 (a)	$\bar{I}_{2017, 2015} = 105.6$ $\frac{4(100) + 3(120) + 2x + 1(106)}{10} = 105.6$ $2x = 190$ $x = 95$ <p>% of price change = 5%</p>	<p>K1 Use formula $\frac{\sum w_i I_i}{\sum W_i}$</p> <p>K1 Solve Equation</p> <p>N1 95</p> <p>N1 % of price change = 5%</p>	4	
(b)	$\frac{P_{17}}{7.80} \times 100 = 120$ $P_{17} = \text{RM } 9.36$	<p>K1 Use formula</p> $I = \frac{Q_1}{Q_2} \times 100$ <p>N1 RM9.36</p>	2	
(c) (i)	$\frac{115 \times 105.6}{100}$ $= 121.44$	<p>K1 Use $\frac{115}{100} \times \frac{105.6}{100} \times 100$</p> <p>N1 121.44</p>		
(ii)	$\frac{P_{19}}{85} \times 100 = 121.44$ $P_{19} = \text{RM } 103.22$	<p>K1 $\frac{P_{19}}{85} \times 100 = 121.44$</p> <p>N1 RM103.22</p>	4	10

15 (a)		<input type="checkbox"/> NI $5x + 3y \geq 60$ <input type="checkbox"/> NI $x + y \leq 10$ <input type="checkbox"/> NI $y \geq 3x$		
(b)	Refer graph	<input type="checkbox"/> K1 Draw at least 1 line from *inequality involving x and y <input type="checkbox"/> NI All 3 *line correctly drawn <input type="checkbox"/> NI Correct region	3	
(c)			3	
(i)	$y = 6$ $4 \leq x \leq 8$	<input type="checkbox"/> NI $4 \leq x \leq 8$		
(ii)	Minimum point (3,7)	<input type="checkbox"/> NI (3,7)		
	Min cost = $100(3) + 80(7)$ = 860	<input type="checkbox"/> K1 Use $100x + 80y$ for a point in the *region <input type="checkbox"/> NI 860	4	10

Graph for Question 15

