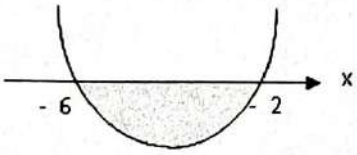
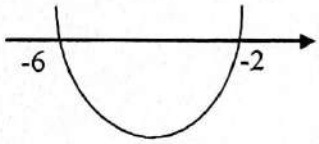
NO.	SOLUTION	SUB MARKS	MARKS
1	$2x^2-5x+2=0$ B2 : $p=1$ *or* $q=2$ B1 : $\frac{1}{2}p+\frac{1}{2}q=\frac{-(-3)}{2}$ *or* $\frac{1}{2}p\times\frac{1}{2}q=\frac{1}{2}$	3	3
2	58 minutes 20 seconds // 3500 saat // $58\frac{1}{3}$ minit B2 : $S_{10}=\frac{10}{2}[2(260)+9(20)]$ B1: a= 260 and d= 20	3	3
3	First term $=\frac{12}{q}$ **and** common ratio $=\frac{q}{2}$ B1 : First term $=\frac{12}{q}$ *or* common ratio $=\frac{q}{2}$	2	2
4	$h(x)=3x^2+2x-\frac{14}{3}$ B3 : $c=-\frac{14}{3}$ *or* $-5=3\left(-\frac{1}{3}\right)^2+2\left(-\frac{1}{3}\right)+c$ B2 : $h(x)=3x^2+2x+c$ *or* $x=-\frac{1}{3}$ B1 : $h'(x)=6x+2$ *or* $c=2$	4	4
5	2 B1 : $\lim_{x\to\infty}\left(\frac{2x^2+3}{x^2-5x-1}\right)\times\left(\frac{\frac{1}{x^2}}{\frac{1}{x^2}}\right)$ *or* $\lim_{x\to\infty}\frac{2+\frac{3}{x^2}}{1-\frac{5}{x}-\frac{1}{x^2}}$ *or* $\frac{2+0}{1-0-0}$	2	2

6	(a) 19 B1 : $8x + 3$ *or* $8(2) + 3$ (b) $19k$ B1 : $[8(2) + 3] \times k$	2 2	4
7	One to one relation Inverse function	1 1	2
8	(a) $gf(x) = 0.02(x - 5000)$ B1 : gf *or* $g(x - 5000)$ (b) 83.44 B1 : $0.02(9172 - 5000)$	2 2	4
9	Pekerja kilang B lebih cekap kerana mempunyai sisihan piawai yang kecil berbanding sisihan piawai pekerja Kilang A B3 : Kilang A : min = 7.1 , σ = 1.261 : Kilang B : min = 7.1 , σ = 1.044 } *dan* B2 : Kilang A : min = 7.1 , σ = 1.261 *atau* : Kilang B : min = 7.1 , σ = 1.044 B1 : min = 7.1 *atau* σ = 1.261 *atau* σ = 1.044 *atau* $\bar{x}_A = \frac{(5\times3)+(6\times2)+(7\times9)+(8\times2)+(9\times4)}{3+2+9+2+4}$ atau $\bar{x}_B = \frac{(5\times1)+(6\times5)+(7\times7)+(8\times5)+(9\times2)}{1+5+7+5+2}$ atau $\sqrt{\frac{(5^2\times3)+(6^2\times2)+(7^2\times9)+(8^2\times2)+(9^2\times4)}{3+2+9+2+4}}$ atau $\sqrt{\frac{(5^2\times1)+(6^2\times5)+(7^2\times7)+(8^2\times5)+(9^2\times2)}{1+5+7+5+2}}$	4	4

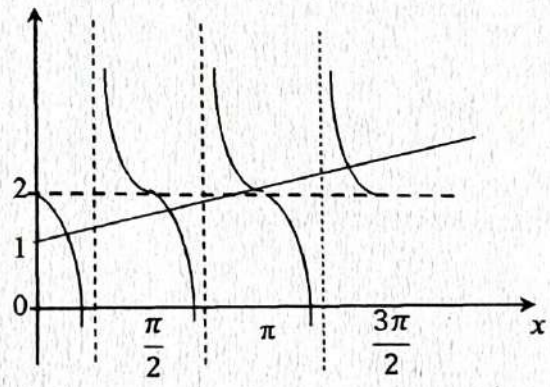
10	(a) $\frac{m}{20}$ (b) $\sqrt{\frac{n-m}{20}}$	1 1	2
11	$k = m$ (gradient) × 3 and $h = c$ (y-intercept) × 3 B2 : $Y = \frac{y}{\sqrt{x}}$, m (gradient) multiply by 3 = k , c (y-intercept) multiply by 3 = h **(Any two)** B1 : $Y = \frac{y}{\sqrt{x}}$, *or* m (gradient) = $\frac{k}{3}$ *or* c (y-intercept) = $\frac{h}{3}$	3	3
12	(a) 1 (b) (i) 96 (ii) 33 B1 : ${}^6C_2$ **OR** ${}^3C_1 \times {}^6C_1$	1 1 2	4
13	$\frac{3}{10}$ B3 : $\frac{1}{5} \times \frac{1}{2} + \frac{4}{10} \times \frac{1}{2}$ B2 : $\frac{1}{5} \times \frac{1}{2}$ or $\frac{4}{10} \times \frac{1}{2}$ B1 : $\frac{1}{5}$	4	4
14	3^x (77) B2 : $3^x\left[\left(3^4\right)+1-45\left(3^{-2}\right)\right]$ B1 : $3^x \times 3^4$ *or* $3^x \times 3^{-2}$	3	3

15	$\frac{8+y-4x}{3}$ B3 : $\frac{8}{3}+\log_8 2^y-\log_8 2^{4x}$ B2 : $\log_8 256c^2-\log_8 b^4$ B1 : $b=2^x$ or $c=\sqrt{2}^y$	4	4
16	(a) $\theta = 0.8$ rad (b) 15.01 B2 : $\frac{1}{2}\times 10^2\times 0.8-\frac{1}{2}\times 10\times 6.9678\times sin45.83$ **OR** $\frac{1}{2}\times 10^2\times 0.8-\frac{1}{2}\times 6.9678\times 7.7128$ B1 : $\frac{1}{2}\times 10^2\times 0.8$ **OR** $\frac{1}{2}\times 10\times 6.9678\times sin45.83$ $\frac{1}{2}\times 6.9678\times 7.7128$	1 3	4
17	(a) $\sqrt{1-t^2}$ B1 : $kos90^\circ kos\alpha-\sin 90^\circ \sin\alpha$ (b) $\frac{2t\sqrt{1-t^2}}{2t^2-1}$ B1 : $\frac{2\frac{\sqrt{1-t^2}}{t}}{1-\left(\frac{\sqrt{1-t^2}}{t}\right)^2}$	2 2	4

18	2.041 B2 : $P\left(Z > \frac{61-60}{\sigma}\right) = 0.3121$ B1 : $\frac{61-60}{\sigma} = 0.49$	3	3
19	(a) $1-g-h$ B1 : $\frac{54}{125}+\frac{64}{125}$ (b) 0.8 // $\frac{4}{5}$ B1 : ${}^3C_3p^3q^{3-3} = \frac{64}{125}$	3	3
20	$8x^2+8y^2-14x-44y+61=0$ B2 : $\sqrt{(x-2)^2+(y-5)^2} = 3\sqrt{(x-1)^2+(y-3))^2}$ B1 : $TQ = 3TP$	3	3
21	$m = \frac{3n-1}{3}$ B2 : $m = 3h$ *or* $h = \frac{3n-1}{9}$ B1 : $\frac{2m(1)+2h(3)}{3+1} = m$ *or* $\frac{(n+1)(1)+3h(3)}{3+1} = n$	3	3
22	$r = \frac{12-s}{5}$ B1 : $\begin{pmatrix}-r+2\\-2\end{pmatrix} = \lambda\begin{pmatrix}s-r\\-12\end{pmatrix}$ *or* $\begin{pmatrix}2-r\\-2\end{pmatrix} = \lambda\begin{pmatrix}s-2\\-10\end{pmatrix}$	2	2

23	$-6 < r < -2$ B2 : $[-(4+r)]^2 - 4(1)(1) < 0$ <u>atau</u> $(-4-r)^2 - 4(1)(1) < 0$  B1 : $[-(4+r)]^2 - 4(1)(1)$ $\square$ 0 <u>atau</u> $(-4-r)^2 - 4(1)(1)$ $\square$ 0 <u>atau</u> $(r+2)(r+6)$ $\square$ 0 <u>atau</u> $r = -2,\ r = -6$ $\square$ =, >, ≤, ≥ <u>atau</u>  	3	3
24	(a) $-3\underset{\sim}{i}+13\underset{\sim}{j}$ B1 : $10\underset{\sim}{j}+(3\underset{\sim}{i}+7\underset{\sim}{j})+(-6\underset{\sim}{i}-4\underset{\sim}{j})$ (b) $\dfrac{-3\underset{\sim}{i}+13\underset{\sim}{j}}{\sqrt{178}}$ B1 : $\sqrt{(-3)^2+(13)^2}$	2 2	4
25	$f(x) = -\frac{1}{2}(x-3)^2 + 8$ B2 : $a = -\frac{1}{2}$ B1 : Maximum point $= (3, 8)$ *or* $f(x) = a(x-3)^2 + 8$	3	3

NO.	SOLUTION	MARKS	TOTAL MARK
1			
(a)	(i) $\overrightarrow{QS} = \overrightarrow{QP} + \overrightarrow{PS}$	K1	
	$-6\underline{a} + 6\underline{b}$	N1	
	(ii) $\overrightarrow{TR} = \overrightarrow{TS} + \overrightarrow{SR}$		
	$8\underline{a}$	N1	
(b)	Cari $\overline{QU}$ atau $\overline{QS}$	K1	
	$\overline{QU} = \overline{QP} + \overline{PT} + \overline{TU}$		
	$= -2\underline{a} + 2\underline{b}$	N1	
	$\frac{\overline{QS}}{\overline{QU}} = \frac{-6\underline{a} + 6\underline{b}}{-2\underline{a} + 2\underline{b}}$		
	$\frac{\overline{QS}}{\overline{QU}} = \frac{6(-\underline{a} + \underline{b})}{2(-\underline{a} + \underline{b})}$		
	$\overline{QS} = 3\overline{QU}$	K1	
	Ada nisbah. Maka terbukti ianya adalah segaris	N1	
			7
2			
(a)	10, 12, 14, 16, ...	P1	
	Distance particle P, $S_p = \frac{n}{2}[2(10) + (n-1)2]$	K1	
	Distance particle Q, S_Q : $8n$		
	use $S_p + S_Q = 60$	K1	
	$(n + 20)(n - 3) = 0$ *factorise*	K1	
	$n = 3$		
	$t = 3$	N1	
(b)	Distance $= \frac{3}{2}[2(10) + 2(2)]$,		
	use formula $S_n = \frac{n}{2}[2a + (n-1)d]$ *or* $10 + 12 + 14$	K1	
	$= 36$	N1	
			7

3	$y = \frac{4}{x}$, $x = 2$ $y = 2$ (2, 2) $\frac{dy}{dx} = \frac{-4}{x^2}$ kecerunan tangent = -1 kecerunan normal = 1 $2 = 2 + c$ $y = x$ $\frac{4}{x} = x$ $x = 2$ atau -2 titik persilangan (-2, -2)	K1 K1 K1 N1 K1 N1	6
4 (a) (b)	Use $\cos 2A = 1 - \sin^2 A$ $\sin^2 \frac{1}{2}A = \frac{1-\cos A}{2}$ (i)  $y = \frac{x}{\pi} + 1$ Number of solutions is 4	K1 N1 P1 (tangen graph) P1 (cycle) P1 (reflection) P1 (shifted) K1 (gradient or intercept) N1	8

5 (a)	$\frac{90}{u}+\frac{60}{v}=2.7$	K1	
	$200u+300v=9uv$	N1	
(b)	$u-v=10$		
	$200u+300v=9uv$		
	$u=10+v$	K1	
	$200(10+v)+300v=9v(10+v)$	K1	
	$9v^2-410v-2000=0$		
	$(9v+40)(v-50)=0$		
	$v=50$	N1	
	$u=60$	N1	6
6	$x\log_{10}\left(1-\frac{2}{y}\right)=\log_{10}\frac{p}{q}$ Menggunakan Hukum log	K1	
	$\left(1-\frac{2}{y}\right)^x=\frac{p}{q}$	K1	
	Menggantikan nilai y, p dan q dalam persamaan		
	$\left(1-\frac{2}{20}\right)^x=\frac{10000}{100000}$	K1	
	Meringkaskan persamaan log untuk mencari nilai x		
	$x\log_{10}\left(\frac{18}{20}\right)=\log_{10}\frac{10000}{100000}$	K1	
	$x=\frac{-1}{-0.04576}$	K1	
	$x=21.85$ *tahun*	N1	6

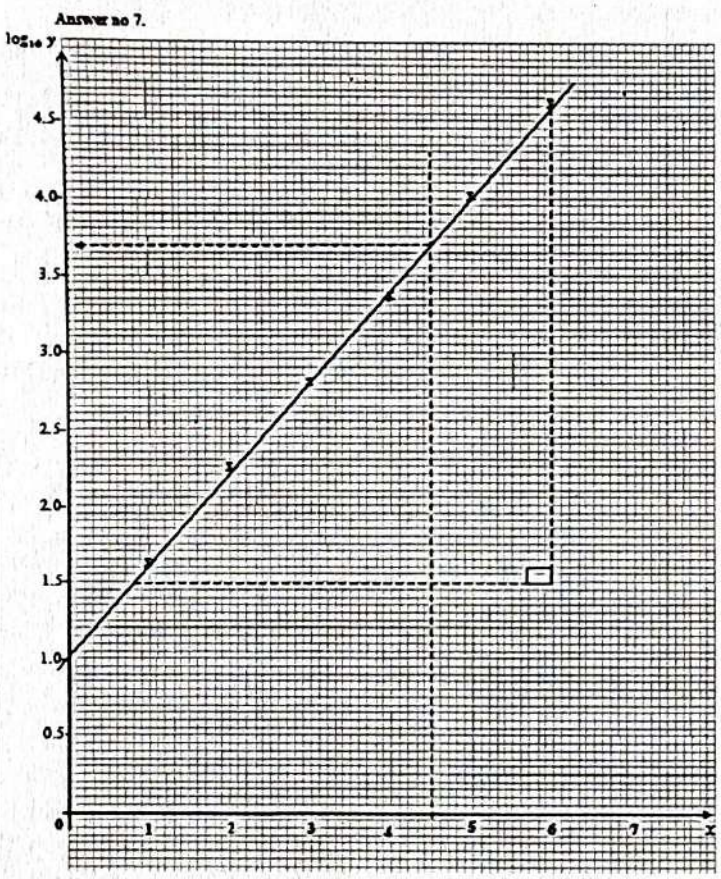
7

(a)

$\log_{10} y$	1.602	2.250	2.806	3.350	4.010	4.612

N1

(b)



One point plotted correctly with correct scale — K1

6 *points plotted correctly — N1

Line of best fit — N1

(c) $\log_{10} y = \log_{10} p + (q+1)(\log_{10} 2)x$ — P1

Use * c = $\log_{10} p$ or Use *$m = (q+1)\log_{10} 2$ — K1

(i) $y = 5623.4$ $\quad 4466.84 \le y \le 7079.46$ — N1 K1

(ii) $p = 10$ $\quad 8.91 \le p \le 11.22$ — N1

(iii) $q = 0.9998$ $\quad 0.93 \le q \le 1.05$ — N1

Note : SS-1 if part of the scale is not uniform or not using the scales given or not using the graph paper

10

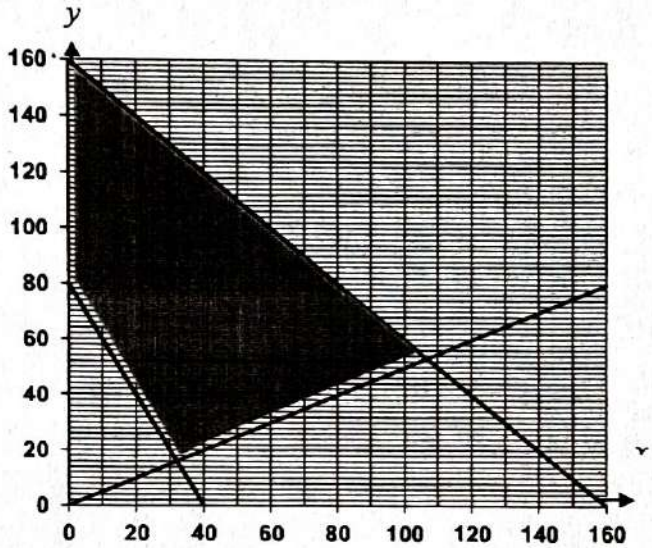
8 (a)	Titik tengah SM		
	$\left(\frac{-3+3}{2}, \frac{2+(-1)}{2}\right)$	K1	
	$\left(0, \frac{1}{2}\right)$		
	Kecerunan SM $M_1 = -\frac{1}{2}$		
	$M_2 = 2$	K1	
	$y = 2x + \frac{1}{2}$	K1	
(b)	$y = -\frac{1}{2}x + \frac{9}{2}$	K1	
	Titik persilangan $2x + \frac{1}{2} = -\frac{1}{2}x + \frac{9}{2}$	K1	
	$\left(\frac{8}{5}, \frac{37}{10}\right)$	N1	
(c)	$\sqrt{(x+3)^2 + (y+4)^2} = \sqrt{(x-3)^2 + (y+1)^2}$ $12x + 6y + 15 = 0$	K1 N1	
(d)	Terima mana-mana pengiraan luas dengan kaedah yang betul.	K1	
	Luas Δ GSR = 12 unit^2 // Luas Δ GSM = 12 unit^2 // Luas $GSRM$ = 30 unit^2	N1	
			10

9			
(a)	$\sin \angle BPC = \frac{3}{5}$	K1	
	$\angle BPC = 36.87^\circ$		
	$\angle ABP = \angle BPC = 36.87 \times \frac{3.142}{180}$	K1	
	$\angle ABP = 0.6436$ *radians*	N1	
(b)	Area of sector $BAP = \frac{1}{2}(5)^2(0.6436)$	K1	
	8.045	N1	
	Area of sector $DAQ = \frac{1}{2}(3)^2\left(\frac{\pi}{2}\right)$	K1	
	7.07	N1	
(c)	Area of Δ PBC $= \frac{1}{2}(4)(3) = 6$ *or* Area of $\square ABCD = 15$	K1	
	Area of shaded region = [Area of sector BAP + Area of sector DAQ + Area of ΔPBC] – [Area of $\square ABCD$]		
	[8.045 + 7.07 + 6] – 15	K1	
	6.115	N1	
			10
10			
(a)	(i) $P(x=1) = P(x=2)$	K1	
	$^nC_1\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{n-1} = {}^nC_2\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{n-2}$	K1	
	$n\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^{n-1} = \frac{n!}{(n-2)!2!}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)^{n-2}$		
	$\frac{n-1}{2} = 1$		
	$n = 3$	N1	
	(ii) $np = 50$		
	$n(0.5) = 50$	K1	
	$n = 100$	N1	

(b)	$P(Z > \frac{k-60}{5}) = 0.15$	K1	
	$\frac{k-60}{5} = 1.036$	K1	
	$k = 65.18$	N1	
	$0.15 = \frac{n(x)}{1200}$	K1	
	$n(x) = 180$	N1	
			10
11 (a)	Use $\frac{x^2}{2} + 3 = 5$	K1	
	$k = -2$	N1	
(b)	Use $\int_{-2}^{1} \left(\frac{x^2}{2} + 3\right) dx$	K1	
	Integrate $\left[\frac{x^3}{6} + 3x\right]_{-2}^{1}$	K1	
	Substitute value of limit $\left(\frac{1}{6} + 3(1)\right) - \left(\frac{(-2)^3}{6} + 3(-2)\right)$	K1	
	$\frac{21}{2}$ // 10.5	N1	
(c)	Use $\pi \int_{3}^{5} x^2 dy$	K1	
	Integrate $\pi[y^2 - 6y]_3^5$	K1	
	Substitute value of limit $\pi[(5^2 - 6(5)) - (3^2 - 6(3))]$	K1	
	4π	N1	
			10

12 (a)	(i) $p = 120$	N1	
	(ii) $\frac{2.23}{q} \times 100 = 120$	K1	
	$q = 1.86$	N1	
(b)	$\frac{150(20) + 120(30) + 125(10) + 134(40)}{100}$	K1	
	$= 132.1$	N1	
(c)	(i) $\frac{132.1(x)}{100} = 135$	K1	
	$x = 102.20$	N1	
	(ii) $\frac{x}{7.50} \times 100 = 135$	K1	
	$x = 10.13$	N1	
	Maksimum $= \frac{488}{10.13}$		
	$= 48$ pasang	N1	
			10
13 (a)	$\tan 40° = \frac{10}{BD}$		
	$BD = 11.92$ cm	K1	
	$\frac{BC}{\sin 15°} = \frac{11.92}{\sin 106°}$	K1	
	$BC = 3.209$ cm	N1	

(b)	$AC=\sqrt{10^2+3.209^2}$ or $AD=\sqrt{10^2+11.92^2}$ $=10.50$ $=15.56$	P1	
	$\frac{CD}{\sin 59^\circ}=\frac{11.92}{\sin 106^\circ}$ $CD=10.63$	K1	
	$15.56^2=10.50^2+10.63^2-2(10.50)(10.63)kosC$ $C=94.85^\circ$ // $94^\circ\ 51'$	K1	
	$Luas\ \Delta ACD=\frac{1}{2}(10.50)(10.63)(\sin 94.85^\circ)$ $=55.61\text{ cm}^2$	K1 N1	
(c)	Jarak terpendek dari C ke AD. $\frac{1}{2}\times 15.56\times h=55.61$	K1	
	$h=7.148\text{ cm}$	N1	10
14 (a)	$v=8$	P1	
(b)	$2-2t=0$	N1	
	$t=1,\ v=8+2(1)-(1)^2$ $v=9$	K1 N1	
(c)	$v=0,\ (t-4)(t+2)=0$	K1	
	$t=4$	N1	
(d)	Total Distance		
	$=\left[\int_0^4(8+2t-t^2)\,dt\right]+\left\|\left[\int_4^6(8+2t-t^2)\,dt\right]\right\|$	K1	
	$=\left[8t+\frac{2t^2}{2}-\frac{t^3}{3}\right]_0^4+\left[\left\|8t+\frac{2t^2}{2}-\frac{t^3}{3}\right\|_4^6\right]$	K1	
	$=\left[8(4)+\frac{2(4)^2}{2}-\frac{(4)^3}{3}\right]-0+\left[\left\|\left(8(6)+\frac{2(6)^2}{2}-\frac{(6)^3}{3}\right)-\left(8(4)+\frac{2(4)^2}{2}-\frac{(4)^3}{3}\right)\right\|\right]$	K1	
	$s=\frac{124}{3}$	N1	10

15			
(a)	I: $x + y \leq 160$	N1	
	II: $y \geq \frac{1}{2}x$	N1	
	III: $40x + 20y \geq 1600$	N1	
(b)		K1 *If two lines correctly plotted graph* N1 *All graph lines correctly plotted* N1 *Region R*	
(c)	(i) 32	N1	
	(ii) $40x + 20y$ *or* (106, 54)	N1	
	40(106) + 20(54)	K1	
	RM 5320	N1	
			10