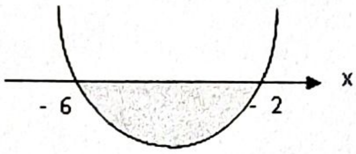
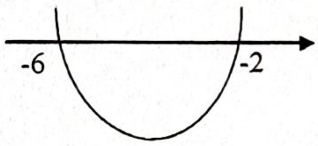
NO.	SOLUTION	SUB MARKS	MARKS
1	$2x^2-5x+2=0$ B2 : $p=1$ *or* $q=2$ B1 : $\frac{1}{2}p+\frac{1}{2}q=\frac{-(-3)}{2}$ *or* $\frac{1}{2}p\times\frac{1}{2}q=\frac{1}{2}$	3	3
2	58 minutes 20 seconds // 3500 saat // $58\frac{1}{3}$ minit B2 : $S_{10}=\frac{10}{2}[2(260)+9(20)]$ B1: a= 260 and d= 20	3	3
3	First 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 : $8x + 3$ <u>or</u> $8(2) + 3$ (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 } <u>dan</u> B2 : Kilang A : min = 7.1 , σ = 1.261 <u>atau</u> : Kilang B : min = 7.1 , σ = 1.044 B1 : min = 7.1 <u>atau</u> σ = 1.261 <u>atau</u> σ = 1.044 <u>atau</u> $\bar{x}_A = \frac{(5\times3)+(6\times2)+(7\times9)+(8\times2)+(9\times4)}{3+2+9+2+4}$ 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

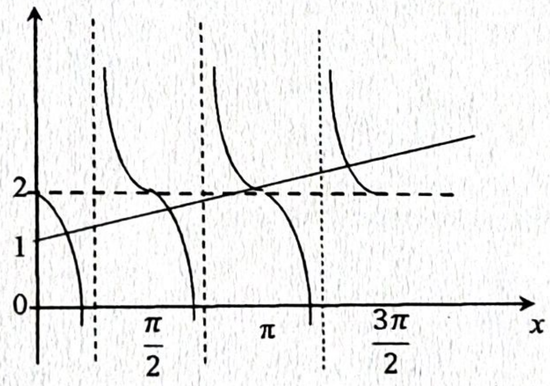
10	(a) $\frac{m}{20}$ (b) $\sqrt{\frac{n-m}{20}}$	1 1	2
11	$k = m$ (gradient) × 3 and $h = c$ (y-intercept) × 3 B2 : $Y = \frac{y}{\sqrt{x}}$, m (gradient) multiply by 3 = k , c (y-intercept) multiply by 3 = h **(Any two)** B1 : $Y = \frac{y}{\sqrt{x}}$, *or* m (gradient) = $\frac{k}{3}$ *or* c (y-intercept)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

15	$\dfrac{8+y-4x}{3}$ 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 : $kos90^\circ \cdot kos\alpha-\sin 90^\circ \sin\alpha$ (b) $\dfrac{2t\sqrt{1-t^2}}{2t^2-1}$ B1 : $\dfrac{2\dfrac{\sqrt{1-t^2}}{t}}{1-\left(\dfrac{\sqrt{1-t^2}}{t}\right)^2}$	2 2	4

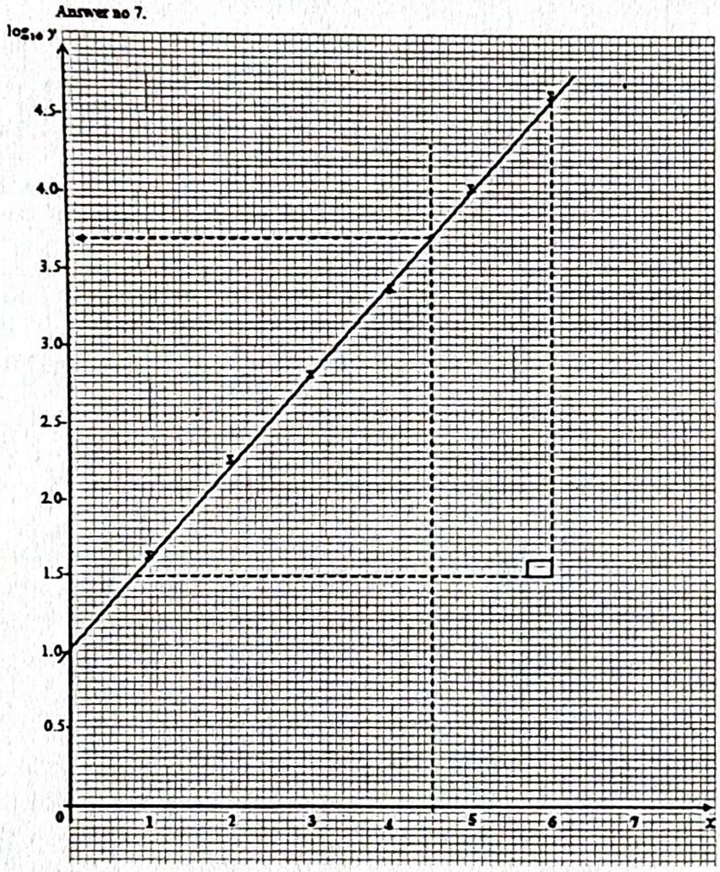
18	2.041 B2 : $P\left(Z > \frac{61-60}{\sigma}\right) = 0.3121$ B1 : $\frac{61-60}{\sigma} = 0.49$	3	3
19	(a) $1-g-h$ B1 : $\frac{54}{125} + \frac{64}{125}$ (b) 0.8 // $\frac{4}{5}$ B1 : ${}^3C_3 p^3 q^{3-3} = \frac{64}{125}$	3	3
20	$8x^2 + 8y^2 - 14x - 44y + 61 = 0$ B2 : $\sqrt{(x-2)^2 + (y-5)^2} = 3\sqrt{(x-1)^2 + (y-3))^2}$ 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 : $[-(4+r)]^2 - 4(1)(1)$ ☐ 0 <u>atau</u> $(-4-r)^2 - 4(1)(1)$ ☐ 0 <u>atau</u> $(r+2)(r+6)$ ☐ 0 <u>atau</u> r = -2, r = -6 ☐ =, >, ≤, ≥ <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) $\vec{QS} = \vec{QP} + \vec{PS}$	K1	
	$-6\underset{\sim}{a} + 6\underset{\sim}{b}$	N1	
	(ii) $\vec{TR} = \vec{TS} + \vec{SR}$		
	$8\underset{\sim}{a}$	N1	
(b)	Cari $\overline{QU}$ atau $\overline{QS}$		
	$\overline{QU} = \overline{QP} + \overline{PT} + \overline{TU}$	K1	
	$= -2\underset{\sim}{a} + 2\underset{\sim}{b}$	N1	
	$\frac{\overline{QS}}{\overline{QU}} = \frac{-6\underset{\sim}{a} + 6\underset{\sim}{b}}{-2\underset{\sim}{a} + 2\underset{\sim}{b}}$		
	$\frac{\overline{QS}}{\overline{QU}} = \frac{6(-\underset{\sim}{a} + \underset{\sim}{b})}{2(-\underset{\sim}{a} + \underset{\sim}{b})}$		
	$\overline{QS} = 3\overline{QU}$	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)		
	$\frac{dy}{dx} = \frac{-4}{x^2}$	K1	
	kecerunan tangent = -1		
	kecerunan normal = 1	K1	
	$2 = 2 + c$	K1	
	$y = x$	N1	
	$\frac{4}{x} = x$	K1	
	$x = 2$ atau -2		
	titik persilangan (-2, -2)	N1	6
4 (a)	Use $\cos 2A = 1 - \sin^2 A$	K1	
	$\sin^2 \frac{1}{2} A = \frac{1-\cos A}{2}$	N1	
(b)	(i) 	P1 (tangen graph) P1 (cycle) P1 (reflection) P1 (shifted)	
	$y = \frac{x}{\pi} + 1$	K1 (gradient or intercept)	
	Number of solutions is 4	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	
	$x=21.85\ \textit{tahun}$	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) $y = 5623.4$ $4466.84 \le y \le 7079.46$	N1	
	(ii) $p = 10$ $8.91 \le p \le 11.22$	K1 N1	
	(iii) $q = 0.9998$ $0.93 \le q \le 1.05$	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

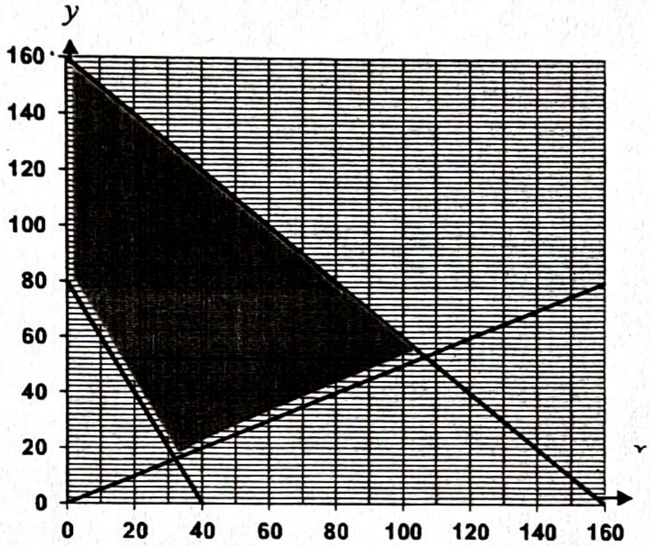
8 (a)	Titik tengah *SM*		
	$\left(\frac{-3+3}{2}, \frac{2+(-1)}{2}\right)$	K1	
	$\left(0, \frac{1}{2}\right)$		
	Kecerunan *SM* $M_1 = -\frac{1}{2}$		
	$M_2 = 2$	K1	
	$y = 2x + \frac{1}{2}$	K1	
(b)	$y = -\frac{1}{2}x + \frac{9}{2}$	K1	
	Titik persilangan $2x + \frac{1}{2} = -\frac{1}{2}x + \frac{9}{2}$	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 unit² // Luas Δ *GSM* = 12 unit² // Luas *GSRM* = 30 unit²	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 □$ABCD$ = 15	K1	
	Area of shaded region = [Area of sector *BAP* + Area of sector *DAQ* + Area of Δ*PBC*] – [Area of □ *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)	$P(Z > \frac{k-60}{5}) = 0.15$ $\frac{k-60}{5} = 1.036$ $k = 65.18$ $0.15 = \frac{n(x)}{1200}$ $n(x) = 180$	K1 K1 N1 K1 N1	10
11 (a)	Use $\frac{x^2}{2} + 3 = 5$ $k = -2$	K1 N1	
(b)	Use $\int_{-2}^{1} \left(\frac{x^2}{2} + 3\right) dx$ Integrate $\left[\frac{x^3}{6} + 3x\right]_{-2}^{1}$ Substitute value of limit $\left(\frac{1}{6} + 3(1)\right) - \left(\frac{(-2)^3}{6} + 3(-2)\right)$ $\frac{21}{2}$ // 10.5	K1 K1 K1 N1	
(c)	Use $\pi \int_{3}^{5} x^2 dy$ Integrate $\pi[y^2 - 6y]_3^5$ Substitute value of limit $\pi[(5^2 - 6(5)) - (3^2 - 6(3))]$ 4π	K1 K1 K1 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)	$\tan 40^\circ = \frac{10}{BD}$		
	$BD = 11.92$ cm	K1	
	$\frac{BC}{\sin 15^\circ} = \frac{11.92}{\sin 106^\circ}$	K1	
	$BC = 3.209$ cm	N1	

(b)	$AC=\sqrt{10^2+3.209^2}$ $=10.50$ *or* $AD=\sqrt{10^2+11.92^2}$ $=15.56$	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	
	$Luas\ \Delta ACD=\frac{1}{2}(10.50)(10.63)(\sin 94.85^\circ)$	K1	
	$=55.61\text{ cm}^2$	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: $x + y \le 160$	N1	
	II: $y \ge \frac{1}{2}x$	N1	
	III: $40x + 20y \ge 1600$	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