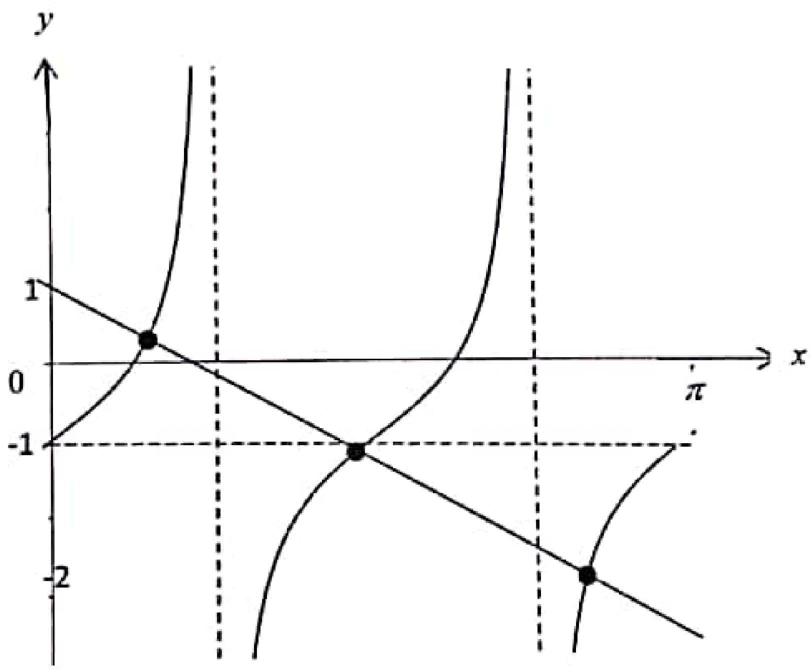
NO	MARKING SCHEME	MARKS	FULL MARKS
1	$q = \frac{2\sqrt{6}p}{3}$	2	2
	$\frac{p}{5p+3q} = \frac{5p-3q}{p}$	B1	
2	$h + q = \frac{k^2 + 2p^2}{8}$	3	3
	$q = \frac{p^2}{4}$ *or* $h = \frac{k^2}{8}$ OR solve simultaneous equations	B2	
	$p^2 - 4q = 0$ or $(-k)^2 - 4(2)(h) = 0$	B1	
3	a) -1	2	4
	$-\frac{8}{(x+3)^3} = -1$	B1	
	b) 16	2	
	$(-1) \times \frac{dx}{dt} = -16$	B1	
4	-6	2	2
	$p = 4$ or $r = -1$ or $pqr = 24$ or $4q(-1) = 24$	B1	
5	a) $-\frac{20}{9}$	2	4
	$a\left(\frac{3}{2}\right)^2 + 5 = 0$	B1	
	b) $\frac{45}{8}\pi$ or equivalent	2	
	$-\frac{9}{20}\pi\left[\frac{y^2}{2} - 5y\right]_0^5$	B1	
6	a) Many to one	1	2
	b) $x \leq 2$ *or* $x \geq 2$ (accept any one of the answer)	1	
7	*a)* $\frac{13}{3}$	2	4
	$2 - 3p = 11$ or $2 - 3p = -11$	B1	
	b) $\frac{4}{3} < x < \frac{13}{3}$	2	
	$-(2 - 3x) = 2$ or equivalent	B1	

NO	MARKING SCHEME	MARKS	FULL MARKS
8	a) 13	1	2
	b) 4	1	
9	$\frac{1}{3}$	3	3
	$\log_k 9 = -2$	B2	
	$\log_k y = \log_k 9 - x \log_k q$	B1	
10	a) $x < p, x > q$	1	2
	b) $p < x < q$	1	
11	a) $x = u$	1	4
	b) $k \leq 16$	3	
	$(-4)^2 - 4(1)(k-12) \geq 0$	B2	
	$x^2 - 4x + k - 12 = 0$	B1	
12	$\frac{3q}{4p^2}$	3	3
	$\frac{(3^n)(3)}{(2^n)^2(4)}$	B2	
	$\frac{3^{3(n+1)\frac{1}{3}}}{2^{2(n+1)}}$	B1	
13	$\frac{2x+y}{3}$	4	4
	$\log_m v = \frac{x+2y}{3}$ or $\log_m u = \frac{x-y}{3}$ OR $\left(\frac{x+2y}{3} + \frac{x-y}{3}\right)$	B3	
	$\log_m v = x - 2(\log_m v - y)$ or $\log_m u = x - 2\log_m u - y$	B2	
	$\log_m v = x - 2\log_m u$ OR $\log_m u = \log_m v - y$	B1	
14	a) 8	2	4
	$16.5 + \left[\frac{\frac{24+k}{2} - (k+5)}{12}\right]3 = 17.25$	B1	
	b) 14.625 saat	2	
	$13.5 + \left[\frac{8-5}{8}\right]3$	B1	

NO	MARKING SCHEME	MARKS	FULL MARKS
15	a) $\frac{49}{200}$	1	4
	b) $p = \frac{5}{8}$		
	$\frac{4}{5}p + \frac{3}{25}p + \frac{12}{25}(1-p) = \frac{151}{200}$	3	
		B2	
	$(p)\left(\frac{4}{5}\right)$ or $(p)\left(\frac{1}{5}\right)\left(\frac{3}{5}\right)$ or $(1-p)\left(\frac{3}{5}\right)\left(\frac{4}{5}\right)$	B1	
16	$\frac{ab}{4}$	3	3
	$\frac{1}{2}(a)\left(\frac{b}{2}\right)$	B2	
	- a or $\frac{b}{2}$	B1	
17	$\lambda = 30$	1	2
	$\lambda - 4 = 2(13)$ or $6\mu = 12$	1	
18	a) $\alpha = \frac{\pi}{3}$	1	4
	b) $p\left(\frac{2\sqrt{3}-\pi}{2}\right)$ or $p\left(\sqrt{3} - \frac{\pi}{2}\right)$ or	3	
	$\sqrt{3}p - \frac{p\pi}{2}$ [Shaded area = area of triangle – area of sectors]	B2	
	$\frac{1}{2}(2\sqrt{p})^2 sin60°$ [Area of a triangle] OR $\frac{1}{2}\left(\sqrt{p}\right)^2\left(\frac{\pi}{3}\right)$ [Area of a sector]	B1	
19	a) $\frac{m}{n}$	1	3
	b) $\frac{n-m}{2n}$	2	
	$\frac{m}{n} = 1 - 2\sin^2\frac{A}{2}$	B1	
20	$R(-45, -24)$	4	4
	$y^2 = 36 - 12(2y+3)$ or $y(y+24) = 0$ or $y = -24$ OR $x = 2(-24) + 3$ or $x = -45$	B3	
	$y = \frac{1}{2}x - \frac{3}{2}$ (Equation of QR)	B2	
	$m_{PQ} = -2$ OR $P(0,6)$ or $S(0,-6)$ or $Q(3,0)$	B1	

21	$\frac{3}{2}$	3	3
	$Q = \frac{3}{2}\left(4i - \frac{5}{4}j\right)$ OR $P = 4i - \frac{5}{4}j$	B2	
	$P = (3i - j) + (i - \frac{1}{4}j)$ OR $Q = \left(7i - \frac{17}{8}j\right) - (i - \frac{1}{4}j)$	B1	
22	$p = \sqrt[4]{a}$	2	2
	${}^4C_4\,(p^4)(q^0) = a$	B1	
23	1491	4	4
	$0.04561 = \frac{68}{n}$	B3	
	0.04561 or $P(Z > 1.689)$	B2	
	$P\left(Z > \frac{15 - 7.40}{4.50}\right)$	B1	
24	Not able,	1	4
	because 3 m < 9.6 m (Both need to support by the value of S_n)	1	
	$S_n = \frac{15}{2}\,[2(8) + 14(8)]$ or 960 cm	B2	
	$n = 15$ or $a = 8$ or $d = 8$	B1	
25	a) 252	1	4
	b) 102	3	
	${}^3C_1 \times {}^3C_2 \times {}^4C_2 + {}^3C_2 \times {}^3C_2 \times {}^4C_1 + {}^3C_1 \times {}^3C_3 \times {}^4C_1$	B2	
	${}^3C_1 \times {}^3C_2 \times {}^4C_2$ or ${}^3C_2 \times {}^3C_2 \times {}^4C_1$ or ${}^3C_1 \times {}^3C_3 \times {}^4C_1$	B1	

NO	SCHEME	MARKS
1(i)	$PC = AC$	P1
	$\sqrt{(x-3)^2+(y-4)^2} = \sqrt{(-2-3)^2+(4-4)^2}$	K1
	$x^2+y^2-6x-8y=0$	N1
(ii)	$(6)^2+h^2-6(6)-8(h)=0$	K1
	$h=0, h=8$	N1
(b)	LHS $=(7)^2+(2)^2-6(7)-8(2)$	K1
	$=-5$	
	No because LHS $\neq$ RHS	N1
		7 MARKS
2(a)	$\dfrac{2\tan x}{2-(\tan^2 x+1)}$	K1
	$\tan 2x$	N1
(b)		
	Shape of tangent graph	P1
	1 cycle for $0 \le x \le \pi$	P1
	Shifted	P1
	$y = 1-\dfrac{3x}{\pi}$	N1
	Draw a straight line $y=1-\dfrac{3x}{\pi}$	K1
	No of solutions = 3	N1
		8 MARKS

NO	SCHEME	MARKS
3(a)	Scheme A : $\frac{12}{2}[2(14400)+(11)(200\times12)]$ OR $14400+11(2400)$	K1
	Scheme B : $\frac{15000(1.02^{12}-1)}{1.02-1}$ OR $15000(1.02)^{11}$	K1
	Scheme A offered higher income	N1
	Total saving $=\frac{25}{100}\times331200=82800$	N1
(b)	$T_4=[2850+(3)(250)]\times12$ or $34200+3(3000)$ *or* listing method applied	K1
	43200	N1
		6 MARKS
4(a)	$\frac{4+10+x+3x+12+14}{6}=2k$ or $\frac{40+4x}{12}=k$ or $\frac{40+4x+6(-2)}{6}=\frac{5}{3}k$ or $2k-2=\frac{5}{3}k$	P1
	$\frac{40+4x+6(-2)}{6}=\frac{5}{3}\left(\frac{40+4x}{12}\right)$ *or* $\frac{40+4x}{6}=2(6)$	K1
	$x=8$	N1
(b)	$\sigma=\sqrt{\frac{4^2+10^2+8^2+24^2+12^2+14^2}{6}-12^2}$	K1
	$\sigma=6.2183$	N1
(c)	The standard deviation of the set of 8 numbers is smaller than the set of 8 numbers because the two numbers added are close to the mean.	N1
		6 MARKS
5	$2x+2(y+3)+26=56$	K1
	$y=12-x$	P1
	$(x+2)^2+(y+3)^2=13^2$ or $x^2+4x+4+y^2+6y+9=169$	K1
	$(x-3)(x-10)=0$	K1
	$x=3, x=10$	N1
	$y=9, y=2$	N1
		6 MARKS

NO	SCHEME	MARKS
6(a)	$L = 2\pi r + h$	
	$\pi r^2 h = 6000$	K1
	$h = \dfrac{6000}{\pi r^2}$	K1
	$L = 2\pi r + \dfrac{6000}{\pi r^2}$	N1
(b)	$\dfrac{dL}{dr} = 2\pi - \dfrac{12000}{\pi r^3}$	K1
	$2\pi - \dfrac{12000}{\pi r^3} = 0$	K1
	$r = 8.471$	N1
	$h = \dfrac{6000}{\pi(8.471)^2}$	
	$h = 26.61$	N1
		7 MARKS
7 a)	See table below	P1 P1
b)	Graph	
c)(i)	$\frac{x}{y} = 3.025$	P1
	$\frac{1.6}{y} = 3.025$	
	$y = 0.5289$	N1
	$m = \frac{2.45-0.4}{2-0} = \frac{41}{40}$	K1
c)(ii)	$c = 0.4$	
	$Y = \frac{41}{40}X + \frac{2}{5}$	K1
	$\frac{x}{y} = \frac{41}{40}x^2 + \frac{2}{5}$	
	$y = \frac{40x}{41x^2+16}$	N1
		10 MARKS

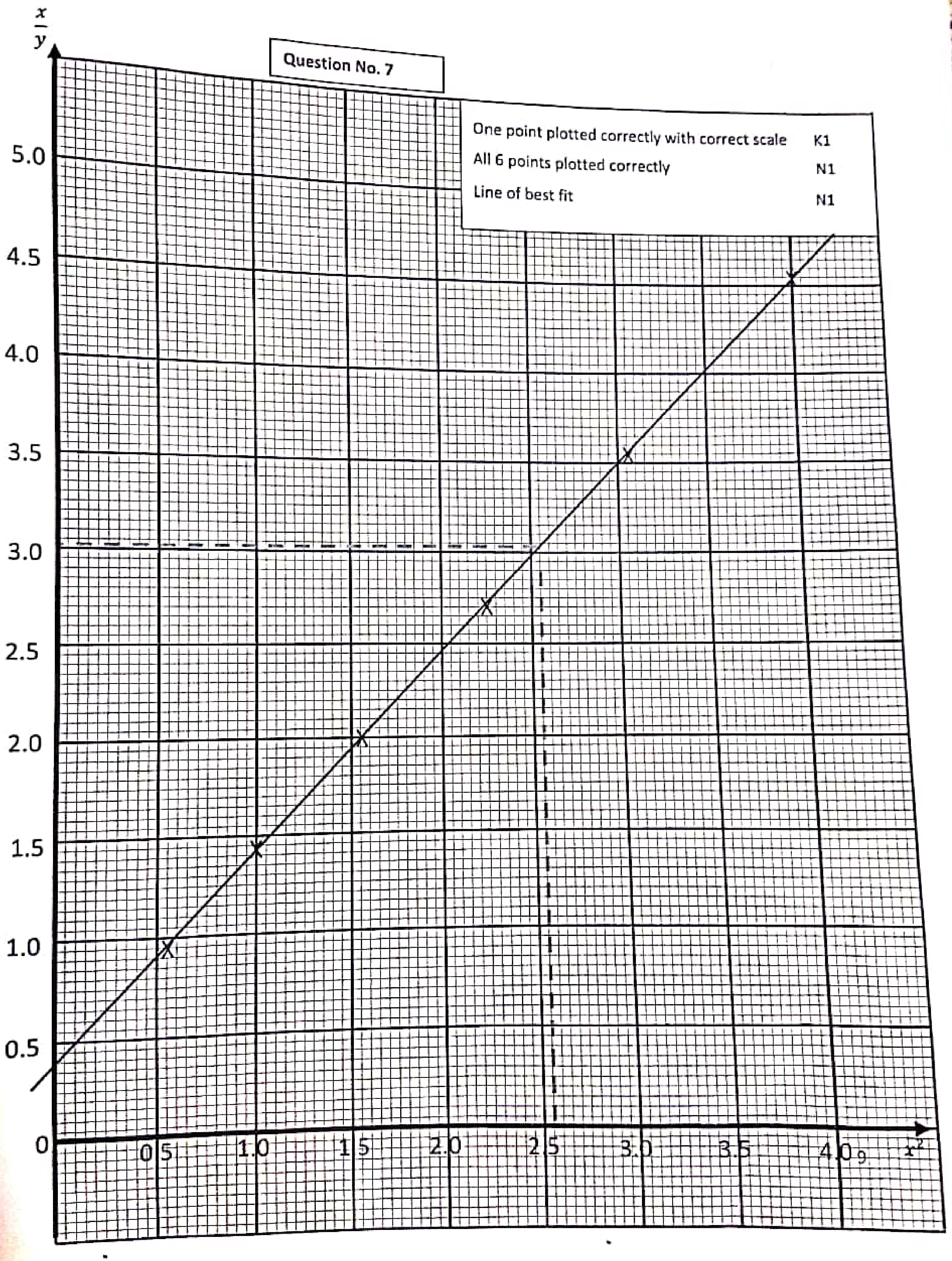
x^2	0.56	1.00	1.56	2.25	3.06	4.00
$\frac{x}{y}$	0.95	1.45	2.02	2.68	3.57	4.55

NO	SCHEME	MARKS
8a)i)	$-6\underline{x} + 3\underline{y}$	N1
ii)	$\overrightarrow{KT} = \overrightarrow{KL} + \frac{1}{3}\overrightarrow{LN}$	K1
	$2\underline{y} + 2\underline{x}$	N1
b)i)	$\overrightarrow{NM} = \overrightarrow{NK} + \overrightarrow{KM}$ or $\overrightarrow{NM} = \overrightarrow{NK} + \frac{1}{2}\overrightarrow{KT}$	K1
	$\left(\frac{2}{q} - 6\right)\underline{x} + \frac{2}{q}\underline{y}$	N1
ii)	$2p = \frac{2}{q}$ or $\frac{2}{q} - 6 = -2$	K1
	$q = \frac{1}{2}, p = 2$	N1, N1
c)	$\frac{1}{2} \times 5 \times 6\lvert\underline{x}\rvert = 120$	K1
	8	N1
		10 MARKS
9a)	$\sin \angle AOD = \frac{6}{10}$	K1
	1.287	N1
b)	$\angle PAD = 0.6436$ rad or $\angle PDA = 0.9274$ rad	P1
	$\cos 0.6436ad = \frac{AP}{12}$ or $\cos 0.9274rad = \frac{DP}{12}$	K1
	$S_{AP} = 10(1.287)$	K1
	$10 + 10 + 12 + 10(1.287) + 12\cos 0.6436rad + 12\cos 0.9274rad$	K1
	61.67	N1
c)	$\frac{1}{2}(7.2)(9.6)$ or $\frac{1}{2}(10)^2(1.287)$ or $\frac{1}{2}(10)^2\sin 73.74°$ or $\frac{1}{2}(12)(8)$	P1
	$\frac{1}{2}(10)^2 sin73.74° + \left[\frac{1}{2}(9.6)(7.2) - \left[\frac{1}{2}(10)^2(1.287) - \frac{1}{2}(10)^2\sin 73.74°\right]\right]$ or equivalent	K1
	66.21	N1
		10 MARKS

NO	SCHEME	MARKS
10(a)	$np = 128 \quad or \quad npq = 58.88$	P1
	$128q = 58.88$	K1
	$q = 0.46$	
	$p = 0.54$	N1
	$0.54n = 1284$	K1
	$n = 237$	N1
b)	$P\left(Z > \frac{95-\mu}{\sigma}\right) = 0.0375 \quad \text{or} \quad P\left(Z < \frac{70-\mu}{\sigma}\right) = 0.1587$	K1
	$\frac{95-\mu}{\sigma} = 1.78$	K1
	$\frac{70-\mu}{\sigma} = -1.0$	K1
	$\sigma = 8.993$	N1
	$\mu = 78.993$	N1
		10 MARKS
11a)	$\frac{dy}{dx} = -2x$	P1
	$m = -2(2) = -4$ $y - 12 = -4x + 8$	
	$y - 12 = -4(x - 2)$ $y = -4x + 20$	K1
	$h = 5$	N1
b)	$\frac{1}{2}(3)(12) - \int_2^4 (16 - x^2)\,dx$	K1
	$18 - \left[16x - \frac{x^3}{3}\right]_2^4$	K1
	$18 - \left[16(4) - \frac{(4)^3}{3} - \left[16(2) - \frac{2^3}{3}\right]\right]$	K1
	$4\frac{2}{3}$	N1
(c)	$\pi \int_{12}^{16} (16 - y)\,dy$	K1
	$\pi \left[16y - \frac{y^2}{2}\right]_{12}^{16}$	K1
	8π	N1
		10 MARKS

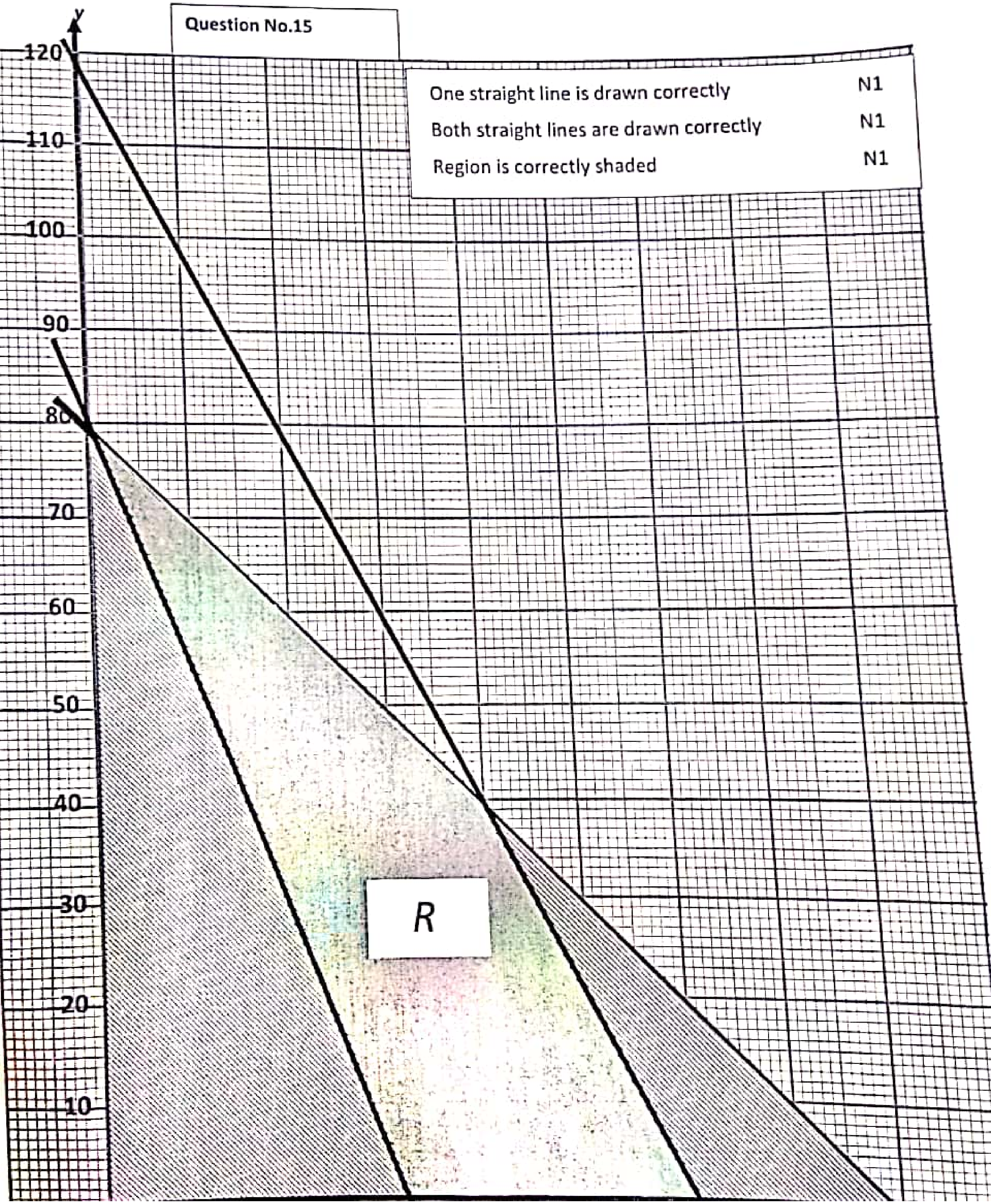
NO	SCHEME	MARKS
12a)	$a_Q = 54t$	
	$54\ ms^{-2}$	P1
	$V_Q = 27t^2 - 3$	K1
b)	$V_Q = 27(0)^2 - 3$	
	$V_Q = -3\ ms^{-1}$	N1
c)	$S_Q = 9\left(\frac{1}{3}\right)^3 - 3\left(\frac{1}{3}\right)$	K1
	$9(2)^3 - 3(2) + \left\|9\left(\frac{1}{3}\right)^3 - 3\left(\frac{1}{3}\right)\right\| + \left\|9\left(\frac{1}{3}\right)^3 - 3\left(\frac{1}{3}\right)\right\|$	K1
	67.33 or $67\frac{1}{3}$ or $\frac{202}{3}$	N1
d)	$S_P = \int 27t^2 + 15\,dt$	
	$S_P = 9t^3 + 15t$	K1
	$S_P = 18 + S_Q$	
	$9t^3 + 15t = 18 + 9t^3 - 3t$	K1
	$t = 1$	N1
	$S_P = 9(1)^3 + 15(1) = 24m$, $S_Q = 9(1)^3 - 3(1) = 6m$	
	Distance from point $B = 24 - 18 = 6m$	N1
		10 MARKS
13a)	$\frac{YZ}{\sin 55°} = \frac{12}{\sin 70°}$	K1
	$YZ = 10.461cm$	N1
b)	$VY^2 = 6.8^2 + 10.461^2 - 2(6.8)(10.461)\cos 38^0$	K1
	$VY = 6.600cm$	N1
c)	$\frac{1}{2} \times 6.8 \times 10.461 \times \sin 38°$	K1
	$21.90\ cm^2$	N1
d)	$VM = \sqrt{6.8^2 - 6^2}$ or 3.2	K1
	$YM = \sqrt{10.461^2 - 6^2}$ or 8.569	K1
	$6.6^2 = 3.2^2 + 8.569^2 - 2(3.2)(8.569)\cos Q$	K1
	$43°$	N1
		10 MARKS

NO	SCHEME	MARKS
14a) (i)	$\frac{28.6}{22} \times 100$ or $\frac{p}{22} \times 100 = 117$	K1
	$x = 130$	N1
(ii)	RM25.74	N1
b)(i)	$\frac{108(2) + 125(h) + 117(3)}{2 + h + 3} = 119.2$	K2
	$h = 5$	N1
(ii)	$\frac{59.6}{y} \times 100 = 119.2$	K1
	$RM50.00$	N1
c)	$\frac{100}{125} \times 135$	K1
	108	N1
		10 MARKS
15a)	$6x + 3y \leq 360$ *or equivalent*	N1
	$800x + 300y \geq 24\,000$ *or equivalent*	N1
b)	Total hectares of land for planting banana trees and planting papaya trees is not more than 80 hectares.	P1
c)	Graph	
d)(i)	60	P1
(ii)	(40,40) maximum point	K1
	Maximum profit = RM700(40) + RM250(40)	K1
	= RM38 000	N1
		10 MARKS



Question No. 7
One point plotted correctly with correct scale K1
All 6 points plotted correctly N1
Line of best fit N1
$\frac{x}{y}$
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
x^2

Question No.15



One straight line is drawn correctly	N1
Both straight lines are drawn correctly	N1
Region is correctly shaded	N1