Making scheme module 2 paper 1

No.		Solution	Marks
1.		$3^k = x \quad 7^m = x \quad 63^n = x$ $3 = x^{\frac{1}{k}} \quad 7 = x^{\frac{1}{m}} \quad 63 = x^{\frac{1}{n}}$ $63 = 7 \times 3^2$ $x^{\frac{1}{n}} = x^{\frac{1}{m}} \times x^{\frac{2}{k}}$ $x^{\frac{1}{n}} = x^{\frac{1}{m}+\frac{2}{k}}$ $\frac{1}{n} = \frac{1}{m} + \frac{2}{k}$ $n = \frac{mk}{k+2m}$	1 1 1 1
2.		$= 9^x.9^1 - 9^x$ $= 9^x(9-1)$ $= 9^x(8)$	1 1
3.	(a)	$b = \frac{a}{4}$	1
	(b)	Equation AB: $y = \frac{1}{4}x + 4$ $\frac{1}{4}x + 4 = -4x - 1$ $x = -\frac{20}{17}$ $y = \frac{63}{17}$ $C = \left(-\frac{20}{17}, \frac{63}{17}\right)$	1 1
4.		$(x-40)^2 + (y-75)^2 = 100^2$ $x^2 - 80x + 1600 + y^2 - 150y + 5625 - 10000 = 0$ $x^2 + y^2 - 80x - 150y - 2775 = 0$ Substitute $y = 25x + 90$ into eq. of locus: $x^2 + (25x+90)^2 - 80x - 150(25x+90) - 2775 = 0$ $x^2 + 625x^2 + 4500x + 8100 - 80x - 3750x - 13500 - 2775 = 0$ $626x^2 + 670x - 8175 = 0$ $Discriminant = 670^2 - 4(626)(-8175) = 20\,919\,100\ (> 0)$ It is not suitable because the fence will intersect Motorway YZ at two points/location.	1 1 1 1
5.		$\sigma = \sqrt{\frac{90\,000}{20} - 52^2}$ $\sigma = 42.38$	1 1

6.		$Orange: \sigma^2 = \frac{17270}{5} - \left(\frac{288}{5}\right)^2 = 136.24$ $Papaya: \sigma^2 = \frac{24473}{5} - \left(\frac{339}{5}\right)^2 = 297.76$ Papaya is less consistent because the variance is higher compared to Team Orange.	1, 1 1 1
7.	(a)	*persamaan* $y\sqrt{x} = 4 - \frac{x}{4}$ $-6 = 4 - \frac{q}{4}$ $\frac{q}{4} = 10$ $q = 40$	1 1
	(b)	$0 = 4 - \frac{1}{4}x$ $x = 16$	1
8.	(a)	$\frac{dy}{dx} = 3x - 2$ $0 = 3(q) - 2$ $q = \frac{2}{3}$ $y = \int (3x - 2)dx$ $y = 3x^2 - 2x + c$ $(4) = 3(1)^2 - 2(1) + c$ $c = 3$ $y = 3x^2 - 2x + 3$	1 1 1
9.	(a)	$\int_5^2 f(x)\,dx = 9$	1
	(b)	$\int_2^5 (f(x) + 4x)dx$ $= \int_2^5 f(x)dx + \int_2^5 (4x)dx$ $= (-9) + 2(x^2)_2^5$ $= -9 + 2(25 - 4)$ $= 33$	1 1
10.		$\frac{1}{4}\pi(5k)^2$ or $\frac{1}{2}(5\sqrt{2}k)^2(\frac{\pi}{4})$ A= $\frac{1}{2}(12k + 17k)(5k) - \frac{1}{4}\pi(5k)^2 - \frac{1}{2}(5\sqrt{2}k)^2(\frac{\pi}{4})$ $= 72.5k^2$ $-12.5\pi k^2$	1 1 1

11.	(a)	Side of square = 100 –x $A = \frac{1}{4}x^2 + (\frac{100-x}{2})(\frac{100-x}{2})$	1
	(b)	$= \frac{1}{2}x^2 + 2500 - 50\,x$ $\frac{dA}{dx} = x - 50 = 0$ x = 50	1 1 1
12.		$l = 7a$ $\frac{9}{2}(a + 7a) = 72$ $a = 2$ $a + 8d = 14$ $d = \frac{3}{2}$	1 1 1 1
13.		$[(x + (-\frac{8}{2})^2 - (-\frac{8}{2})^2 + s^2]$ $[(x + (-4)^2 – (-4)^2 + s^2]$ $(x – 4)^2 – 16 + s^2$ $-16 + s^2 = 20$ $s^2 = 36$ $s = –6, 6$	1 1 1
14.	(a)	$y = -2x^2 + 6x – 8$ $= -2[x^2 – 3x + 4]$ $= -2[x^2 + (-\frac{3}{2})^2 - (-\frac{3}{2})^2 + 4]$ $= -2[(x - \frac{3}{2})^2 – (\frac{9}{4}) + 4]$ $= -2(x - \frac{3}{2})^2 - \frac{7}{2}$ $a(x + p)^2 + q$ $x - \frac{3}{2} = 0$ q = y $x = \frac{3}{2}$ $y = -\frac{7}{2}$ $(\frac{3}{2}, -\frac{7}{2})$	1 1
	(b)	eq. of axis of symmetry, $x = p = \frac{-b}{2a}$ $x = \frac{-6}{2(-2)}$ $x = \frac{3}{2}$	1

15		$g(x) = 3x + 1$ $fg(x) = f(3x+1)$ $= (3x+1)^2 - 4x - 6$ $= 9x^2 + 2x - 5$	1 1 1
16.	(a) (b)	$\frac{3x+1}{2} = x$ $x = -1$ $\frac{3(2m+7)+1}{2} = 4 - m$ $m = -\frac{7}{4}$	 1 1 1
17.		$x^2 + kx + 9 - x = 0$ $x^2 + (k-1)x + 9 = 0$ $a = 1 \quad b = k-1 \quad c = 9$ $b^2 - 4ac = 0$ $(k-1)^2 - 4(1)(9) = 0$ $(k-1)^2 - 36 = 0$ $(k-1)^2 = 36$ $k-1 = -6 \qquad k-1 = 6$ $k = 7 \qquad k = -5$ (both)	1 1 1
18.	(a) (b) (c)	$2x^2 - 14x - 9 = 0$ POR = -9/2 $(-14)^2 - 4(2)(-9)$ $268 > 0$ Two Distinct Roots	1 1 1 1
19.		$n(play\ both) = \frac{25}{100} \times 40 = 10$ $P(Violin\ or\ Piano\ only) = \frac{15}{40} + \frac{9}{40}$ $= \frac{24}{40}$ $= \frac{3}{5}$ $P(do\ not\ play\ any\ musical\ instrument) = \frac{6}{40}$ $= \frac{3}{20}$	1 1 1

20.		$0.5 - 0.3485 = 0.1515$ $m = -1.03$ $-1.03 = \frac{X - 78}{3}$ $X = 74.91$	 1 1 1
21	(a)	$P(X < 1) + P(X = 3)$ $= P(X = 0) + P(X = 3)$ $= 1 - P(X = 1) - P(X = 2)$ $= 1 - b - a$	 1
	(b)	$P(X = 3) = \frac{64}{729}$ ${}^3C_3(k)^3(1-k)^0 = \frac{64}{729}$ $k^3 = \left(\frac{4}{9}\right)^3$ $k = \frac{4}{9}$	 1 1
22		$\overrightarrow{KM} = \overrightarrow{KL} + \overrightarrow{LM}$ $= \overrightarrow{KL} + \overrightarrow{KO}$ $= \begin{pmatrix}-6\\3\end{pmatrix} + \begin{pmatrix}-3\\-4\end{pmatrix}$ $= \begin{pmatrix}-9\\-1\end{pmatrix}$ or $-9\underline{i} - \underline{j}$	1 1 1
23		$\cot x = 2\cos x$ $\cos x = 2\cos x \sin x$ $\cos x(1 - 2\sin x) = 0$ $\cos x = 0$ or $\sin x = \frac{1}{2}$ $x = -90^0, 90^0; x = 30^0, 150^0$	 1 1 1
24	(a)	${}^{11}c_4 = 330$	1
	(b)	${}^6c_2 \times {}^5c_2$ $= 150$	1 1

25		$T_{n+1} = S_{n+1} - S_n$ $= \log_x y^{(n+1)^2} - \log_x y^{n^2}$ $= log_x(\frac{y^{n^2+2n+1}}{y^{n^2}})$ $= \log_x y^{n^2+2n+1-n^2}$ $= \log_x y^{2n+1}$	1 1 1