Question Number		Scheme	Marks
1.	(a)	Continuous uniform (Rectangular) U(−0.5, 0.5)	B1 B1 (2)
	(b)	P(error within 0. 2 cm) = $2 \times 0.2 = 0.4$	M1 A1 (2)
	(c)	P(both within 2 cm) = $0.4^2 = 0.16$	M1 A1 (2)
			(6 marks)
2.	(a)	$X \sim \mathrm{Po}(7)$	B1
		$P(X \le 2) = 0.0296$	B1
		$P(X \ge 13) = 1 - 0.9370 = 0.0270$	M1 A1
		Critical region is $(X \le 2) \cup (X \ge 13)$	A1 (5)
	(b)	Significance level = $0.0296 + 0.0270 = 0.0566$	B1 (1)
	(c)	$x = 5$ is not the critical region $\Rightarrow$ insufficient evidence to reject H_0	M1 A1 (2)
			(8 marks)
3.	(a)	Weeds grow independently, singly, randomly and at a constant rate (weeds/m^2) any 2	B1 B1 (2)
	(b)	Let X represent the number of weeds/m^2	
		$X \sim \mathrm{Po}(0.7)$, so in 4 m^2, $\lambda = 4 \times 0.7 = 2.8$	B1
		$P(Y < 3) = P(Y = 0) + P(Y = 1) + P(Y = 2)$	M1
		$= e^{-2.8}\left(1 + 2.8 + \dfrac{2.8^2}{2}\right)$	A1
		$= 0.46945$	A1 (4)
	(c)	Let X represent the number of weeds per 100 m^2	
		$X \sim \mathrm{Po}(100 \times 0.7 = 70)$	B1
		$P(X > 66) \approx P(Y > 66.5)$ where $Y \sim \mathrm{N}(70, 70)$	M1 M1 A1
		$\approx P\left(Z > \dfrac{66.5 - 70}{\sqrt{70}}\right)$	M1
		$\approx P(Z > -0.41833\ldots) = 0.6628$	A1 (6)
			(12 marks)

Question Number	Scheme	Marks
4. (a)	$P(X > 0.7) = 1 - F(0.7) = 0.4267$	M1 A1 (2)
(b)	$f(x) = \dfrac{d}{dx} F(x) = \dfrac{4}{3} \times 2x - \dfrac{4x^2}{3}$	M1
	$= \dfrac{4x}{3}(2 - x^2)$ for $0 \le x \le 1$	A1 (2)
(c)	$E(X) = \displaystyle\int_0^1 \dfrac{4}{3}(2x^2 - x^4)\, dx = \left[\dfrac{4}{3}\left(\dfrac{2x^3}{3} - \dfrac{x^5}{5}\right)\right]_0^1$	M1 A1
	$= \dfrac{28}{45} = 0.622$	A1
	$Var(X) = \displaystyle\int_0^1 \dfrac{4}{3}(2x^3 - x^5)\, dx - \left(\dfrac{28}{45}\right)^2$	M1
	$= \left[\dfrac{4}{3}\left(\dfrac{2x^4}{4} - \dfrac{x^6}{6}\right)\right]_0^1 - \left(\dfrac{28}{45}\right)^2$	A1
	$= \dfrac{116}{2025} = 0.05728$	A1 (6)
(d)	$f(x) = \dfrac{4}{3}(2 - 3x^2) = 0$	M1
	$\Rightarrow mode = \sqrt{\dfrac{2}{3}} = 0.816496$	A1
	$skewness = \dfrac{\dfrac{28}{45} - \sqrt{\dfrac{2}{3}}}{\sqrt{\dfrac{116}{2025}}} = -0.81170$	M1 A1 (4)
		(14 marks)

Question Number		Scheme	Marks
5.	(*a*)	Let X represent the number of double yolks in a box of eggs	B1
		$\therefore X \sim$ B(12, 0.05)	B1
		P($X = 1$) = P($X \le 1$) − P($X \le 0$) = 0.8816 − 0.5404 = 0.3412	M1 A1 (3)
	(*b*)	P($X > 3$) = 1 − P($X \le 3$) = 1 − 0.9978 = 0.0022	M1 A1 (2)
	(*c*)	P(only 2) = $C_2^3 (0.3412)^2 (0.6588)^2$	M1 A1
		= 0.230087	A1 (3)
	(*d*)	Let X represent the number of double yolks in 10 dozen eggs	
		$\therefore X \sim$ B(120, 0.05) $\Rightarrow X =$ Po(6)	B1
		P($X \ge 9$) = 1 − P($X \le 8$) = 1 − 0.8472	M1 A1
		= 0.1528	A1
	(*e*)	Let X represent the weight of an egg $\therefore W \sim$ N(65, 2.4^2)	M1
		P($X > 68$) = P$\left(Z > \dfrac{68 - 65}{2.4} \right)$	A1
		= P($Z > 1.25$)	A1
		= 0.1056	A1 (3)
			(15 marks)

Question Number		Scheme	Marks	
6.	(a)	All subscribers to the magazine	B1	(1)
	(b)	A list of all members that had paid their subscriptions	B1	(1)
	(c)	Members who have paid	B1	(1)
	(d)	Advantage: total accuracy	B1	
		Disadvantage: time consyming to obtain data and analyse it	B1	(2)
	(e)	Let X represent the number agreeing to change the name		
		$\therefore X \sim B(25, 0.4)$	B1	
		$P(X = 10) = P(X \le 10) - P(X \le 9) = 0.1612$	M1 A1	(3)
	(f)	$H_0: p = 0.40$, $H_1: p < 0.40$	B1, B1	
		$P(X \le 6) = 0.0736 > 0.05 \Rightarrow$ not significant	M1 A1	
		No reason to reject H_0 and conclude % is less than the editor believes	A1	(5)
	(g)	Let X represent the number agreeing to change the name $\therefore X \sim B(200, 0.4)$		
		$P(71 \le X < 83) \approx P(70.5 \le Y < 82.5)$ where $Y \sim N(80, 48)$	B1 B1	
		$\approx P\left(\dfrac{70.5 - 80}{\sqrt{48}} \le X < \dfrac{82.5 - 80}{\sqrt{48}} \right)$	M1 M1	
		$\approx P(-1.37 \le X < 0.36)$	A1 A1	
		$= 0.5533$	A1	(7)
			(20 marks)	