1	**(i)**	Binomial	B1	
		$n = 400, \quad p = 0.012$	B1 [2]	Both. Not $p = 1.2\%$ Or B(400, 0.012): B1B1
	(ii)	Poisson	B1	
		n large and mean = 4.8, which is < 5	B1 [2]	n large, p small
	(iii)	$1 - e^{-4.8}(1 + 4.8 + \frac{4.8^2}{2})$	M1	P(X = 0, 1, 2); allow any λ; allow one end error
		= 0.857/0.858	A1 [2]	(Normal/Binomial in (ii) can score M1 only)
			[Total: 6]	
2	**(i)**	$\frac{2}{3}\int_1^2 x^2 \mathrm{d}x$	M1	Attempt integ. $xf(x)$; ignore limits
		$= \frac{2}{3}\left[\frac{x^3}{3}\right]_1^2$	A1	Correct integration and limits
		$= \frac{14}{9}$ or 1.56 o.e.	A1 [3]	
	(ii)	$\frac{2}{3}\int_1^{\frac{14}{9}} x\,dx$	M1	Attempt integ. f(x); with limits
		$(= \frac{2}{3}\left[\frac{x^3}{3}\right]_1^2)$		
		$= \frac{115}{243}$ or 0.473 (3 s.f.)	A1 [2]	
	(iii)	$\frac{115}{243} < \frac{1}{2}$ o.e.	M1	Comparison of prob. or values
		Hence mean < median	A1ft[2]	ft (i) or (ii)
			[Total: 7]	

3	**(i)**	$\frac{73.1-75.2}{\frac{5.7}{\sqrt{n}}} = -1.563$	M1	For standardising (with $\sqrt{n}$)
		$n = \{-1.563\times5.7\div(-2.1)\}^2$	A1	Any correct expression for n or $\sqrt{n}$. May be implied by ans.
		$n = 18$	A1	
		Assume s.d. for the region is 5.7	B1 [4]	
	(ii)	H_0: pop mean (or μ) = 75.2		
		H_0: pop mean (or μ) < 75.2	B1	Both (could be stated in (i))
		1.563 comp 1.555	M1	For comparison of z values / areas / x values
		Evidence that plants shorter	A1 [3]	CWO. No contradictions
			[Total: 7]	
4	**(i)**	est(μ) = 9750/150 = (65)	B1	
		est(σ^2) = $\frac{1}{149}(647500 - \frac{9750^2}{150})$	M1	Correct subst. in correct formula
		= 92.3 (3 s.f.)	A1 [3]	
	(ii)	$z = 2.326$	B1	
		'65' $\pm z\times\frac{\sqrt{'92.28188'}}{\sqrt{150}}$	M1	Any z
		= 63.2 to 66.8 (3 s.f.)	A1 [3]	(Use of 'biased' can still score here)
	(iii)	0.02^2	M1	Allow M1 for 0.02 seen
		= 0.0004 o.e.	A1 [2]	
			[Total: 8]	

5	**(i)**	$6 \times 510 + 70 = (3130)$ $6 \times 12^2 + 4^2 = (880)$ N(3130, 880)	B1 B1	
		$\frac{3050-3130}{\sqrt{880}}$ $(= -2.697)$ $\frac{3150-3130}{\sqrt{880}}$ $(= 0.674)$	M1	Both. With their mean and variance($\geq$0) Allow without √
		$\Phi(\text{'0.674'}) - (1 - \Phi(\text{'2.697'}))$ $(= 0.7499 - 0.0035)$	M1	Use of tables and attempt to find area consistent with their working
		$= 0.746$ (3 sf)	A1 [5]	
	(ii)	$510 - 8 \times 70 = (-50)$ $12^2 + 8^2 \times 4^2 = (1168)$ $P - 8C \sim N(-50, 1168)$	B1 B1	o.e. +50; 510/8 -70; – (510/8 – 70) o.e. $(12/8)^2 + 4^2$
		$\frac{0-(-50)}{\sqrt{1168}}$ $(= 1.463)$	M1	For standardising with attempt "P-8C" oe with their mean and variance($\geq$0).Allow without √
		$1 - \Phi(\text{'1.463'})$	M1	Use of tables and attempt to find area consistent with their working
		$= 0.0717$ (3 s.f.)	A1 [5]	
			[Total: 10]	

6	(i)	H_0: Pop mean (or λ or μ) is 5.3 H_1: Pop mean (or λ or μ) is less than 5.3	B1	Both
		$P(X \leq 1) = e^{-5.3}(1 + 5.3)$ $P(X \leq 2) = e^{-5.3}(1 + 5.3 + \frac{5.3^2}{2})$ /P(X=2)	M1	Both attempted
		$P(X \leq 1) = 0.0314$ or 0.0315 & $P(X \leq 2) = 0.102$/ P(X=2)=0.7071	A1	Both correct
		CR is 0 or 1 cases	A1	Dep. M1 and $P(X \leq 1) < 0.05 < P(X \leq 2)$
		No evidence mean has decreased	B1f [5]	ft their CR
	(ii)	Concluding mean has decreased when it hasn't '0.0314 or 0.0315'	B1 B1ft[2]	In context ft their $P(X \leq 1)$, dep. < 0.05
	(iii)	(Po(18.4)) N(18.4, 18.4)	B1 B1ft	Stated or implied B1 for N(18.4, ..); B1f for var. = 18.4
		$\frac{20.5-18.4}{\sqrt{18.4}}$ (= 0.490)	M1	For standardising with or without cc.Allow without √
		1 – Φ('0.490')	M1	Use of tables and attempt to find area consistent with their working
		= 0.312 (3 s.f.)	A1 [5]	
			[Total: 12]	