Question Number	Scheme	Marks
5 (a)	$[X \sim \mathrm{B}(15, 0.25) \quad \mathrm{P}(X > 4) =] 1 - \mathrm{P}(X \leq 4) = 1 - 0.6865$	M1
	= 0.3135 (Calc 0.313514...) awrt **0.314**	A1
		(2)
(b)	$\mathrm{P}(X \geq 1) > 0.95 \Rightarrow 1 - \mathrm{P}(X = 0) > 0.95$ so $\left[{}^{n}C_{0}(0.25)^{0} \right](0.75)^{n} < 0.05$	M1
	$n >$ 10.4(1...) or $n > \dfrac{\log(0.05)}{\log(0.75)}$ or $n > \log_{0.75}(0.05)$	M1
	$n =$ **11**	A1
		(3)
(c)	$X \sim \mathrm{B}(100, 0.25)$ so N(25, 18.75)	B1
	$\mathrm{P}(21.5 < Y < 30.5) = \mathrm{P}(Y < 30.5) - \mathrm{P}(Y < 21.5)$	M1
	$\mathrm{P}\left(Z < \dfrac{30.5 - 25}{\sqrt{18.75}}\right) - \mathrm{P}\left(Z < \dfrac{21.5 - 25}{\sqrt{18.75}}\right) = \mathrm{P}(Z < 1.27) - \mathrm{P}(Z < -0.81)$	M1 M1
	= 0.8980 – 0.2090 = 0.689 (Calc 0.688526...) awrt **0.689**	A1
		(5)
(d)	H_0: $p = 0.3$ and H_1: $p > 0.3$	B1
	$R \sim$B(25, 0.3) $\mathrm{P}(X \geq 10) = 1 - \mathrm{P}(X \leq 9) = 1 - 0.8106$ or CR method: $\mathrm{P}(X \geq 11) = 1 - \mathrm{P}(X \leq 10) = 1 - 0.9022 = 0.0978$	M1
	= 0.1894 or CR $\geqslant$ 11	A1
	Do not reject H_0/not significant/not in the CR	M1
	There is **not** significant evidence that the **proportion** of tulips producing **red** flowers is **greater than 0.3**	A1
		(5)

	Notes	**Total 15**
(a)	**M1**	For $1 - \mathrm{P}(X \leq 4)$ or $1 - 0.6865$
	A1	awrt 0.314 correct answer 2/2
(b)	**M1**	For $1 - \mathrm{P}(X = 0) > 0.95$ or $(0.75)^{n} < 0.05$ (condone =)
	M1	For $n >$ 10.41 or $n > \dfrac{\log(0.05)}{\log(0.75)}$ or $n > \log_{0.75}(0.05)$ (condone < or =) or for the 2 trials for n = 10 and 11
	A1	cao
(c)	**B1**	For writing or using N(25, 18.75) NB: Poisson approximation send to review
	M1	For writing or using 21.5 or 30.5
	M1	For either standardisation using their mean and standard deviation. Allow 20.5/21/21.5 29.5/30/30.5
	M1	For both standardisations using their mean and standard deviation. Allow 20.5/21/21.5 29.5/30/30.5

	A1	(Dep on all M marks) awrt 0.689 (Exact binomial awrt 0.685 scores 0/5)
(d)	**B1**	Both hypotheses correct. Must be attached to H_0 and H_1 in terms of *p* or π
	M1	For writing or using B(25, 0.3) **and** $1-\mathrm{P}(X \leq 9)$ or for CR : $1-\mathrm{P}(X \leq 10)$
	A1	awrt 0.189 or CR $\geqslant$ 11
	M1	A correct statement – no context needed but do not allow contradicting non contextual comments
	A1	(Dep on both M marks) Correct conclusion in context using bold word o.e.