Question	Scheme	Marks
4 (a)	H_0 : B(4, 0.5) is a suitable model H_1 : B(4, 0.5) is not a suitable model	B1
	Expected frequencies 12.5, 50, 75, 50, 12.5	M1 A1
	$\sum \frac{(O-E)^2}{E} = \frac{(15-"12.5")^2}{"12.5"} + ... + \frac{(10-"12.5")^2}{"12.5"}$ or $\sum \frac{O^2}{E} - N = \frac{15^2}{"12.5"} + ... + \frac{10^2}{"12.5"} - 200$	M1
	$= 10.84$ (or 10.8)	A1
	$\nu = 4$	B1
	$\chi_4^2(0.05) = 9.488 \quad \Rightarrow CR \geqslant 9.488$	B1
	Sufficient evidence to say that the research students claim is not supported	A1ft
		(8)
(b)	$[0\times15+]1\times68+2\times69+3\times38+4\times10[=360]$	M1
	$\frac{360}{200\times4} = 0.45$ *	A1*
		(2)
(c)	H_0 : Binomial is a suitable model H_1 : Binomial is not a suitable model	B1
	$\nu = 3$	B1
	$\chi_3^2(0.05) = 7.815 \quad \Rightarrow CR \geqslant 7.815$	B1ft
	No significant evidence to say that the binomial is not a reasonable model	B1ft
		(4)

		Notes	**Total 14**
(a)	**B1**	Both hypotheses correct. Must mention B(4 ,0.5) at least once. (may be in words need Binomial, probability (p) = 0.5 and a reference to 4 children or n = 4) Condone B(0.5, 4)	
	M1	For a correct method to find at least one expected frequency e.g. $0.5^4\times200[=12.5]$ or $4\times0.5^4\times200[=50]$ or $6\times0.5^4\times200[=75]$ May be implied by correct answer 10.84 or 10.8	
	A1	For all 5 expected frequencies correct. These must be seen and cannot be implied.	
	M1	For an attempt at the test statistic, at least 2 correct expressions/ values seen (include – 200 if needed) $\sum \frac{(O-E)^2}{E} = 0.5+6.48+0.48+2.88+0.5$ **or** $\sum \frac{O^2}{E} - N = 18+92.48+63.48+28.88+8-200$ May be implied by correct answer 10.84 or 10.8	
	A1	10.84 Allow 10.8	
	B1	$\nu = 4$ This mark can be implied by a correct critical value of 9.488	
	B1	9.488 ft their degrees of freedom if given. For $\nu = 3$ it is 7.815	
	A1ft	Dep on the 2nd M1. independent of hypotheses. Need claim or student or binomial. ft their CV and their test statistic only. A correct conclusion based on their test statistic value and their χ^2 critical value (Allow in terns of Binomial eg does not follow a binomial distribution) If their Test statistic > their CV then must say not supported (not binomial) . If their Test statistic < their CV then must say supported (is binomial)	
(b)	**M1**	A correct method for finding the total number of girls. At least 3 non zero terms correct. useful figures [0] + 68+138 + 114 + 40. Implied by 360 or 1.8	
	A1*	cso allow for 360/800 or 1.8/4 or 1.8 = 4p	
(c)	**B1**	Both hypotheses correct. Must mention binomial at least once. Condone inclusion of B(4,0.45)/B(0.45,4)	
	B1	$\nu = 3$ This mark can be implied by a correct critical value of 7.815 Condone (their ν in part(a) – 1)	
	B1ft	7.815 ft their degrees of freedom if they have (their ν in part(a) – 1)	
	B1ft	Ft their CV only. Independent of hypotheses. A correct conclusion based on awrt 2.47 and their χ^2 critical value only. Ignore any parameter given. Do not allow contradicting statements.	