Question Number	Scheme	Marks
3(a)	$np = 3$ and $np(1-p) = 2.55$	M1
	p = 0.15 oe n = 20	A1 A1
		(3)
(b)	[B(40, 0.2) so] E(X) = 8	B1
	$[P(X > 8) =]1 - P(X \,,, 8)$	M1
	= 0.4069 Calc: 0.40687 … awrt 0.407	A1
		(3)
(c)(i)	$[Po(n \times p) =]Po(8)$	M1
	$[P(X \,..\, 12) =]1 - P(X \,,, 11)$	M1
	= 0.1119 Calc: 0.11192 awrt 0.112	A1
(ii)	because n is large and p is small	B1
		(4)

	Notes		**Total 10**
(a)	**M1**	for both $np = 3$ and $np(1-p) = 2.55$ Allow q to imply 1 – p	
	A1	either p = 0.15 oe or n = 20	
	A1	both p = 0.15 oe and n = 20	
(b)	**B1**	for E(X) = 8 Condone $\mu = np$ = 8 May be implied by 40 × 0.2 = 8 or P(X > 8) or 1 – P($X \leqslant 8$) or P(X = 8)	
	M1	for writing or using $1 - P(X \,,, 8)$	
	A1	awrt 0.407 **NB** cao scores 3 out of 3	
(c)(i)	**M1**	for writing or using Po(8) May be implied by awrt 0.112 or 0.888	
	M1	for writing or using $1 - P(X \,,, 11)$	
	A1	awrt 0.112 (**NB** exact binomial gives awrt 0.1004 and would score M0M1A0) **NB** cao scores 3 out of 3	
(ii)	**B1**	allow n > 50 and p < 0.2 or equivalent worded statements. Allow p is close to 0. Do not allow because mean ≈ variance. Ignore any reference to np and np(1 – p)	