Question Number	Scheme	Marks
2(a)(i)	$120(p)^3(1-p)^7$	B1
(ii)	$[^{10}C_3](p)^3(1-p)^7 = [^{10}C_7]16(p)^7(1-p)^3$ or their (a) = $[^{10}C_7]16(p)^7(1-p)^3$	M1
	$(1-p)^4 = 16(p)^4 \Rightarrow (1-p) = 2(p)$ or $15p^4 + 4p^3 - 6p^2 + 4p - 1 = 0$ oe	M1
	$p = \frac{1}{3}$	A1
		(4)
(b)	$\frac{e^{-\lambda}\lambda^3}{3!} = 5\frac{e^{-\lambda}\lambda^5}{5!}$	M1
	$4 = \lambda^2$	M1
	$\lambda = 2$	A1
		(3)
(c)	$np = 32$	M1
	$n = 80$	A1
	$\alpha = 19.2$	A1
		(3)

	Notes	Total 10
(a)(i)	**B1**	Allow equivalent expressions e.g. $^{10}C_3(p)^3(1-p)^7$
(ii)	**M1**	correct equation ft their (a)(i) (condone missing binomial coefficients) but 16 must be on the correct side.
	M1	Attempt to solve their equation as far as a linear equation in p or a correct quartic equation May be implied by $3p^2 + 2p - 1 = 0$ oe Implied by $p = \frac{1}{3}$ If 16 is on the wrong side then their correct quartic is $15p^4 - 64p^3 + 96p^2 - 64p + 16 = 0$ oe Implied by $p = \frac{2}{3}$
	A1	For $\frac{1}{3}$ or an exact equivalent (condone 0.333 or better). If other roots shown they must be rejected. Allow 3/3 for correct answer only in (ii)
(b)	**M1**	correct equation
	M1	attempt to solve their equation as far as $\lambda^2 = k$ or $\lambda = \sqrt{k}$.
	A1	for $\lambda = 2$ only
(c)	**M1**	Writing or using of $np = 32$ Allow any value of p provided $0 < p < 1$ Implied by $n = 80$
	A1	$n = 80$
	A1	$\alpha = 19.2$ **NB** M1A0A1 is possible

3. The continuous random variable X has cumulative distribution function given by

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{6}x(x+1) & 0 \leqslant x \leqslant 2 \\ 1 & x > 2 \end{cases}$$

(a) Find the value of a such that $P(X > a) = 0.4$
Give your answer to 3 significant figures.

(3)

(b) Use calculus to find

(i) $E(X)$

(ii) $Var(X)$

(*Solutions relying on calculator technology are not acceptable.*)

(8)

(Total for Question 3 is 11 marks)