Question	Scheme	Marks
3 (a)	$\mathrm{E}(X) = 2a + 3\times0.4 + 4(0.6-a)$ $\left[= 3.6 - 2a\right]$	M1 A1
		(2)
(b)	$0 < a < 0.6$ oe	B1
	$2\times0.6 + 3\times0.4 [= 2.4]$ or $3.6 - 2\times0.6 [= 2.4]$ **and** $3\times0.4 + 4\times0.6 [= 3.6]$ or $3.6 - 2\times0 [= 3.6]$ **Alternative** $0 > -2a > -1.2$ $3.6 > 3.6 - 2a > 2.4$	M1
	$2.4 < \mathrm{E}(X) < 3.6$	A1
		(3)
(c)	$\mathrm{Var}(X) = \mathrm{E}(X^2) - \mathrm{E}(X)^2$	
	$\left[\mathrm{E}(X^2) =\right] 4a + 3.6. + 9.6 - 16a [= 13.2 - 12a]$	M1 A1
	$\mathrm{Var}(X) = '(13.2 - 12a)' - ('3.6 - 2a')^2$	M1
	$-4a^2 + 2.4a - 0.32 = 0$	A1
	$a = \dfrac{-'2.4' \pm \sqrt{'2.4'^2 - 4\times'-4'\times'-0.32'}}{2\times'-4'}$	M1
	$a = \dfrac{1}{5}$ $a = \dfrac{2}{5}$	A1
		(6)

	Notes	Total 11
(a)	**M1**	for an attempt to find E(X) with 2 out of the 3 products correct
	A1	for $2a + 1.2 + 4(0.6 - a)$ oe
(b)	**B1**	This may be seen as two separate parts e.g. $a > 0$ and $a < 0.6$, Allow the use of $\leqslant$ or $\geqslant$ for < or > We allow this to be written in words e.g. a is between 0 and 0.6
	M1	for a correct method for finding the lower and upper end of the range. May be implied by $2.4 < \mathrm{E}(X) < 3.6$ or sight of 2.4 and 3.6
	A1	Allow e.g. 2.4,, $3.6 - 2a$,, 3.6
		NB $2.4 < \mathrm{E}(X) < 3.6$ or 2.4,, $3.6 - 2a$,, 3.6 scores 3/3
(c)	**M1**	An attempt at an expression for $\mathrm{E}(X^2)$ with 2 terms correct. May be seen in an attempt at Var(X)
	A1	a correct expression for $\mathrm{E}(X^2)$ May be seen in an attempt at Var(X) Does not have to be fully simplified, allow $4a + 3.6 + 9.6 - 16a$ or better
	M1	use of $\mathrm{Var}(X) = \mathrm{E}(X^2) - \mathrm{E}(X)^2$ ft their $\mathrm{E}(X^2)$ and their part (a)
	A1	a correct 3TQ e.g. $25a^2 - 15a + 2 = 0$
	M1	correct method for solving their 3TQ e.g. $(5a - 2)(5a - 1) = 0$ May be implied by $a = \dfrac{1}{5}$ and $a = \dfrac{2}{5}$ If the 3TQ is incorrect then a correct substitution of their values into the quadratic formula (If a and c are both negative, allow the omission of negatives in $4ac$ and allow a correct single value in the denominator) or a complete method using completing the square or a correct factorisation must be seen before their values of a
	A1	$a = \dfrac{1}{5}$ oe and $a = \dfrac{2}{5}$ oe Allow any letter for a