Question Number	Scheme	Marks
7 (a)	$\frac{1}{2}\times 8\times 4a=1\Rightarrow a=\frac{1}{16}$ * or $\int_{[0]}^{[4]} ax\ \mathrm{d}x=0.5\Rightarrow \left[\frac{ax^2}{2}\right]_0^4=0.5\Rightarrow a=\frac{1}{16}$ *	B1*
		(1)
(b) (i)	(By symmetry) $b=-\frac{1}{16}$	B1
(ii)	At (8, 0) $0=-\frac{1}{16}\times 8+c\Rightarrow c=\frac{1}{2}$ or at (4, 0.25) $0.25=-\frac{1}{16}\times 4+c\Rightarrow c=\frac{1}{2}$	M1 A1
		(3)
(c)	$\mathrm{E}(X)=4$	B1
	$\mathrm{E}(X^2)=\int_0^4 x^2\left(\frac{1}{16}x\right)\mathrm{d}x+\int_4^8 x^2\left(-'\frac{1}{16}'x+'\frac{1}{2}'\right)\mathrm{d}x$	M1
	$=\frac{1}{64}\left[x^4\right]_0^4+\left['-\frac{1}{64}x^4+\frac{1}{6}x^3'\right]_4^8$	A1ft
	$=4+\left[\left(-64+\frac{256}{3}\right)-\left(-4+\frac{32}{3}\right)\right]\left[=\frac{56}{3}\right]$	dM1A1
	$\mathrm{Var}(X)=\frac{56}{3}-4^2=\frac{8}{3}$ *	A1*
		(6)
(d)	$\frac{1}{2}\times Q_1\times\frac{1}{16}\times Q_1=\frac{1}{4}$ or $\int_0^{Q_1}\frac{1}{16}x\ \mathrm{d}x=0.25\rightarrow\frac{Q_1^2}{32}=0.25$	M1
	$Q_1=\sqrt{8}=2.828...$ or $Q_3=8-\sqrt{8}=5.171...$ awrt 2.83 or awrt 5.17	A1
	$Q_1=\sqrt{8}=2.828...$ and $Q_3=8-\sqrt{8}=5.171...$ awrt 2.83 and awrt 5.17	A1
		(3)
(e)	50% lies between Q_1 and Q_3	
	Statistician's claim: $\mathrm{P}\left('4'-\sqrt{\frac{8}{3}}<X<'4'+\sqrt{\frac{8}{3}}\right)=\mathrm{P}(2.37<X<5.63)$	M1
	as this is outside Q_1 and Q_3, >0.5/ statistician's claim is correct* or $\mathrm{P}(2.37<X<5.63)=0.6498...>0.5$/ statistician's claim is correct*	A1*
		(2)
	Notes	**Total 15**
(a)	**B1*** Allow any correct equivalent method. E.g. $\frac{1}{2}\times 4\times 4a=\frac{1}{2}\Rightarrow a=\frac{1}{16}$, integration, use of gradients, etc. Answer is given so a complete correct method with no incorrect working must be seen	
(b)	**B1** Cao	
	M1 Use of equation of line to find c e.g. $y-0=-\frac{1}{16}(x-8)$ or use of integration or any valid method	
	A1 Cao correct answer scores M1A1	

(c)	**B1**	For $\mathrm{E}(X) = 4$ This may be seen at any point in the solution
	M1	For use of $\int x^2 \mathrm{f}(x)\,\mathrm{d}x \quad x^n \to x^{n+1}$ for both parts of pdf (ignore limits) ft their values of *b* and *c*
	A1ft	For correct integration of **either** of the 2 parts, ft their values of *b* and *c*
	depM1	For use of correct limits in **either** part (dep on previous M1) may be implied by sight of 4 or $\frac{44}{3}$ but **not** implied by $\frac{56}{3}$ allow ft on their values of *b* and *c* which you may need to check
	A1	For complete correct substitution $4+\left[\left(-64+\frac{256}{3}\right)-\left(-4+\frac{32}{3}\right)\right]$ or $\frac{56}{3}$ allow $=4+\frac{44}{3}$
	A1*	Answer is given so need to see use of $\mathrm{Var}(X) = \mathrm{E}(X^2) - \mathrm{E}(X)^2 = \frac{8}{3}$ with values substituted
(d)	**M1**	For correct method for either Q_1 or Q_3 e.g. $\frac{1}{2} \times Q_1 \times \frac{1}{16} \times Q_1 = \frac{1}{4}$, $\int_0^{Q_1} \frac{1}{16} x\,\mathrm{d}x = 0.25 \to \frac{Q_1^2}{32} = 0.25$
	A1	For either awrt 2.83 allow $\sqrt{8}$ oe or awrt 5.17 allow $8-\sqrt{8}$ oe
	A1	For either awrt 2.83 allow $\sqrt{8}$ oe and awrt 5.17 allow $8-\sqrt{8}$ oe
(e)	**M1**	For use of $\mathrm{P}(\mu-\sigma < X < \mu+\sigma)$ ft their μ implied by awrt 2.37 and awrt 5.63
	A1*	Must state that this > 0.5 as it is outside Q_1 and Q_3 Allow '2.83' > '2.37' and '5.16' < '5.63' **or** a correct probability calculated awrt 0.65 Answer is given so no incorrect working can be seen. If their values are not consistent with the statistician's claim, then A0 here.

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