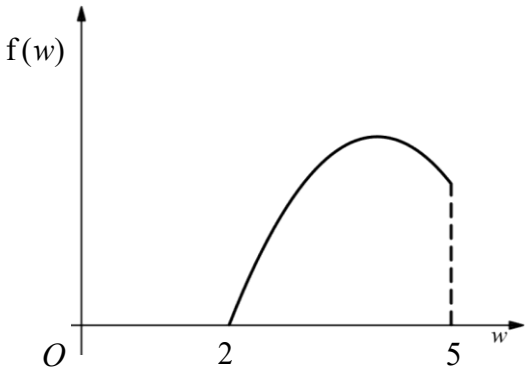
Question Number	Scheme	Marks
6(a)		M1 A1
		(2)
(b)	Mode $= 4$	B1
		(1)
(c)	$\mathrm{E}(W) = \frac{1}{9}\int_2^5 w(6-w)(w-2)\ \mathrm{d}w$	M1
	$\mathrm{E}(W) = \frac{1}{9}\int_2^5 \left(-w^3+8w^2-12w\right)\mathrm{d}w = \frac{1}{9}\left[-\frac{w^4}{4}+\frac{8w^3}{3}-6w^2\right]_2^5$	M1
	$= \frac{1}{9}\left(\left(-\frac{5^4}{4}+\frac{8\times5^3}{3}-6\times5^2\right)-\left(-\frac{2^4}{4}+\frac{8\times2^3}{3}-6\times2^2\right)\right)$	dM1
	$= 3.75\,(\mathrm{kg})$	A1
		(4)
(d)	Standard deviation $= \sqrt{\frac{73}{5}-\left("\frac{15}{4}"\right)^2}$	M1
	$= \frac{\sqrt{215}}{20} = 0.73314...\,(\mathrm{kg})$ **awrt 0.733**	A1
		(2)
(e)	$\frac{1}{9}\int\ (-w^2+8w-12)\ \mathrm{d}w = \frac{1}{9}\left(-\frac{w^3}{3}+4w^2-12w\right)$	M1A1
	$\mathrm{F}(3.7) = \frac{1}{9}\int_2^{3.7}(-w^2+8w-12)\ \mathrm{d}w = 0.460...\ (<0.5)$	M1
	$\mathrm{F}(3.8) = \frac{1}{9}\int_2^{3.8}(-w^2+8w-12)\ \mathrm{d}w = 0.504\ (>0.5)$	M1
	3.7 and 3.8 give values either side of 0.5 hence median lies between 3.7 and 3.8	A1
		(5)
(f)	$X \sim \mathrm{N}(30,\ 30)$	B1
	$\mathrm{P}\left(Z < \frac{19.5-"30"}{\sqrt{"30"}}\right) = \mathrm{P}(Z<-1.917...)$	M1M1 A1ft
	= awrt 0.0274 or awrt 0.0276	A1
		(5)
		Total 19

	Notes	
(a)	**M1**	a negative **quadratic** shape which is in the first quadrant
	A1	correct graph with 2 and 5 labelled. Do not be concerned by the value of the maximum labelled. (condone missing axes labels\ missing vertical line at w=5) (If sketch shown for w<2 and w >5, must have f(w) = 0)
(b)	**B1**	Cao (accept $w = 4$)
(c)	**M1**	for attempting $\int w\,\mathrm{f}(w)\,\mathrm{d}w$. Does not require limits. Condone omission of dw or use of another variable.
	M1	for an attempt at integration of wf(w) with correct limits. Look for $w^n \rightarrow w^{n+1}$ for at least one term
	dM1	dependent on both previous method marks. For correct use of limits.
	A1	3.75 (kg) o.e. (Must see evidence of all previous M marks)
(d)	**M1**	for a correct standard deviation calculation using their part (c) including square root. May see $\sqrt{\frac{43}{80}}$ or $\sqrt{0.5375}$ or $\sqrt{\frac{215}{400}}$ (o.e)
	A1	awrt 0.733 (kg)
(e)	**M1**	for an attempt at integration of f(x). Look for $w^n \rightarrow w^{n+1}$ for at least one term Ignore limits. Condone missing 1/9 for this mark
	A1	correct integrated expression, including the 1/9 with or without + c. Limits do not need to be substituted in.
	dM1	dependent on the 1st M1. For one correct evaluation using 2 and 3.7 **or** 2 and 3.8 (Allow equivalent substitution into re-arrangements)
	dM1	dependent on the previous method marks. For two correct evaluations using 2 and 3.7 and 2 and 3.8 (Allow equivalent substitution into re-arrangements)
	A1	correct calculations, reasoning and conclusion (e.g. comparing awrt = 0.46 or awrt 0.504 with 0.5 \ median) o.e
	ALT	**Finding the value of *m***
	M1 A1	See scheme
	dM1	dependent on the 1st M1. Uses $\frac{1}{9}\int_2^m (-w^2+8w-12)\,\mathrm{d}w = 0.5$ must see limits.
	dM1	dependent on the previous method marks. Substituting **both** limits to obtain a cubic $am^3+bm^2+cm+d=0$ where a, b, c and d are constants and solves by any method (including calculator) to obtain m = ..., for at least one root. Allow substitution of 3.7 and 3.8 into the cubic expression.
	A1	All 3 correct roots seen **and** indicates awrt 3.79 **and** give a reason for rejecting the other two roots (other roots awrt 0.65 (condone 0.64) awrt 7.6 (condone 7.5)) Allow substitution of 3.7 and 3.8 into the cubic expression and identifying a sign change.
(f)	**B1**	for a correct normal approximation to a Poisson
	M1	for attempting to use a continuity correction (19.5 or 20.5)
	M1	for attempting to standardise (They can achieve this with 19.5, 20 or 20.5)
	A1ft	Dependent on both previous method marks for correct standardisation following through their mean and variance
	A1	awrt 0.0274 (Calc: 0.027617…) or awrt 0.0276 **NB Use of Poisson distribution gives 0.02187… and scores 0 marks.**