Question Number	Scheme	Marks
3. (a)	$\int_2^5 \frac{1}{48}\left(x^2-8x+c\right)\mathrm{d}x=1$	M1
	$1=\frac{1}{48}\left[\frac{x^3}{3}-4x^2+cx\right]_2^5$	M1
	$1=\frac{1}{48}\left(\left(\frac{5^3}{3}-4(5^2)+5c\right)-\left(\frac{2^3}{3}-4(2^2)+2c\right)\right)$ <u>or</u> $48=39-84+3c$	
	$(\Rightarrow 3c=93\Rightarrow)c=31$*	A1cso*
		(3)
(b)	$\mathrm{P}(2<X<3)=\frac{1}{48}\left[\frac{x^3}{3}-4x^2+31x\right]_2^3$	M1
	$\frac{1}{48}\left(\left(\frac{3^3}{3}-4(3^2)+31(3)\right)-\left(\frac{2^3}{3}-4(2^2)+31(2)\right)\right)=\frac{13}{36}$ (=awrt 0.361)	A1
		(2)
(c)	Less than 3 since "$\frac{13}{36}$" > 0.25	B1
		(1)
(d)	x = 4 leads to the minimum/lowest value of f(x) / f(x) is a positive quadratic	B1
		(1)
(e)	Considers x = 2 and x = 5 by e.g. • $\mathrm{f}(2)=0.39(583\dot{)}\,[=\frac{19}{48}]$ and $\mathrm{f}(5)=0.\dot{3}\,[=\frac{16}{48}]$ (so f(2) > f(5)) • Sketch of f(x) from x = 2 to x = 5 • x = 2 is further than x = 4 (then x = 5)	M1
	Mode is x = 2	A1
		(2) **[9 marks]**

	Notes
(a)	1st M1 setting up integral and equating to 1 (condone missing dx) limits not needed 2nd M1 attempting to integrate f(x) at least one term $x^n \to x^{n+1}$ (need not be = 1) Use of integration of f(x) with F(2) = 0 and F(5) = 1 can score M1M1 A1* cso including use of correct limits. There should be at least one line of working between scoring the 2nd M1 and arriving at the given answer. Allow a verification method 1st M1 setting up integral 2nd M1 attempting to integrate A1cso use of correct limits to show that it integrates to 1 and concluding that c = 31
(b)	M1 for use of integration of f(x) $x^n \to x^{n+1}$ with correct limits 2 and 3 (ft from their (a)) A1 allow awrt 0.361 (correct answer scores 2 out of 2)
(c)	B1 less than 3 with correct reasoning. May use their part (b), but must be consistent with 'less than 3' If the lower quartile is found awrt 2.67, allow LQ/2.67 < 3
(d)	B1 correct reason why the method does not give the correct mode. Allow a sketch of f(x). Also allow, e.g. 'Kei's method did not consider the end-points'
(e)	M1 considers end-points A1 mode is 2 cao Answer only scores M0A0. Must have some justification.