Question	Scheme	Marks
6. (a)	$\int_0^2 0.1x\,\mathrm{d}x + \int_2^4 kx(8-x)\,\mathrm{d}x = \frac{31}{45}$	M1
	$\left[\frac{0.1x^2}{2}\right]_0^2 + k\left[4x^2 - \frac{x^3}{3}\right]_2^4 = \frac{31}{45}$	M1
	$0.2 + k\left(64 - \frac{64}{3} - (16 - \frac{8}{3})\right) = \frac{31}{45} \to k = \frac{1}{60}$	dM1 A1
		(4)
(b)(i)	$a = \left[\left(1 - \frac{31}{45}\right) \div 2 =\right] \ \frac{7}{45}$	B1
(ii)	$\mathrm{P}(0 \text{ „ } X \text{ „ } 5.5) = \frac{31}{45} + "a" \times 1.5 = \frac{83}{90}$	M1 A1
		(3)
(c)	$\int_0^x 0.1t\,\mathrm{dt} = \frac{0.1x^2}{2}$	B1
	$\int_0^2 0.1t\,\mathrm{dt} + \int_2^x "\frac{1}{60}" t(8-t)\,\mathrm{d}t,$ $\qquad \frac{31}{45} + \int_4^x "\frac{7}{45}"\,\mathrm{d}t$	M1, M1
	$[\mathrm{F}(x) =]\begin{cases} 0 & x < 0 \\ 0.05x^2 & 0 \text{ „ } x < 2 \\ \frac{1}{60}(4x^2 - \frac{x^3}{3} - \frac{4}{3}) & 2 \text{ „ } x < 4 \\ \frac{7}{45}x + \frac{1}{15} & 4 \text{ „ } x < 6 \\ 1 & x \ldots 6 \end{cases}$	B1 A1 A1 (6)
	Notes	**[13 marks]**
(a)	1st M1 sum of two integrals = $31/45$ (ignore limits) It may be equated to 31/45 later in their working. Condone missing dx	
	2nd M1 attempt at integration $x \to x^2$ or $x^2 \to x^3$ for at least one	
	3rd dM1 dep on 1st M1 being awarded for use of correct limits	
	A1 $k = \frac{1}{60}$ cao Allow $0.01\dot{6}$ or equivalent exact value $k = \frac{1}{60}$ with no working gains 4/4 $\quad k = \frac{1}{60}$ from $0.2 = 2k(8-2)$ gains M0M0M0A0	
(b)(i)	B1 $a = \frac{7}{45}$ cao allow $0.1\dot{5}$ or equivalent exact value	
(ii)	M1 ft "their value of a" for $\frac{31}{45} + 1.5 \times "a"$ or $1 - 0.5 \times "a"$	
	A1 $\frac{83}{90}$ cao Allow $0.9\dot{2}$ or equivalent exact value	
(c)	1st B1 a correct integration of 2nd line of pdf if have + C must get $C = 0$	
	1st M1 a correct method to find 3rd line of cdf Condone incorrect integration (allow k) Allow $0.2 + \int_2^x "\frac{1}{60}" t(8-t)\,\mathrm{d}t$ **or** $\int "\frac{1}{60}" t(8-t)\,\mathrm{d}t + C$ and F(2) = 0.2	
	2nd M1 a correct method to find 4th line of cdf Condone incorrect integration (allow a) Allow $\int "\frac{7}{45}"\,\mathrm{d}t + C$ and F(6) = 1 but do **not** allow **their** $\mathrm{F}(4) + \int_4^x \frac{7}{45}"\,\mathrm{d}t$	
	For the next 3 marks limits condone < for „ and „ for < and …for >	
	2nd B1 1st and 5th lines correct with correct limits. Allow 1 range to be otherwise for the limits, Must have consistent use of letter throughout for this mark	
	1st A1 3rd line correct with correct limits Allow equivalent un-simplified expressions	
	2nd A1 4th line correct with correct limits Allow equivalent un-simplified expressions	