Question Number	Scheme	Marks
1. (a)	$(3+kx)^7 = 3^7 + {}^7C_1 3^6 (kx)^1 + {}^7C_2 3^5 (kx)^2 + {}^7C_3 3^4 (kx)^3 + \ldots$ $= 2187 + 5103kx + 5103k^2x^2 + 2835k^3x^3 + \ldots$	B1, M1 A1, A1 **(4)**
(b)	Sets $5103k^2 = 3 \times 2835k^3 \Rightarrow k = \ldots$ $k = \frac{3}{5}$	M1 A1 **(2)** **(6 marks)**

(a)

B1: For a first term (constant term) of 3^7 or 2187 or even ${}^7C_0 \times 3^7$

M1: For an attempt at the binomial expansion. Score for a correct attempt at one of terms 2, 3 or 4

Accept sight of ${}^7C_1 3^6 (kx)^1$ or ${}^7C_2 3^5 (kx)^2$ or ${}^7C_3 3^4 (kx)^3$ condoning the Omission of brackets.

Accept any **correct** coefficient appearing from Pascal's triangle.

A1: For any two simplified terms of $2187 + 5103kx + 5103k^2x^2 + 2835k^3x^3$

A1: For $2187 + 5103kx + 5103k^2x^2 + 2835k^3x^3$ ignoring terms with greater powers. Allow as a list and allow in descending order.

ALT For the first two marks

B1: Takes 3^7 out as a common factor to obtain $3^7\left(1+\frac{kx}{3}\right)^7$

M1: For an attempt at the binomial expansion Score for a correct attempt at one of terms 2, 3 or 4 inside the main bracket.

Accept $\ldots\left(1+(7\times)\left(\frac{kx}{3}\right), \left(\frac{7\times6}{2!}\right)\times\left(\frac{kx}{3}\right)^2, \left(\frac{7\times6\times5}{3!}\right)\times\left(\frac{kx}{3}\right)^3\right)$ condoning the omission of brackets

(b)

M1: For setting $'5103'k^2 = 3\times'2835'k^3$ leading to $k =$ …following **correct** processing M0 if they include x's, but allow if recovered

A1: For $k = \frac{3}{5}$ or exact equivalent. No other values stated.

Question Number	Scheme	Marks
2 (a)	$h = 3$	B1
	Area $\approx \frac{3}{2}\{1.3195 + 0.4665 + 2\times(1.0718 + 0.8706 + 0.7071 + 0.5743)\}$	M1
	$= 12.35$	A1
		(3)
(b)	States either 'use more trapezia', or other such as 'make the strip widths narrower'	B1
		(1)
(c)	$\int_{-4}^{11} 2^{3-0.1x}\,\mathrm{d}x = 2^3 \times \int_{-4}^{11} 2^{-0.1x}\,\mathrm{d}x = 8\times'12.35' = 98.8$	M1, A1
		(2)
		(6 marks)

(a)

B1 For $h = 3$ seen anywhere even if it is not later used correctly.
This is implied by sight of $\frac{3}{2}$ in front of the bracket

M1 For a correct content of the bracket within Trapezium Rule, condoning slips.
E.g., missing end bracket(s) or MR on no more than two values
FYI: Area $A \approx \left(\frac{3}{2}\right)\left(1.786 + 2\left[3.2238\right]\right) \Rightarrow \left(\frac{3}{2}\right)\left(8.2336\right) = 12.3504$

A1 awrt 12.35 following the award of M1
Note that the calculator answer for this integral is 12.31

(b)

B1: States any valid method that states or implies thinner strips, more strips, more trapezia, reduce the size of *h* etc.,

We will also condone for the award of this mark;

Use more *y* values
Use more *x* values
Use more *x* and *y* values

(c)

M1: Attempts to use the rule $2^{3-0.1x} = 2^3 \times 2^{-0.1x}$ seen anywhere.

A1: awrt 99 following 8×12.35
Note that the calculator answer is 98.4