Question	Scheme	Marks	AOs
6(a)	e.g. ${}^{12}C_1 \times a = -\frac{15}{2}$	M1	1.1b
	$12a = -\frac{15}{2} \Rightarrow a = -\frac{5}{8}$ *	A1*	1.1b
		(2)	
(b)	${}^{12}C_2 \times a^2 = k \Rightarrow k = ...$	M1	1.1b
	$k = \frac{825}{32}$	A1	1.1b
		(2)	
(c)	$1 - \frac{5}{8}x = \frac{17}{16} \Rightarrow x\,(=-0.1) \Rightarrow 1 - \frac{15}{2} \times ("-0.1") + "\frac{825}{32}" \times ("-0.1")^2$	M1	3.1a
	= awrt 2.0078	A1	1.1b
		(2)	
			(6 marks)

Notes

(a)

M1: Correct equation to find a e.g. $12a = -\frac{15}{2}$ or ${}^{12}C_1 \times a = -7.5$ or $\frac{12!}{11!}a = -\frac{15}{2}$.

Condone if x is present on both sides of their equation.

Also allow attempts using $a = -\frac{5}{8}$ e.g. ${}^{12}C_1 \times -\frac{5}{8} = -\frac{15}{2}$

A1*: Rearranges to achieve the given answer with no errors and sufficient steps shown i.e. the binomial coefficient must have been evaluated first.

e.g. $\binom{12}{1} \times a = -\frac{15}{2} \Rightarrow 12a = -\frac{15}{2} \Rightarrow a = -\frac{5}{8}$ is M1A1*

Minimum acceptable $12a = -\frac{15}{2} \Rightarrow a = -\frac{5}{8}$ is M1A1*

${}^{12}C_1 \times a = -7.5 \Rightarrow a = -\frac{5}{8}$ is M1A0*

Do not penalise if solutions contain x as well e.g. $12ax = -\frac{15}{2}x \Rightarrow a = -\frac{5}{8}$ is M1A1*

Attempts using $a = -\frac{5}{8}$ must show the binomial coefficient evaluated and there must be a conclusion such as "hence shown", QED

$12 \times -\frac{5}{8}x = -\frac{15}{2}x$ with e.g. hence shown is M1A1*

We do not need to be concerned with any workings related to other terms.

(b) If the expression is seen in (a) it must be used in (b) to score

M1: Correct expression or equation to find k and proceeds to find a value for k e.g.

$66a^2 = k \Rightarrow k = ...$. May be implied by a correct answer or $\frac{825}{32}x^2$ .Allow use of $\frac{5}{8}$ for a.

A1: $\frac{825}{32}$ o.e. e.g. 25.78125. isw if they round after a correct answer is seen.

Do not accept $\frac{825}{32}x^2$ but allow the coefficient to be circled or underlined to identify the answer.

(c)

M1: A correct strategy to find the appropriate value of x e.g. $1-\frac{5}{8}x=\frac{17}{16}\Rightarrow x=...\ (=-0.1)$

and substitutes their value of x into $1-\frac{15}{2}x+kx^2$ using their value for k. Their $x=-0.1$ embedded in the expression is sufficient. Accept a sign slip on the substitution of their x and/or k provided the embedded values are seen.
Maybe implied by their value for the expression (you may need to check this on your calculator if the substitution is not seen)

Alternatively, attempts $\left(1+\frac{1}{16}\right)^{12}=1+12\times\frac{1}{16}+\frac{12\times11}{2}\times\left(\frac{1}{16}\right)^2$

Do not withhold this mark if they attempt incorrectly to find additional terms of the binomial expansion.

A1: awrt 2.0078 (full answer on calculation is 2.0078125 or allow $\frac{257}{128}$).

This value with no working seen can score both marks. isw if they round after a correct answer is seen.

Note that if they find the term in x^3 this is $-\frac{6875}{128}x^3$ which using $x=-0.1$ in the expansion up to and including this would give awrt 2.0615 which can score both marks.

Note that 2.06988999…is the value from the calculator for $\left(\frac{17}{16}\right)^{12}$ which is likely to score M0A0 (unless some method is shown for finding the value of x and substituting in)