1) 

(i) $1+18 x+135 x^{2} \ldots$
(ii) $\begin{gathered}(1 \times-5)+(18 \times-3)+(135 \times 1) \\ =76\end{gathered}$

B1,B1
[2]
M1,A1ft
A1 [3]

B2, 1, $0-1$ for each error

M1 for a correct method using their (i) A1ft on their 3 terms unsimplified


| M1,A1ft | M1 for a correct method using their (i) |
| :---: | :---: |
| A1 | A1ft on their 3 terms unsimplified |
| [3] |  |

(ii) $2 \times(189)$ and $5 \times(-945)$ $-4347$
(b) Identifies relevant $\left(x^{2}\right)^{3}\left(\frac{2}{x}\right)^{6}$

Multiplies by 84
3)

| $\begin{aligned} & (\mathrm{a}+\mathrm{x})(1-2 \mathrm{nx}+\ldots)=3-41 \mathrm{x}+ \\ & \mathrm{bx}^{2} \\ & \text { term in } \mathrm{x}^{3}={ }_{\mathrm{n}} \mathrm{C}_{2}( \pm 2 \mathrm{x})^{2} \end{aligned}$ | B1 | Wherever it comes. |
| :---: | :---: | :---: |
| $\rightarrow \mathrm{a}=3$ | B1 | Co - anywhere |
| $1-2 \mathrm{an}=-41 \rightarrow \mathrm{n}=7$ | M1 A1 | Must use 2 terms. |
| Coeff of $x^{2}$ is $3 \times 84-1 \times 14$ | M1 | Must use sum of 2 products. |
| $\rightarrow 238$ | A1 | Co. |
|  | [6] |  |

4) 5 [6] $\left.\left|\begin{array}{ll}{ }_{n} C_{2}=28 \Rightarrow & n(n-1)=56 \quad \Rightarrow n=8 \quad\left[\text { or via } n^{2}-n-56=(n-8)(n+7)!\right. \\ n p=-12 & \Rightarrow \quad p=-12 / 8=-1.5\end{array}\right| \begin{aligned} & \text { M1 A1 } \\ & q={ }_{8} C_{3}(-1.5)^{3}=-56 \times 27 / 8=-189\end{aligned} \right\rvert\, \begin{aligned} & \text { M1 A1 } 1 \\ & \text { M1 A1 }\end{aligned}$
5) Coefficient of x is $2^{5}\left(\frac{-x}{2}\right) 6 C 1=-96$ Coefficient of $x^{2}$ is $2^{4}\left(\frac{-x}{2}\right)^{2} .6 C 2=60$ $(k+x)\left(60 x^{2}-96 x\right) \rightarrow 60 k-96=84$

$$
\rightarrow \mathrm{k}=3
$$

| M1 A1 | Unsimplified with 6C1. | co. |
| :--- | :--- | :--- |
| M1A1 | Unsimplified with 6C2. | co. |
| M1 | Must be considering 2 terms. |  |
| A1 | For his incorrect coefficients. |  |

## Binomial 2 Answers

6) [6]
(i) $(1+x)^{5}=1+5 x+10 x^{2}+10 x^{3}+5 x^{4}+x^{5}$
(ii) $(\sqrt{ } 2)^{3}=2 \sqrt{ } 2 \quad(\sqrt{ } 2)^{5}=4 \sqrt{ } 2 \quad(1+\sqrt{ } 2)^{5}=41+29 \sqrt{ } 2$
(iii) $(1-\sqrt{ } 2)^{5}=41-29 \sqrt{ } 2 \quad(1+\sqrt{ } 2)^{5}+(1-\sqrt{ } 2)^{5}=82$
7) 

(i) $2^{5}+{ }^{5} C_{1} 2^{4}(-3 x)+{ }^{5} C_{2} 2^{3}(-3 x)^{2}$ $32-240 x+720 x^{2}$
(ii) $32 a=64, \quad a=2$ $32 b-240 a=-192$, $b=9$ $-240 b+720 a=c$ $c=-720$

B1 for 32 or $2^{5}$
B1 for -240
[3] B1 for 720.

B 1 for $a=2$
M1 for equation in $a$ and $b$ equated to $\pm 192$
A1 for $b=9$
M1 for equation in $a$ and $b$ equated to $c$
A1 for $c=-720$
8)
(i) $64-96 x+60 x^{2}-20 x^{3}$
$\mathrm{B} 1+\mathrm{B} 1+\mathrm{B} 1+\mathrm{B} 1$
(ii) Multiply by $1+2 x+x^{2}$ $-20+120-96=4$

