

# BINOMIAL EXPANSION

- 3 (i) Find the first 3 terms in the expansion, in ascending powers of  $x$ , of  $(2 - x)^5$ . [3]  
(ii) Hence find the value of the constant  $k$  for which the coefficient of  $x$  in the expansion of  $(k + x)(2 - x)^5$  is  $-8$ . [2]

- 11 (a) (i) Expand  $(2 + x)^5$ . [3]  
(ii) Use your answer to part (i) to find the integers  $a$  and  $b$  for which  $(2 + \sqrt{3})^5$  can be expressed in the form  $a + b\sqrt{3}$ . [3]  
(b) Find the coefficient of  $x$  in the expansion of  $\left(x - \frac{4}{x}\right)^7$ . [3]

- 5 Find the coefficient of  $x^3$  in the expansion of  
(i)  $(1 + 3x)^8$ , [2]  
(ii)  $(1 - 4x)(1 + 3x)^8$ . [3]

- 4 Find the coefficient of  $x^4$  in the expansion of  
(i)  $(1 + 2x)^6$ , [2]  
(ii)  $\left(1 - \frac{x}{4}\right)(1 + 2x)^6$ . [3]

- 8 (i) In the binomial expansion of  $\left(x + \frac{k}{x^3}\right)^8$ , where  $k$  is a positive constant, the term independent of  $x$  is 252.  
Evaluate  $k$ . [4]  
(ii) Using your value of  $k$ , find the coefficient of  $x^4$  in the expansion of  $\left(1 - \frac{x^4}{4}\right)\left(x + \frac{k}{x^3}\right)^8$ . [3]

# ANSWERS

3. (i) $32 - 80x + 80x^2$  (ii) $(k + x) \times (i)$ Coeff. of $x$ is $-80k + 32$ Equated with $-8 \rightarrow k = \frac{1}{2}$ or $0.5$	B1 x 3   M1 A1√ [5]	Allow $2^5$ for 32 (if whole series is given, mark the 3 terms).  Must be 2 terms considered. For solution of $k = (-8 - a) \div (b)$
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<b>11 (a)</b>	(i)	$32 + 80x + 80x^2 + 40x^3 + 10x^4 + x^5$ All coefficients to be resolved	<b>B3, 2, 1</b>
	(ii)	$x = \sqrt{3} \Rightarrow x^3 = 3\sqrt{3}, x^5 = 9\sqrt{3}$ $32 + 80\sqrt{3} + 240 + 120\sqrt{3} + 90 + 9\sqrt{3} = 362 + 209\sqrt{3}$	<b>B1 B1</b> <b>B1</b>
<b>(b)</b>		$\dots + x^4(-4/x)^3 \dots \times {}_7C_4$ (or ${}_7C_3$ ) = $35 = -2240$	<b>M1 A1 A1</b>

[9]

<b>5</b>	(i)	evidence of 27 or 56 in correct place 1512	B1 B1
	(ii)	28 x 9 complete plan 504	B1 M1 A1

[5]

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<b>4</b>	(i)	15 or $2^4$ 240	B1 B1
	(ii)	160 $(240) + \left(-\frac{1}{4}\right) \times (160)$ 200	B1 M1 A1

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<b>8 [7]</b>	(i) ${}^8C_r x^r (k/x^3)^{8-r} \Rightarrow r - 3(8-r) = 0 \Rightarrow r = 6$ ${}^8C_6 k^2 = 252 \Rightarrow k^2 = 9 \Rightarrow k = 3$	M1 A1 M1 A1
	(iii) $(x + 3/x^3)^8 \Rightarrow \dots + 8x^7(3/x^3) + \dots$ $(1 - x^4/4)(x^8 + 24x^4 + 252 + \dots) \Rightarrow$ Coefficient of $x^4 = 24 - 63 = -39$	B1 M1 A1√