

A Level · Edexcel · Maths



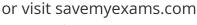


# 4.1 Binomial Expansion

4.1.1 Binomial Expansion

Total Marks	/146
Very Hard (10 questions)	/40
Hard (10 questions)	/38
Medium (10 questions)	/40
Easy (9 questions)	/28

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## **Easy Questions**

- 1 Evaluate
  - (i)

  - (ii)  ${}^5C_2$  (iii)  ${}^6C_3$

(3 marks)

**2** Show that, for all values of k,

$${}^kC_1 = k$$

(2 marks)

**3** Expand  $(x + 2)^4$ .

(3 marks)

**4** Find the first three terms, in ascending powers of x, in the expansion of  $(3 + 2x)^8$ .

**5** Find the coefficient of the  $x^2$  term in the expansion of  $(2-x)^5$ .

(3 marks)

**6** Expand  $(2x-3)^6$ .

(3 marks)

7 In the expansion of  $(p+x)^{12}$ , the coefficient of the  $x^5$  term is 12 976 128. Find the value of p.

8 (a)	Find the first three terms in the expansion of $(5 + 2x)^5$ .	
		(3 marks)
(b)	Use your answer to part (a) to estimate the value of $(5.04)^5$ .	
		(2 marks)
9	In the expansion of $(p+x)^4$ , where $p$ is a non-zero constant, the coefficient of term is twice the coefficient of the $x$ term. Find the value of $p$ .	f the $x^2$
		(3 marks)

### **Medium Questions**

**1** Expand  $(2 + x)^4$ .

(3 marks)

**2** Find the coefficient of the term in  $x^3$  in the expansion of  $(2-x)^8$ .

3 (a)	(a) Find the first three terms, in ascending powers of $x$ , in the expansion of $(3 + x)^4$ .		
(b)	Use your answer to part (a) to estimate $(3.1)^4$ .	(3 marks)	
4	In the expansion of $(a-x)^4$ , the coefficient of the $x^2$ term is 96.	(2 marks)	
	Given that $a > 0$ , find the value of $a$ .	(2 marks)	

5 (a)	Find the first three terms in the expansion of $(9-2x)^5$ .
	(3 marks
(h)	Use your answer to part (a) to estimate $(8.9)^5$ .
(D)	ose your answer to part (a) to estimate (6.9).
	(2 marks
	<b>(</b> — 111311131
6	In the expansion of $(a-2x)^5$ , the coefficient of the $x^2$ term is equal to the coefficient of the $x^3$ term. Find the value of $a$ .
	the A term. This the value of <b>a</b> .
	/A manufac
	(4 marks
7	In the expansion of $(3 + px)^6$ , the coefficient of the $x^4$ term is four times the coefficient
	of the $x^2$ term. Find the possible values of $p$ .
	(3 marks

8 (a)	Find the first three terms in the expansion of $(3 + 2x)^8$ .

**(b)** Given that x is small such that  $x^3$  and higher powers of x can be ignored show that

$$(1+x)(3+2x)^8 \approx 6561 + 41553x + 116640x^2$$

(3 marks)

**9** In the expansion of  $(p+qx)^5$ , the coefficients of the  $x^2$  term and the  $x^3$  term are equal. Find p in terms of q.

(4 marks)

**10 (a)** In the expansion of  $(a + bx)^4$ , the coefficient of the  $x^2$  term is equal to the coefficient of the  $x^3$  term.

Show that 
$$\frac{a}{b} = \frac{2}{3}$$
.

(3 marks)

**(b)** Given that a and b are integers, and that 10 < b < 15, find the values of a and b.

(2 marks)

#### **Hard Questions**

1 Fully expand  $(4-x)^4$ .

(3 marks)

**2** Fully expand  $(2 - \frac{1}{3}x)^4$ .

- (4 marks)
- **3** Find the coefficient of the term in  $x^4$  in the expansion of  $(3+2x)^9$ .

4 (a)	Find the first three terms, in ascending powers of $x$ , in the expansion of $(5-2x)^4$ .		
		(3 marks)	
(b)	Use your answer to part (a) to estimate $(4.5)^4$ .		
		(2 marks)	
5	In the expansion of $(4-px)^6$ , the coefficient of the $x^4$ term is 19 440. Given that $p$ is a positive integer find the value of $p$ .		
		(3 marks)	
6	In the expansion of $(3a-2x)^6$ , the coefficient of the $x^3$ term is equal to the coefficient of the $x^4$ term. Find the value of $a$ .	oefficient	
		(2 marks)	
		(3 marks)	

7 (a)	Find the first three terms in the expansion	of (	$(2 - 3x)^{-1}$	)7.
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**(b)** Given that x is small such that  $x^3$  and higher powers of x can be ignored show that

$$(1-2x)(2-3x)^7 \approx 128 - 1600x + 8736x^2$$

(3 marks)

**8** In the expansion of  $(p+qx)^8$ , the coefficients of the  $x^2$  term and the  $x^6$  term are equal. Find p in terms of q.

(3 marks)

**9** In the expansion of  $(1 + x)^n$ , the coefficient of the  $x^3$  term is 84. Find the value of n.

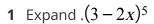
**10** In the expansion of  $(a + bx)^4$ , the coefficient of the  $x^3$  term is 216.

In the expansion of  $(a + bx)^6$ , the coefficient of the  $x^4$  term is 4860.

Find the possible values of a and b.

(5 marks)

### **Very Hard Questions**

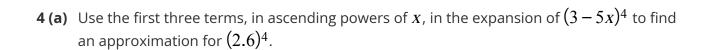


(3 marks)

**2** Find the coefficient of the term in  $x^4$  in the expansion of  $(4-3x)^7$ ...

(3 marks)

**3** Given that  ${}^{n}C_{3} = 35$  find the value of n.



(5 marks)

(b) Using your calculator, find the percentage error in the approximation from part (a) to the exact value of  $(2.6)^4$ .

(2 marks)

**5** In the expansion of  $(m - \frac{1}{4}x)^5$ , the coefficient of the  $x^3$  term is -10. Find the possible values of m.

(3 marks)

**6** In the expansion of  $(3a + \frac{1}{2}x)^6$ , the coefficient of the  $x^3$  term is equal to the coefficient of the  $x^5$  term. Find the values of a, giving your answers in the form  $\frac{\sqrt{m}}{n}$ , where mand n are integers to be found.



7 (a)	Find the first three terms in the expansion	of (	(4 - 3)	$(3x)^{9}$	) .
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**(b)** Given that x is small such that  $x^3$  and higher powers of x can be ignored show that

$$(3-2x^2)(4-3x)^9 \approx 786432 - 5308416x + 15400960x^2$$

(3 marks)

8 In the expansion of  $(p+qx)^9$ , the coefficient of the  $x^3$  term is double that of the  $x^5$ term. Find p in terms of q.

(3 marks)

**9** In the expansion of  $(1-3x)^n$ , the coefficient of the  $x^3$  term is -3240.

Find the value of n.

**10** In the expansion of  $(a + bx)^8$ , the coefficient of the  $x^5$  term is -870 912.

In the expansion of  $(a + bx)^{12}$ , the coefficient of the  $x^3$  term is -1 557 135 360.

Find the possible values of a and b.

(5 marks)