

### Pure Mathematics: Binomial Expansion

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Edexcel IAL AS and A Levels Mathematics	
Sub Topic : Sequences and Series	
Type : Topic Questions	
INTERNATIONAL ADVANCED LEVEL	
EDEXCEL INTERNATIONAL GCSE	
ECONOMICS/ Danale Concernation	
FURTHER MATHEMATICS/	
SPECIFICATION	
Edexcel International Advanced Subsidiary in Mathematics (XMA01) Edexcel International Advanced Subsidiary in Further Mathematics (XFM01)	
Edexcel International Advanced Subsidiary in Pure Mathematics (XPM01)	
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First examination June	

To be used by all students preparing for Edexcel IAL AS and A Levels Mathematics

Students of other boards may also find this useful



Q1.

A curve C has equation y = f(x) where

 $f(x) = (2 - kx)^5$ 

and k is a constant.

Given that when f(x) is divided by (4x - 5) the remainder is  $\frac{243}{32}$ 

(a) show that  $k = \frac{2}{5}$ 

(2)

(3)

(Total for question = 7 marks)

(b) Find the first three terms, in ascending powers of x, of the binomial expansion of

 $\left(2-\frac{2}{5}x\right)^2$ 

Exam Papers Practice

giving each term in simplest form.

Using the solution to part (b) and making your method clear,

(c) find the gradient of C at the point where x = 0



Use the binomial series to find the expansion of

$$\frac{1}{(2+5x)^3}$$
  $|x| < \frac{2}{5}$ 

in ascending powers of x, up to and including the term in  $x^3$ 

Give each coefficient as a fraction in its simplest form.



#### (Total for question = 6 marks)

Q3.

(a) Find the first four terms, in ascending powers of x, of the binomial expansion of

$$\left(2-\frac{1}{4}x\right)^{6}$$

(4)

(b) Given that x is small, so terms in  $x^4$  and higher powers of x may be ignored, show

$$\left(2 - \frac{1}{4}x\right)^6 + \left(2 + \frac{1}{4}x\right)^6 = a + bx^2$$

where a and b are constants to be found.

(3)

#### (Total for question = 7 marks)

## **Exam Papers Practice**

Q4.

(a) Find the first 4 terms, in ascending powers of x, in the binomial expansion of

$$\left(1+\frac{x}{4}\right)^{12}$$

giving each coefficient in its simplest form.

(3)

(b) Find the term independent of x in the expansion of

$$\left(\frac{x^2+8}{x^5}\right)\left(1+\frac{x}{4}\right)^{12}$$

(3)



(Total for question = 6 marks)

Q5.

Q6.

One of the terms in the binomial expansion of  $(3 + \alpha x)^6$ , where  $\alpha$  is a constant, is  $540x^4$ 

 $\left(\frac{1}{81} + \frac{1}{x^6}\right)(3 + ax)^6$ 

(a) Find the possible values of  $\alpha$ .

(b) Hence find the term independent of x in the expansion of

(Total for question = 7 marks) (a) Find the first 4 terms, in ascending powers of x, of the binomial expansion of ctice  $2-\frac{x}{4}$ 10

giving each term in its simplest form.

(4)

(4)

(3)

(b) Hence find the constant term in the series expansion of

$$\left(3 - \frac{1}{x}\right)^2 \left(2 - \frac{x}{4}\right)^{10}$$

(3)

#### (Total for question = 7 marks)



Q7.

(a) Use the binomial expansion to expand

$$(4-5x)^{-\frac{1}{2}}$$
  $|x| < \frac{4}{5}$ 

in ascending powers of x, up to and including the term in  $x^2$  giving each coefficient as a fully simplified fraction.

$$f(x) = \frac{2+kx}{\sqrt{4-5x}}$$
 where k is a constant and  $|x| < \frac{4}{5}$ 

Given that the series expansion of f(x), in ascending powers of x, is

$$1 + \frac{3}{10}x + mx^2 + \dots$$
 where *m* is a constant

(b) find the value of k,



#### (Total for question = 6 marks)

Q8.

(a) Find the first three terms, in ascending powers of x, of the binomial expansion of

 $(2 + px)^{6}$ 

where p is a constant. Give each term in simplest form.



Given that in the expansion of

(4)

 $\left(3 - \frac{1}{2}x\right)\left(2 + px\right)^6$ 

the coefficient of  $x^2$  is  $-\frac{3}{4}$ 

(b) find the possible values of *p*.

(4)



Q9.

(a) Find the first 4 terms, in ascending powers of x, of the binomial expansion of



giving each coefficient in its simplest form. Example papers Practice (5)

By substituting  $x = \frac{1}{100}$  into the answer for (a),

(b) find an approximation for  $\sqrt{5}$ 

Give your answer in the form  $\frac{a}{b}$  where *a* and *b* are integers to be found.

(2)

(Total for question = 7 marks)



(4)

Q10.

(a) Find, in ascending powers of x, up to and including the term in  $x^3$ , the binomial expansion of

$$\left(2+\frac{x}{8}\right)^{13}$$

fully simplifying each coefficient.

(b) Use the answer to part (a) to find an approximation for 2.0125<sup>13</sup> Give your answer to 3 decimal places. (3) Without calculating 2.0125<sup>13</sup> (c) state, with a reason, whether the answer to part (b) is an overestimate or an underestimate. (1) (1) (Total for question = 8 marks) Q11. Given that k is a constant and the binomial expansion of  $\sqrt{1 + kx}$  |kx| < 1in ascending powers of x up to the term in  $x^3$  is  $1 + \frac{1}{8}x + Ax^2 + Bx^3$ 

(a) (i) find the value of k,

(ii) find the value of the constant A and the constant B.

(5)

(b) Use the expansion to find an approximate value to  $\sqrt{1.15}$ 

Show your working and give your answer to 6 decimal places.



#### (Total for question = 7 marks)

Q12.

The first three terms, in ascending powers of x, of the binomial expansion of  $(1 + kx)^{16}$  are

1, -4x and  $px^2$ 

where *k* and *p* are constants.

- (a) Find, in simplest form,
- (i) the value of k
- (ii) the value of p

 $g(x) = \left(2 + \frac{16}{x}\right) \left(1 + kx\right)^{16}$ 

(3)

Using the value of k found in part (a),

(b) find the term in  $x^2$  in the expansion of g(x).

# **Exam Papers Practice**<sup>(3)</sup>

#### (Total for question = 6 marks)

Q13.

$$f(x) = \sqrt{1 - 4x^2}$$
  $|x| < \frac{1}{2}$ 

(a) Find, in ascending powers of x, the first four non-zero terms of the binomial expansion of f(x). Give each coefficient in simplest form.

(4)

(b) By substituting x =



 $\frac{1}{4}$  into the binomial expansion of f(x), obtain an approximation for  $\sqrt{3}$ 

Give your answer to 4 decimal places.

1

(2)

(Total for question = 6 marks)

Q14.

(a) Find the first 4 terms, in ascending powers of *x*, of the binomial expansion of

$$\left(2-\frac{kx}{4}\right)^8$$

where k is a non-zero constant. Give each term in simplest form.

(4)

$$f(x) = (5 - 3x) \left(2 - \frac{kx}{4}\right)^8$$

In the expansion of f(x), the constant term is 3 times the coefficient of x. (b) Find the value of k. (3)

(Total for question = 7 marks)

Q15.

Find the first four terms, in ascending powers of x, of the binomial expansion of

$$\left(2+\frac{3}{8}x\right)^{10}$$



Give each coefficient as an integer.

#### (Total for question = 4 marks)

Q16.

(a) Find, in ascending powers of x, the first three non-zero terms of the binomial series expansion of

017.

$$g(x) = \frac{1}{\sqrt{4 - x^2}}$$

(a) Find, in ascending powers of x, the first four non-zero terms of the binomial expansion of g (x). Give each coefficient in simplest form.

(5)

(b) State the range of values of *x* for which this expansion is valid.

- (1)
- (c) Use the expansion from part (a) to find a fully simplified rational approximation for  $\sqrt{3}$



Show your working and make your method clear.

(2)

(Total for question = 8 marks)

Q18.

The binomial expansion of

 $(3 + kx)^{-2}$  |kx| < 3

where k is a non-zero constant, may be written in the form



(ii) find the value of D

(3)

(Total for question = 7 marks)