Binomial Expansion 2 - Past Edexcel Exam Questions

1. (Question 1 - C4 June 2018)

1. (a) Find the binomial series expansion of

$$\sqrt{4 - 9x}, \quad |x| < \frac{4}{9}$$

in ascending powers of $x$, up to and including the term in $x^2$

Give each coefficient in its simplest form. 

(5)

(b) Use the expansion from part (a), with a suitable value of $x$, to find an approximate value for $\sqrt{310}$

Show all your working and give your answer to 3 decimal places.

(3)

2. (Question 2 - C4 June 2017)

2. $f(x) = (2 + kx)^3$, $\quad |kx| < 2$, where $k$ is a positive constant

The binomial expansion of $f(x)$, in ascending powers of $x$, up to and including the term in $x^2$ is

$$A + Bx + \frac{243}{16}x^2$$

where $A$ and $B$ are constants.

(a) Write down the value of $A$. 

(1)

(b) Find the value of $k$. 

(3)

(c) Find the value of $B$. 

(2)
3. **(Question 1 - C4 June 2016)**

1. Use the binomial series to find the expansion of

   \[
   \frac{1}{(2 + 5x)^3}, \quad |x| < \frac{2}{5}
   \]

   in ascending powers of \(x\), up to and including the term in \(x^3\). Give each coefficient as a fraction in its simplest form.

   (6)

4. **(Question 1 - C4 June 2015)**

1. **(a)** Find the binomial expansion of

   \[
   (4 + 5x)^{\frac{1}{2}}, \quad |x| < \frac{4}{5}
   \]

   in ascending powers of \(x\), up to and including the term in \(x^2\). Give each coefficient in its simplest form.

   (5)

   **(b)** Find the exact value of \((4 + 5x)^{\frac{1}{2}}\) when \(x = \frac{1}{10}\)

   Give your answer in the form \(k\sqrt{2}\), where \(k\) is a constant to be determined.

   (1)

   **(c)** Substitute \(x = \frac{1}{10}\) into your binomial expansion from part (a) and hence find an approximate value for \(\sqrt{2}\)

   Give your answer in the form \(\frac{p}{q}\) where \(p\) and \(q\) are integers.

   (2)
5. (Question 2 - C4 June 2014)

2. Given that the binomial expansion of \((1 + kx)^4, \quad |kx| < 1\), is

\[
1 - 6x + Ax^2 + \ldots
\]

(a) find the value of the constant \(k\),

(b) find the value of the constant \(A\), giving your answer in its simplest form.

(2)

(3)

6. (Question 2 - C4 June 2013)

2. (a) Use the binomial expansion to show that

\[
\sqrt{\frac{1 + x}{1 - x}} \approx 1 + x + \frac{1}{2}x^2, \quad |x| < 1
\]

(6)

(b) Substitute \(x = \frac{1}{26}\) into

\[
\sqrt{\frac{1 + x}{1 - x}} = 1 + x + \frac{1}{2}x^2
\]

to obtain an approximation to \(\sqrt{3}\)

Give your answer in the form \(\frac{a}{b}\) where \(a\) and \(b\) are integers.

(3)
7. (Question 3 - C4 June 2012)

3. 

\[ f(x) = \frac{6}{\sqrt{(9 - 4x)}}, \quad |x| < \frac{9}{4} \]

(a) Find the binomial expansion of \( f(x) \) in ascending powers of \( x \), up to and including the term in \( x^3 \). Give each coefficient in its simplest form.

(b) \( g(x) = \frac{6}{\sqrt{(9 + 4x)}}, \quad |x| < \frac{9}{4} \)

(c) \( h(x) = \frac{6}{\sqrt{(9 - 8x)}}, \quad |x| < \frac{9}{8} \)

8. (Question 2 - C4 June 2011)

2. 

\[ f(x) = \frac{1}{\sqrt{(9 + 4x^2)}}, \quad |x| < \frac{3}{2} \]

Find the first three non-zero terms of the binomial expansion of \( f(x) \) in ascending powers of \( x \). Give each coefficient as a simplified fraction.
Solutions

1. (a) $2 - \frac{9}{4}x - \frac{81}{64}x^2$
   
   (b) 17.607

2. (a) $A = \frac{1}{8}$
   
   (b) $k = 9$
   
   (c) $B = -\frac{27}{16}$

3. $\frac{1}{8} - \frac{15}{16}x + \frac{75}{16}x^2 - \frac{625}{32}x^3$

4. (a) $2 + \frac{5}{4}x - \frac{25}{64}x^2$
   
   (b) $\frac{3}{2}\sqrt{2}$
   
   (c) $\frac{181}{128}$

5. (a) $k = \frac{3}{2}$
   
   (b) $A = \frac{45}{2}$

6. (a) -
   
   (b) $\frac{7025}{3056}$

7. (a) $f(x) \approx 2 + \frac{4}{9}x + \frac{4}{27}x^2 + \frac{40}{729}x^3$
   
   (b) $g(x) \approx 2 - \frac{4}{9}x + \frac{4}{27}x^2 - \frac{40}{729}x^3$
   
   (c) $h(x) \approx 2 + \frac{8}{9}x + \frac{16}{27}x^2 + \frac{320}{729}x^3$

8. $f(x) \approx \frac{1}{3} - \frac{2}{27}x^2 + \frac{2}{81}x^4$