Binomial Expansion- Questions

June 2019 Mathematics Advanced Paper 1: Pure Mathematics 1

1.

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

$$\frac{1}{\sqrt{4-x}}$$

giving each coefficient in its simplest form.

(4)

The expansion can be used to find an approximation to $\sqrt{2}$
Possible values of x that could be substituted into this expansion are:

- $x = -14$ because $\dfrac{1}{\sqrt{4-x}} = \dfrac{1}{\sqrt{18}} = \dfrac{\sqrt{2}}{6}$

- $x = 2$ because $\dfrac{1}{\sqrt{4-x}} = \dfrac{1}{\sqrt{2}} = \dfrac{\sqrt{2}}{2}$

- $x = -\dfrac{1}{2}$ because $\dfrac{1}{\sqrt{4-x}} = \dfrac{1}{\sqrt{\dfrac{9}{2}}} = \dfrac{\sqrt{2}}{3}$

(b) Without evaluating your expansion,

    (i) state, giving a reason, which of the three values of x should not be used

(1)

    (ii) state, giving a reason, which of the three values of x would lead to the most accurate approximation to $\sqrt{2}$

(1)

2.

(a) Use binomial expansions to show that $\sqrt{\dfrac{1+4x}{1-x}} \approx 1 + \dfrac{5}{2}x - \dfrac{5}{8}x^2$

(6)

A student substitutes $x = \dfrac{1}{2}$ into both sides of the approximation shown in part (a) in an attempt to find an approximation to $\sqrt{6}$

(b) Give a reason why the student **should not** use $x = \dfrac{1}{2}$

(1)

(c) Substitute $x = \dfrac{1}{11}$ into

$$\sqrt{\dfrac{1+4x}{1-x}} = 1 + \dfrac{5}{2}x - \dfrac{5}{8}x^2$$

to obtain an approximation to $\sqrt{6}$. Give your answer as a fraction in its simplest form.

(3)

3.

(a) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$\left(2 + \dfrac{3x}{4}\right)^6$$

giving each term in its simplest form.

(4)

(b) Explain how you could use your expansion to estimate the value of 1.925^6
You do not need to perform the calculation.

(1)

4.

(a) Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$\left(2 - \frac{x}{16}\right)^9$$

giving each term in its simplest form.

(4)

$$f(x) = (a + bx)\left(2 - \frac{x}{16}\right)^9 , \text{ where } a \text{ and } b \text{ are constants}$$

Given that the first two terms, in ascending powers of x, in the series expansion of $f(x)$ are 128 and 36x,

(b) find the value of a,

(2)

(c) find the value of b.

(2)

5.

1. Find the first 4 terms, in ascending powers of x, of the binomial expansion of

$$\left(3 - \frac{1}{3}x\right)^5$$

giving each term in its simplest form.

(4)

6.

1. Find the first 3 terms, in ascending powers of x, of the binomial expansion of

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

giving each term in its simplest form.

(4)

Jan 2013 Mathematics Advanced Paper 1: Pure Mathematics 2

7.

1. Find the first 3 terms, in ascending powers of x, in the binomial expansion of

$$(2 - 5x)^6.$$

Give each term in its simplest form.

(4)

May 2012 Mathematics Advanced Paper 1: Pure Mathematics 2

8.

1. Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$(2 - 3x)^5,$$

giving each term in its simplest form.

(4)

Jan 2010 Mathematics Advanced Paper 1: Pure Mathematics 2

9.

1. Find the first 3 terms, in ascending powers of x, of the binomial expansion of

$$(3 - x)^6$$

and simplify each term.

(4)