THE GC SCHOOL OF CAREERS

DEPARTMENT OF MATHEMATICS

REVISION GUIDE

CORE MATHEMATICS 4

BINOMIAL EXPANSION

Key Points

1. Binomial Expansion Formula (LEARN)

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \frac{n(n-1)(n-2)}{3!}x^3 + \ldots$$

If *x* is negative or a fraction then the expansion is *valid only for the range of values*

$$|x| < 1$$

2. Adapting the binomial expansion to include all expressions of the form $(a+bx)^n$

Take out a common factor of *a*.

$$\text{e.g. } \frac{1}{3+4x} = (3+4x)^{-1} = \left[3\left(1+\frac{4x}{3}\right)\right]^{-1} = \frac{1}{3}\left(1+\frac{4x}{3}\right)^{-1}$$

3. Using partial fractions

$$\text{e.g. } \frac{7+x}{(3-x)(2+x)} = \frac{2}{3-x} + \frac{1}{2+x} \qquad \text{[Using partial fractions]}$$

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

4. Finding an approximation using a suitable value of *x*

The suitable value of *x* you are going to use must be in the range for which the expansion is valid.

Try using $x = 0.1$ or $x = 0.01$ or $x = 0.001$ and which gives the required value.

Step 1: Replace all x_s by the suitable value, both in the exact and the expanded expresion.

Step 2: Modify the value obtained from the expansion to suit the required approximation.

$$\% \text{ error} = \frac{|Exact - Expected|}{Exact} \times 100$$