Horizon Education

Division of Mathematics

**HORIZON EDUCATION SINGAPORE**

Additional Mathematics

Practice Questions: Binomial Expansion

*Set 1*

**1**

**(a)** Find the coefficient of $x$ in the expansion of $\left(x+\frac{1}{2x^2}\right)^{10}$. **[3]**

**(b)** Obtain the first 3 terms in the expansion $(1-p)^7$ in ascending powers of $p$. Hence find the coefficient of $x^2$ in the expansion $(1-2x-x^2)^7$. **[4]**

**2** Find, in descending powers of $x$, the first four terms in the expansion $\left(x^2-\frac{1}{x}\right)^7$.

Hence, determine the coefficient of $x^5$ in the expansion of $\left(2+\frac{1}{x^3}\right)\left(x^2-\frac{1}{x}\right)^7$. **[5]**

**3**

**(a)** Find the term independent of $x$ in the expansion of $\left(3x-\frac{1}{2\sqrt{x}}\right)^9$. **[3]**

**(b)** In the binomial expansion of $(1+kn)^n$, where $n \geq 3$ and $k$ is a constant, the coefficient of $x^2$ and $x^3$ are equal. Express $k$ in terms of $n$. **[3]**

**4**

**(a)** Obtain the first three terms in the expansion of $(1+p)^n$ in ascending power of $p$, where $n$ is a positive integer.
By using suitable substitution, prove that the coefficient of $x^2$ in the expansion of $(1+x+x^n)^n$ is $\frac{n^2+2}{2}$. **[4]**

**(b)** Given that the coefficient of $x^2$ in the expansion nof $(1-x)(1+x+x^2)$ is 190, find the value of $n$. **[2]**

**5** Find the term independent of $x$ in the expansion of $\left(x^2+\frac{1}{2x^3}\right)^{10}$. **[5]**

**6**

**(a)** Find the coefficient of $x^{-5}$ in the expansion $\left(2x^2-\frac{1}{3x^3}\right)^{10}$. **[4]**

**(b)** Find, in ascending power of $x$, the first three terms in the expansion of $(1+ax)^6$. Given that the first two non-zero terms in the expansion of $(1+bx)(1+ax)^6$ are 1 and $-\frac{7}{3}x^2$, find the possible values of $a$ and $b$. **[6]**

**7** Find the coefficient of $x^{10}$ in $(3x^2+1)\left(1-\frac{x^2}{3}\right)^9$. **[5]**

**8** In the expansion of $\left(\frac{1}{2x^3}-x\right)^8$, find the term independent of $x$ and the coefficient of $\frac{1}{x^4}$.

Hence, find the constant term in the expansion of $(2-3x^2)^2\left(\frac{1}{2x^3}-x\right)^8$. **[5]**

**9** Write down and simplify the first three terms of the binomial expansion of $\left(2-\frac{x}{6}\right)^6$ in ascending powers of $x$.

Given that $(p+qx-x^2)\left(2-\frac{x}{6}\right)^6 = 48-88x+rx^2+\ldots$, solve for $p$, $q$ and $r$. **[6]**

**10**

**(a)** Find the term independent of $x$ in the expansion $\left(x^2-\frac{1}{3x^6}\right)^{24}$. **[3]**

**(b)** Given that the first two non-zero terms of the expansion of $(1+mx)\left(1-\frac{x}{2}\right)^n$ are 1 and $-\frac{15}{4}x^2$, where $n$ is a positive integer, find the value of $m$ and of $n$. **[6]**

**11**

**(i)** The binomial expansion of $(1+ax)^n$, where $n>0$, in ascending powers of $x$ is $1-30x+420x^2-kx^3+\ldots$. Find the values of $a$, $n$ and $k$. **[5]**

**(ii)** Find the term independent of $x$ in the expansion of $\left(2x^2-\frac{1}{x^4}\right)^9$. **[3]**

**12** Find the first four terms in the expansion of $(3+x)^6$ in ascending powers of $x$.
Use the expansion to
**(a)** estimate the value of $(3.02)^6$ correct to 4 decimal places,

**(b)** find the coefficient of $x^3$ in the expansion of $(2x^2-1)(3+x)^6$. **[5]**

**13** Given that the expansion of $(a-3x)\left(1-\frac{x}{2}\right)^n$ in ascending powers of $x$ is $2-11x+bx^2+\ldots$, find the values of the constants $a$, $b$ and $n$. **[6]**

**14** Obtain the first four terms in the expansion of $\left(a+\frac{1}{100a}\right)^6$ in descending powers of $a$. By using this expansion, evaluate $(1.01)^6$ correct to 3 decimal places. **[5]**

**15** Find the first three terms, in ascending powers of $x$, in the expansion of $(2+x)^8$, simplifying your terms. Hence, find the coefficient of $x^2$ in the expansion of $(1-x)^2(2+x)^8$. **[5]**

**16** The first three terms in the expansion of $(1+x)^n$ are $1-9+\frac{297}{8}$. Find the values of $x$ and of $n$. **[4]**

**17**

**(a)** Write down the first three terms in the expansion, in ascending powers of $x$, of $(2+ax)^6$, where $a$ is a constant.
In the expansion of $(1+bx)(2+ax)^6$, where $a$ and $b$ are constants and $a$ is a positive integers, the first two non-zero terms are 64 and $-336x^2$. Find the value of $a$ and of $b$. **[6]**

**(b)** In the expansion of $(2+5x)^n$, the coefficinets of $x^2$ and $x^3$ are in the ratio $1:5$, find the value of $n$. **[4]**

**18**

**(a)** Find the term independent of $x$ in the expansion $\left(x^3+\frac{5}{x}\right)^8$. **[3]**

**(b)** Write down and simplify, in ascending powers of $x$, the first three terms of the expansion

**(i)** $\left(1+\frac{1}{2}x\right)^7$

**(ii)** $(3-2x)^7$

Hence, or otherwise, obtain the coefficient of $x^2$ in the expansion of $\left(3-\frac{1}{x}x-x^2\right)^7$. **[5]**

**19** Obtain

**(i)** the first 3 terms in the expansion, in ascending powers of $x$, of $(2+x)^n$ in terms of $n$, **[2]**

**(ii)** the value of $n$ in the expansion of $(2+x)^n$ if the ratio of the coefficient of $x$ to that of $x^2$ is $1:10$. **[3]**

**20**

**(a)** Find, in ascending powers of $x$, the first three terms in the expansion of $(2-3x)^7$. **[3]**

**(b)** Given that $(1+ax)^n = 1 + 36x + 594x^2 + \ldots$, find $a$ and $n$. **[3]**

**21** Find the coefficient of $x^4$ and $x^6$ in the expansion of $\left(\frac{1}{2}+x^2\right)^{12}$. Hence, find the coefficient of $x^6$ in the expansion of $(2x^2-1)\left(\frac{1}{2}+x^2\right)^{12}$. **[5]**

**END**