MA1200 Practice Exercise 9 Binomial Theorem

1. Evaluate each of the following.

   (a) ${}_nC_{n-3}$ (b) ${}_nC_{n-2} + {}_nC_{n-1}$

2. Write out each of the sums below.

   (a) $\sum_{i=1}^{6}\left(i^2+1\right)$ (b) $\sum_{r=4}^{7}\left[(-2)^r-5\right]$ (c) $\sum_{r=7}^{n}\frac{r-1}{r}$ (d) $2\sum_{r=0}^{n}\frac{n-r}{n+r}$ (e) $\sum_{r=1}^{8}3$

3. Express each of the following sums using summation notation.

   (a) $\frac{1}{3}+\frac{1}{9}+\frac{1}{27}+\ldots+\frac{1}{3^{n-1}}$

   (b) $(a+d)+\left(a+d^2\right)+\ldots+\left(a+d^n\right)$

   (c) $1+3+5+\ldots+(2n-1)$

4. Expand the following with the *binomial theorem*.

   (a) $(2x-3)^4$ (b) $\left(z-\frac{1}{z}\right)^5$ (c) $\left(\frac{a}{2}+\frac{2}{a}\right)^6$

   (d) $\left[\sqrt{5}(\cos\theta+i\sin\theta)\right]^4$ (e) $\left(\frac{2x}{y}-\frac{y}{4x^2}\right)^5$

5. Determine the coefficients of the terms specified in the expansions of the following.

   (a) $\left(\frac{1}{5}-5x\right)^9$, the term in x^6 (b) $(2y-3)^7$, the fourth term in ascending powers of y

   (c) $\left(5z-\frac{3}{z}\right)^8$, the constant term