1. Why does $1 + x + x^2 + x^3 + \cdots + x^m = \frac{1 - x^{m+1}}{1 - x}$?

2. Why does $1 + x + x^2 + x^3 + \cdots = \frac{1}{1 - x}$?

3. Why does $(1 + x)^n = 1 + \binom{n}{1}x + \binom{n}{2}x^2 + \binom{n}{3}x^3 + \cdots + \binom{n}{n}x^n$?
4. Why does \((1 - x^m)^n = 1 - \left(\binom{n}{1} x^m + \binom{n}{2} x^{2m} - \binom{n}{3} x^{3m} + \ldots + (-1)^n \binom{n}{n} x^{nm}\right)\)?

5. Why does \(\frac{1}{(1 - x)^n} = 1 + \left(\binom{1+n-1}{1} x + \binom{2+n-1}{2} x^2 + \binom{3+n-1}{3} x^3 + \ldots\right)\)?

6. Show how to write the product \(\left(\sum_{i=0}^{\infty} a_i x^i\right) \left(\sum_{j=0}^{\infty} b_j x^j\right)\) of two power series as a power series \(\sum_{k=0}^{\infty} c_k x^k\).
7. How do we use the identities in Table 6.1 to determine the coefficients of a given generating function?

8. Read and understand examples 1, 2, 3, and 4.