1. What is a generating function?

2. Why is \( g(x) = (1 + x)^n \) the generating function for \( a_r = \binom{n}{r} \)?
3. Give an example to illustrate that “multiplication in a product of several polynomial factors [can] be viewed as generating the collection of all formal products obtained by multiplying together a term from each polynomial factor” (250).

4. Why is $g(x) = (1 + x + x^2)^4$ the generating function for $a_r$, the number of ways to select $r$ identical objects from four types with at most two of each type?

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