6.1: GENERATING FUNCTION MODELS

GENERATING FUNCTION

Suppose a_r is the number of ways to select r objects in a certain procedure. Then $g(x)$ is a **generating function** for a_r if $g(x)$ has the polynomial expansion

$$g(x) = a_0 + a_1x + a_2x^2 + \cdots + a_rx^r + \cdots + a_nx^n$$

If a_r = C(n, r), what is the generating function.

How to compute the coefficient of x^5 in the expansion of $(1+x+x^2)^4$.

Find the generating function for a_r, the number of ways to select r balls from three green, three white, three blue, and three gold balls.

Find a generating function for the number of ways to select r doughnuts from five chocolate, five strawberry, three lemon, and three cherry doughnuts.

Repeat with the additional constraint that there must be at least one of each type.

Use a generating function to model the problem of counting all selections of six objects chosen from three types of objects with repetition of up to four objects of each type. Also model the problem with unlimited repetition.