$\binom{n}{k}$ **= the number of subsets of size** k **of a set with** n **elements.**

Pascal's triangle:

						1								
					1		1							
				1		2		1						
			1		3		3		1					
		1		4		6		4		1				
	1		5		10		10		5		1			
1		6		15		20		15		6		1		
	7		21		35		35		21		7		1	
8		28		56		70		56		28		8		1

Generating functions

Let $a_0, a_1, a_2 \ldots a_n$ be a sequence of real numbers. The function

$$f(x) = a_0 + a_1 x + \ldots + a_n x^n = \sum_{i=0}^{n} a_i x^i$$

is called the *generating function* of the sequence.

If the sequence is infinite, then the generating function will be a polynomial of infinite degree.

Binomial Theorem

$$(x+y)^n = \sum_{k=0}^{n} \binom{n}{k} x^k y^{n-k}$$

Corrollary:

$$(x+1)^n = \sum_{k=0}^{n} \binom{n}{k} x^k.$$