Binomial Theorem

An expansion of a binomial to a power n. Expand $(\ +\ )^n$ into a sum involving terms ax^by^c, where $b+c=n$ and "a" are positive integers which make up pascal's triangle.

example:

$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$

$(x+y)^3$: binomial to power "n"

3: binomial coefficient (positive integer)

examples:

$$(x+y)^4 = x^4 + 4x^3y + 6x^2y^2 + 4xy^3 + y^4$$

$$(1+x)^n = \sum_{k=0}^{n} \frac{n!}{(n-k)!\,k!}\,x^k$$

$$= 1 + nx + \frac{(n)(n-1)}{2}x^2 + \ldots + nx^{n-1} + x^n$$

theorem:

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

Binomial Coefficients:

$$a_n = \frac{n!}{(n-k)!\,k!}$$

n=0			1			
n=1		1		1		
n=2	1		2		1	
n=3	1	3		3	1	← Pascal's triangle
n=4	1	4	6	4	1	
⋮						

Visualisation of binomial expansion