Other Things From Chapter 8

Combination - order doesn't matter $C(n,r) = n!/(n-r)!r!$

Permutation - order matters $P(n,r) = n!/(n-r)!$

The Binomial Theorem

In the expansion of $(x+y)^n$

$(x+y)^n= x^n = nx^{n-1}y+...+{}_nC_r\, x^{n-r}y+...+nxy^{n-1}+y^n$

The coefficient of $x^{n-r}y^r$ is

${}_nC_r$ = n!/(n-r)!r!

The symbol $\binom{a}{b}$ is often used in place of ${}_nC_r$ to denote binomial coefficients.

Ex. Find the binomial coefficient.

a) ${}_8c_2$ = 8!/(8-2)!2! = 8!/6!2! = 8*7/2 = 28
b) (10/3) = 10!/(10-3)!3! = 10!/7!3! = 10*9*8/3*2*1 - 10*3*4 = 120

The Binomial Coefficient (Pascal's Triangle)

$(x+y)^0 = 1$

$(x+y)^1 = x+y$

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

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

… and so on.

Sums of Powers of Integers

1. $\Sigma^n{}_{i=1} i = 1+2+3+4+... +n = n(n+1)/2$
2. $\Sigma^n{}_{i=1} i^2 = 1^2+2^2+3^2+4^2+... +n^2 = n(n+1)(2n+1)/6$
3. $\Sigma^n{}_{i=1} i^3 = 1^3+2^3+3^3+4^3+... +n^3 = n^2(n+1)^2/4$