10.2 Permutations

the number of permutations or arrangements of n distinct objects taken r at a time is equal to $P(n,r)$

Ex Given 3 objects A_1, A_2, A_3

What is the number of arrangements if 2 are taken at a time.

$A_1 A_2$ $A_2 A_3$ $A_3 A_1$

$A_1 A_3$ $A_2 A_1$ $A_3 A_2$

$$P(3,2) = 6$$

Ex If you are given 6 apples and you want to choose 6 at a time. In how many ways can you make your selection?

Solution

$$P(6,6) = 6! = 720$$

Permutations Formula (r at a time)

The number of permutations of n objects taken r at a time is

$$P(n,r) = n(n-1)(n-2)\cdots(n-r+1)$$

Pg 676 # 1, 3, 7, 11, 15, 19

Factorial

$$n! = n \times (n-1) \times (n-2) \times \cdots \times 2 \times 1$$

$$6! = 6 \times 5 \times 4 \times 3 \times 2 \times 1$$
$$= 720$$

$$\frac{6!}{3!} = \frac{6 \times 5 \times 4 \times \cancel{3!}}{\cancel{3!}}$$

$$= 30 \times 4 = 120$$

Permutation Formula (n at a time)

$$P(n, n) = n!$$