09. Quiz

Counting

- **k-Permutation**

An K-permutation of set n elements is an ordered selection of k elements from the set of n elements , $P(n,k) = nPk$

$$P(n,k) = n(n-1)(n-2)\ldots(n-k+1)$$

- **k-Combination**

Let $X = \{x_1, x_2,\ldots, x_n\}$ be a set containing n distinct elements

❑   An k-*combination* of X is <u>an unordered selection</u> of k elements of X, for $k \leq n$

❑   The number of k-combinations of X is the *binomial coefficient*

$$C(n,k) = n! / k!(n-k)! = P(n,k)/ k! = n! / k!(n-k)!$$

Implementations [1]

- **Declarations**

```
typdef struct setstrings SetStrings;
typdef struct setchars SetChars;
struct setchars {
    int size;
    char* elems;
};

struct setstrings {
    int size;
  SetChars* elems;
};
```

```
int GetCardinality(Set* set);
int Combination(int n, int r);
int Permutation (int n, int r);
SetStrings *MakeCombination(SetChars *set, const int r);
SetStrings *MakePermutation (SetChars *set, const int r);

void PrintSetStrings(SetStrings* set);
void PrintSetChars(SetChars* set);
void DestroySetStrings(SetStrings* set);
void DestroyChars(SetChars* set);
```

Implementations [2]

- Examples (1)
  - There are 3! = 6 permutation of these elements a, b, c
    - Solution
      - abc, bac, cab, acb, bca, cba
      - 3! = 3 × (3 - 1) × (3 – 2) = 3 × 2 × 1 = 6
    - Printout
      - {a, b, c}
        {b, a, c}
        {c, a, b}
        {a, c, b}
        {b, c, a}
        {c, b, a}

- Examples (2)
  - Let S={ A, B, C, D}. Committee consists of 3 of 4 people. List all such 3-comb of S
  - Solution
    - {B, C, D}, {A, C, D}, {A, B, C}, {A, B, D}
    - $_4C_3$ = 4! / 3!(4-3)! = 4
    - Printout
      - {B, C, D}
        {A, C, D}
        {A, B, C}
        {A, B, D}