NCKU Programming Contest Training Course
Vector & Map
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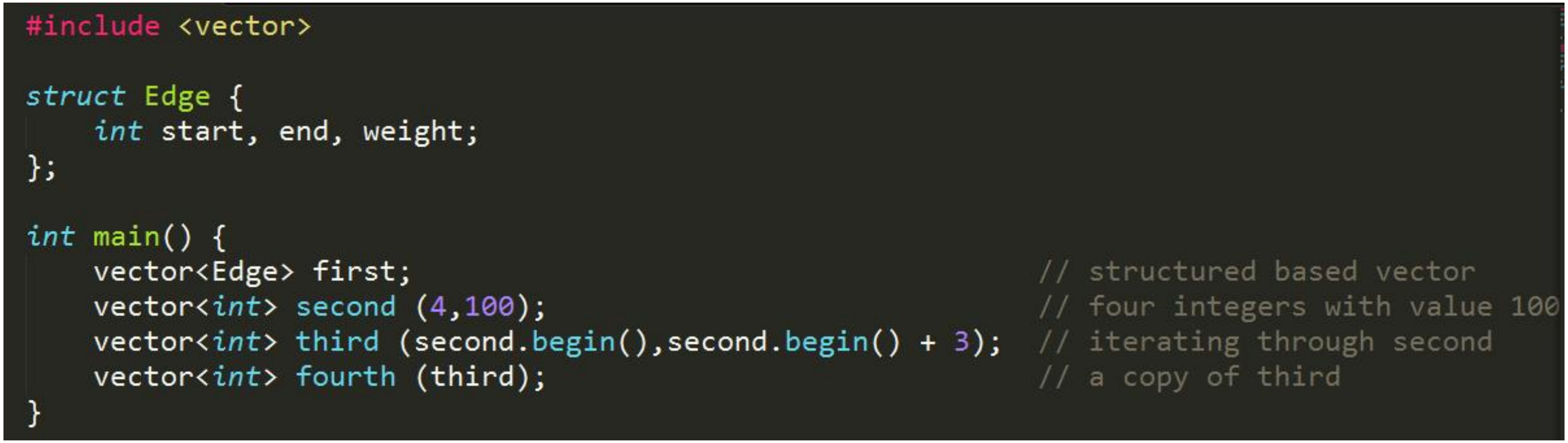
Vector

- Vectors are sequence containers representing arrays that can change in size.

Constructor



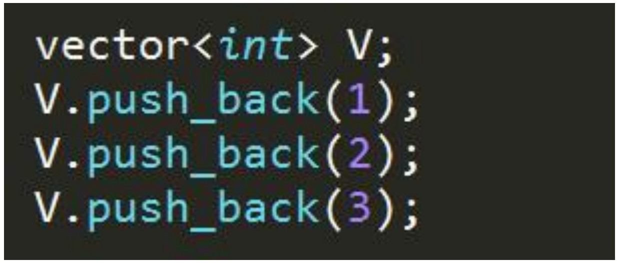
```cpp
#include <vector>

struct Edge {
    int start, end, weight;
};

int main() {
    vector<Edge> first;                                     // structured based vector
    vector<int> second (4,100);                             // four integers with value 100
    vector<int> third (second.begin(),second.begin() + 3);  // iterating through second
    vector<int> fourth (third);                             // a copy of third
}
```

Useful functions

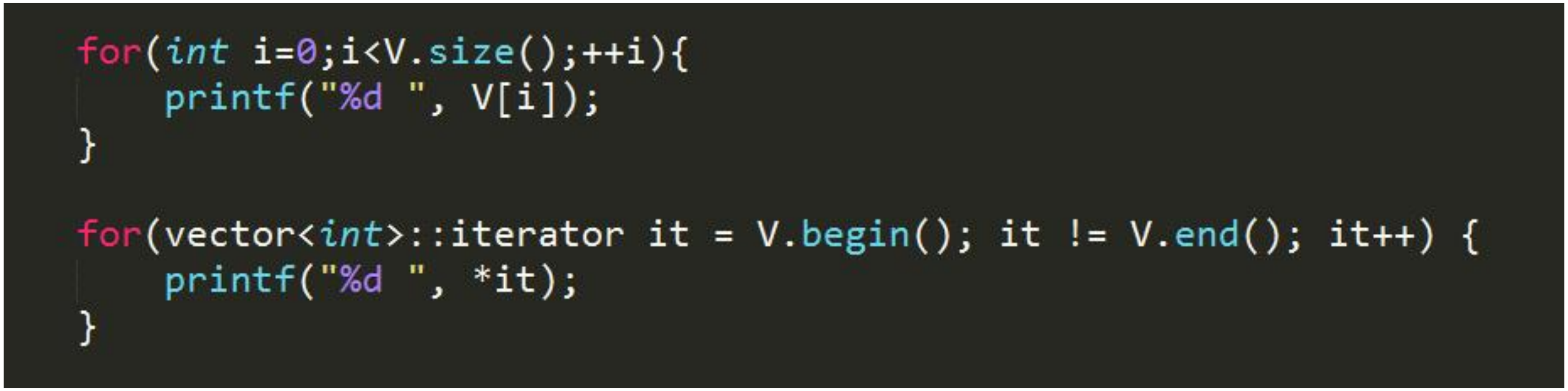
- push_back()
  - add an elements into vector



```
vector<int> V;
V.push_back(1);
V.push_back(2);
V.push_back(3);
```

Traversal

- size(), begin(), end()



```
for(int i=0;i<V.size();++i){
    printf("%d ", V[i]);
}

for(vector<int>::iterator it = V.begin(); it != V.end(); it++) {
    printf("%d ", *it);
}
```

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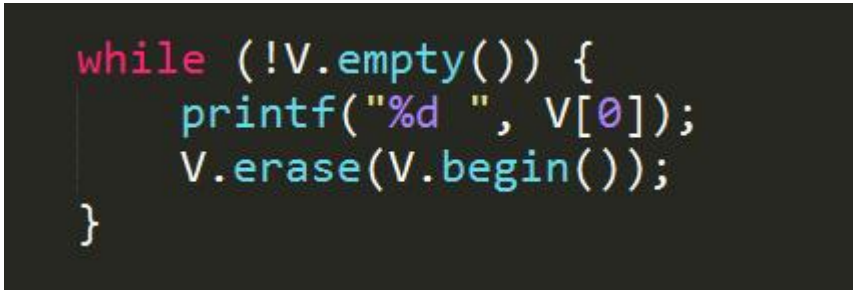
Useful functions

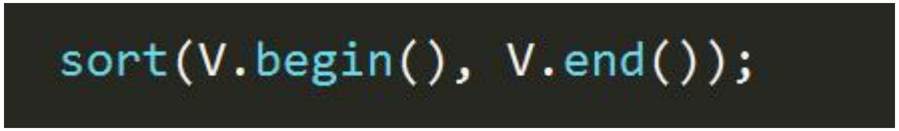
- empty(), erase()



```
while (!V.empty()) {
    printf("%d ", V[0]);
    V.erase(V.begin());
}
```

Useful functions

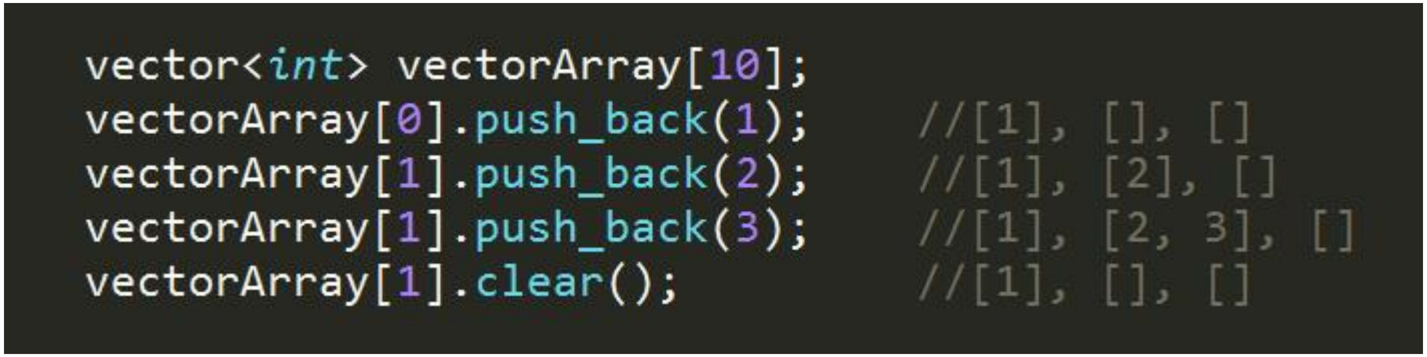
- Sort()



```
sort(V.begin(), V.end());
```

Multi-dimension

- clear()



```
vector<int> vectorArray[10];
vectorArray[0].push_back(1);    //[1], [], []
vectorArray[1].push_back(2);    //[1], [2], []
vectorArray[1].push_back(3);    //[1], [2, 3], []
vectorArray[1].clear();         //[1], [], []
```

Example - 1

UVa 11462 – Age Sort

Problem Description

You are given the ages (in years) of all people of a country with at least 1 year of age. You know that no individual in that country lives for 100 or more years. Now, you are given a very simple task of sorting all the ages in ascending order.

Input

There are multiple test cases in the input file. Each case starts with an integer n (0 < n ≤ 2000000), the total number of people. In the next line, there are n integers indicating the ages. Input is terminated with a case where n = 0. This case should not be processed.

Output

For each case, print a line with n space separated integers. These integers are the ages of that country sorted in ascending order. Warning: Input Data is pretty big (~ 25 MB) so use faster IO.

Example - 1

Sample Input

```
5
3 4 2 1 5
5
2 3 2 3 1
0
```

Sample Output

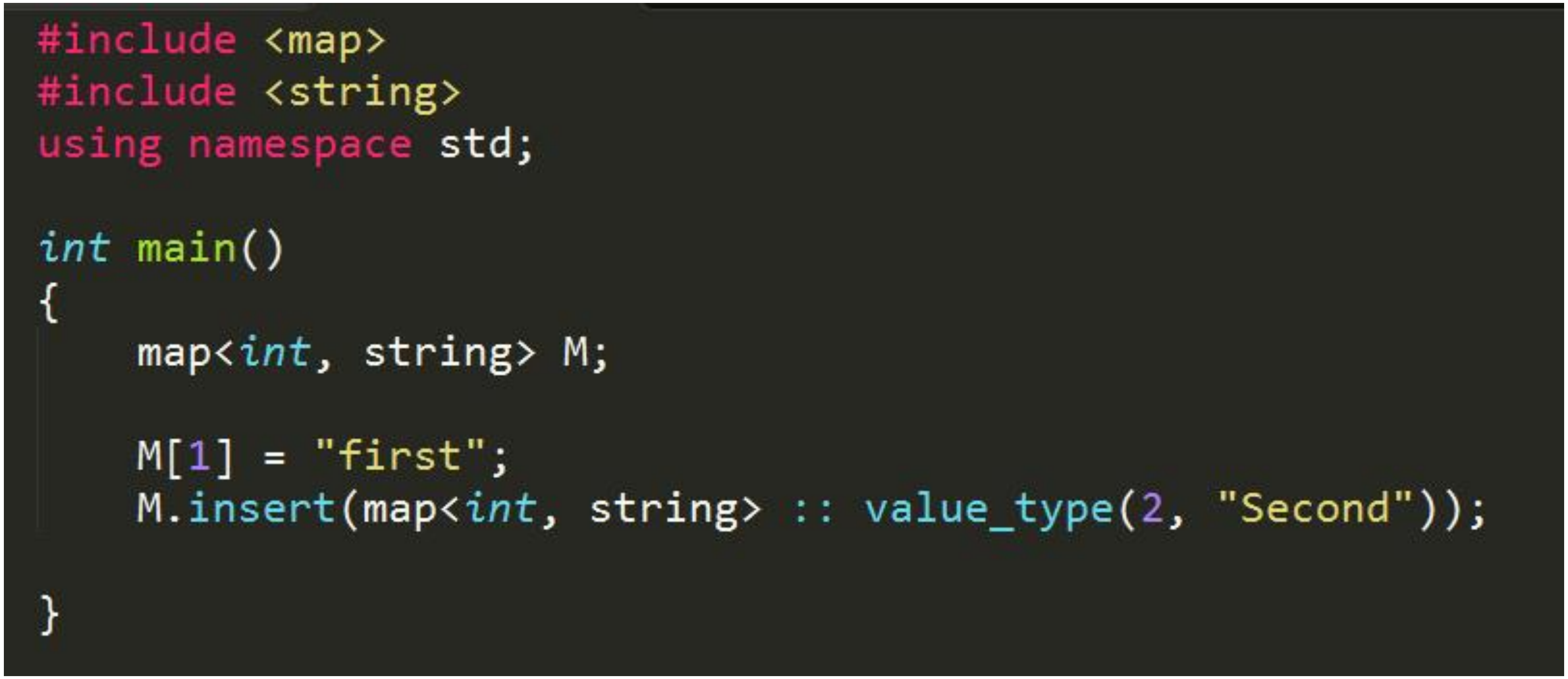
```
1 2 3 4 5
1 2 2 3 3
```

Map

- Maps are associative containers that store elements formed by a combination of a *key value* and a *mapped value*, following a specific order.

Map

- Declare, Insert



```
#include <map>
#include <string>
using namespace std;

int main()
{
    map<int, string> M;

    M[1] = "first";
    M.insert(map<int, string> :: value_type(2, "Second"));

}
```

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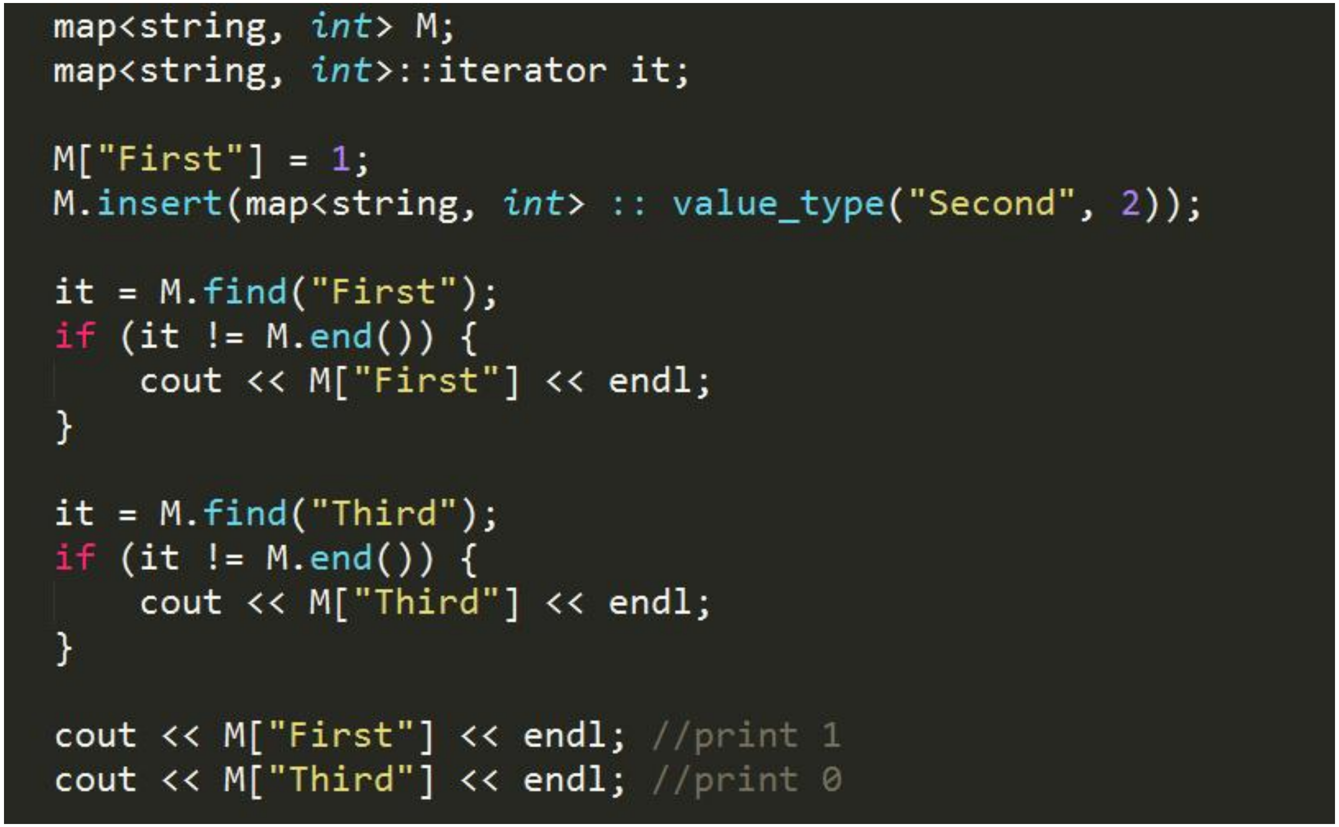
Map

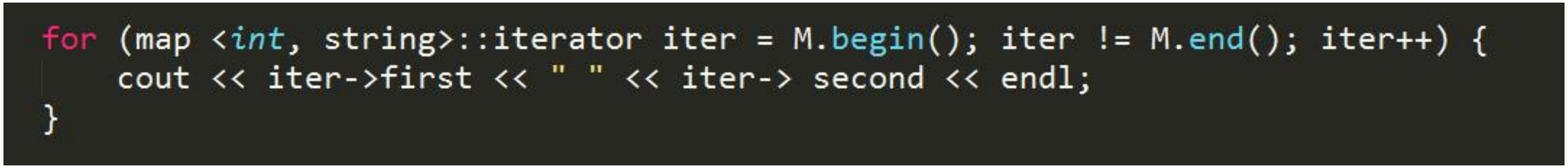
- Find



```
map<string, int> M;
map<string, int>::iterator it;

M["First"] = 1;
M.insert(map<string, int> :: value_type("Second", 2));

it = M.find("First");
if (it != M.end()) {
    cout << M["First"] << endl;
}

it = M.find("Third");
if (it != M.end()) {
    cout << M["Third"] << endl;
}

cout << M["First"] << endl; //print 1
cout << M["Third"] << endl; //print 0
```

Map

- Iterator



```
for (map <int, string>::iterator iter = M.begin(); iter != M.end(); iter++) {
    cout << iter->first << " " << iter-> second << endl;
}
```

Example - 2

UVa 10420 - List of Conquests

Problem Description

In Act I, Leporello is telling Donna Elvira about his master's long list of conquests: "This is the list of the beauties my master has loved, a list I've made out myself: take a look, read it with me. In Italy six hundred and forty, in Germany two hundred and thirty-one, a hundred in France, ninety-one in Turkey; but in Spain already a thousand and three! Among them are country girls, waiting-maids, city beauties; there are countesses, baronesses, marchionesses, princesses: women of every rank, of every size, of every age." (Madamina, il catalogo questo) As Leporello records all the "beauties" Don Giovanni "loved" in chronological order, it is very troublesome for him to present his master's conquest to others because he needs to count the number of "beauties" by their nationality each time. You are to help Leporello to count.

Example - 2

UVa 10420 - List of Conquests

Input

The input consists of at most 2000 lines. The first line contains a number n, indicating that there will be n more lines. Each following line, with at most 75 characters, contains a country (the first word) and the name of a woman (the rest of the words in the line) Giovanni loved. You may assume that the name of all countries consist of only one word.

Output

The output consists of lines in alphabetical order. Each line starts with the name of a country, followed by the total number of women Giovanni loved in that country, separated by a space.

Example - 2

Sample Input

```
3
Spain Donna Elvira
England Jane Doe
Spain Donna Anna
```

Sample Output

```
England 1
Spain 2
```

Homework

Total 2 Problem

- Uva(3)
  - 10420、11462