# Kazakh-British Technical University

# Algorithms and Data Structures, Spring 2011

# Lecture 7: Sorting Algorithms

## 1 Insertion sort

Exercise 1. Implement insertion sort algorithm which we discussed previous lecture.

## 2 Divide-and-conquer approach

The divide-and-conquer paradigm involves three steps at each level of the recursion:

- Divide the problem into a number of subproblems.
- Conquer the subproblems by solving them recursively. If the subproblem sizes are small enough, however, just solve the subproblems in a straightforward manner.
- Combine the solutions to the subproblems into the solution for the original problem.

Next two algorithms of sorting are applications of divide-and-conquer approach.

## 3 Merge sort

Read chapter 2.3.1 of Cormen [1]

Exercise 2. Implement merge sort algorithm pseudocode given in book.

## 4 Quick sort

Read chapter 6 of Cormen [1]

Exercise 3. Implement quick sort algorithm using pseudocode given in book.

## 5 Counting sort: linear time sorting

Read chapter 8 of Cormen [1]

# 6 Set container in STL

### Demonstration

```
#include <iostream>
#include <set>

using namespace std;

int main(){
  set<int> a;
  int x;
  while (cin >> x){
    a.insert(x);
  }
  for(set<int>::iterator it = a.begin(); it != a.end(); ++it)
    cout << *it << " ";
  return 0;
}
```

### Input example

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

### Output

```
1 2 3 5
```

```
#include <iostream>
#include <set>

using namespace std;

int main(){
  set<string> a;
  string x;
  while (cin >> x){
    a.insert(x);
  }
  if (a.find("Ali") != a.end()){
    cout << "Ali" << " was in the set." << endl;
    a.erase("Ali"); // delete "Ali" from the set
  } else
    cout << "Ali wasn't in the set" << endl;


  for(set<string>::iterator it = a.begin(); it != a.end(); ++it)
    cout << *it << " ";
  return 0;
}
```

### Input example

```
Askhat Ali Alibek Dauren Azamat
```

### Output

```
Ali was in the set.
Alibek Askhat Azamat Dauren
```

## References

[1] [chapters 2; 7; 8] Thomas H. Cormen, Charles E. Leiserson. *Introduction to algorithms – 2-nd edition.* – USA : MIT Press, 2001. – 1180p.