

Lab 8 – 1st Assignment support.

1. STL

- a) Where to find information about the available data structures of this library?
- b) What are the standard containers of C++?
- c) Consider the following program. What is the output?

```
int main()
{
    vector<int> v{1, 2, 3, 4, 5, 6, 7, 8, 9, 10};

    int product = accumulate(v.begin(), v.end(), 1, multiplies<int>());
    std::cout << "product: " << product << '\n';

    return 0;
}
```

- d) When you declare a vector object and specify its size as 10, how many elements can be stored in the object?
- e) What are the parameters of the accumulate function?

2. Sorting Algorithms

Consider the following sequence:

66	55	44	11	33	22
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- a) Perform a Selection Sort on the sequence above, showing the sequence obtained after each iteration of the algorithm.
- b) How many comparisons were made in sorting the array?

3. Search Algorithms

Consider the following sequence:

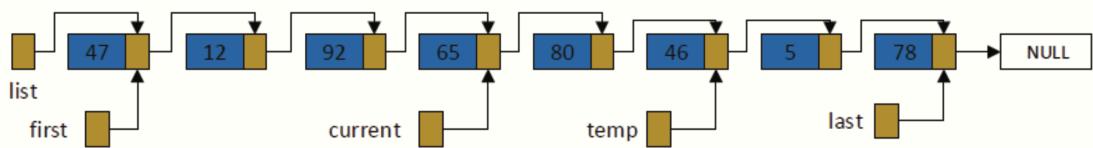
3	50	15	28	1	23	221
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- a) In a draft paper, sort this sequence in ascending order and create its binary tree representation.
- b) From the algorithmic point-of-view, in a linear search how many comparisons are required to find 221?
- c) From the algorithmic point-of-view, using the binary search tree for the sequence above, how many comparisons are required to find 221?
- d) Write down the sequence of vertex labels for an In-Order traversal of the tree.

4. Linked-Lists

Consider the following linked-list.

```
nodeType *list, *first, *current, *last, *temp, *trail, *p, *q;
```



- What are the **info** and **link** values of the node pointed by **temp**.
- If the node with **info** value 5 was properly removed what would be the **link** value of the node pointed by **temp**?

5. What many threads can a process run simultaneously in a single core CPU? And in a Quad Core CPU?

6. In a class definition, what is the default access level?

7. Exceptions

- Consider the following program. What is the output?

```
#include <iostream>
#include <vector>

int main() {
    try {
        std::cout << "Throwing an integer exception...\n";
        throw 42;
        std::cout << "It should be impossible to see this message...\n";
    } catch (int i) {
        std::cout << " the integer exception was caught, with value: " << i << '\n';
    }
}
```

- Is **throw** a suitable clause to catch an exception when running your program?

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Additional references:

- ◆ Simple online coding editor:

<https://code.sololearn.com/#cpp>

- ◆ *C++ Reference:*

<http://www.cplusplus.com/reference/>

- ◆ Computation Efficiency Analysis:

Standard classification in order of decreasing efficiency is:

- Constant: **$O(1)$**
 - running time experiences *no growth* with N
- Logarithmic: **$O(\log N)$**
 - running time experiences *logarithmic growth* with N
- Linear: **$O(N)$**
 - running time experiences *constant growth* with N
- Linearlogarithmic: **$O(N \log N)$**
 - running time experiences *slowly increasing growth* with N
- Quadratic: **$O(N^2)$**
 - running time experiences *increasing growth* with N

- ◆ Sorting algorithm in action:

<https://visualgo.net/bn/sorting>

<https://www.toptal.com/developers/sorting-algorithms/random-initial-order>