Data Structures Lab

(BBM203 Software Practicum I)

Fall 2024 - Introduction

https://web.cs.hacettepe.edu.tr/~bbm201/
https://piazza.com/hacettepe.edu.tr/fall2024/bbm203

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Student Tutors: Emirhan Yalçın, Anar Mammadov

Any Qs: Please ask on Piazza publicly (not via Emails*)

- Only types of questions that require you to share parts of your solutions may be asked in private. No debugging questions, please!
- Contribution to answering your classmates' questions may earn you extra credit.

* Emails end up in spam sometimes, so please stick to the Piazza for communication.

Lab Sessions

Fridays

All Sections at 09:40-11:30

Via MS Team Meetings

Click to join BBM203 on MS Teams

All Sections 🟩

09:40

11:30

Attendance will be taken through assignments.

You must submit and get a non-zero score from at least three assignments to pass attendance!

0 points/empty/gibberish submission will be counted as no submission!

Lab Plan and Program (Tentative)

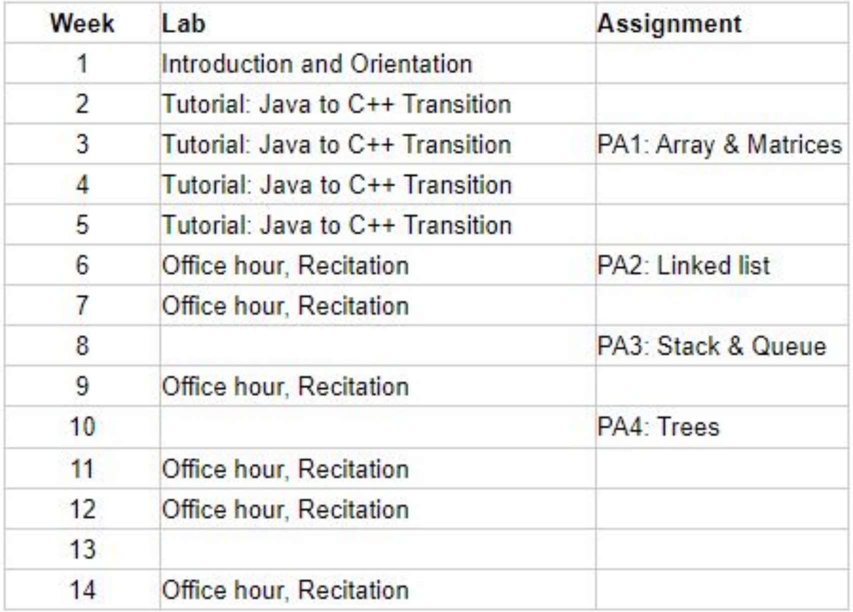
1) Weekly tutorials and practice problems - Four-five weeks of take-home tutorials + solving weekly programming practice problems.

2) Programming Assignments - Implementing data structures in C++ to solve real-world problems.

Grading policy:

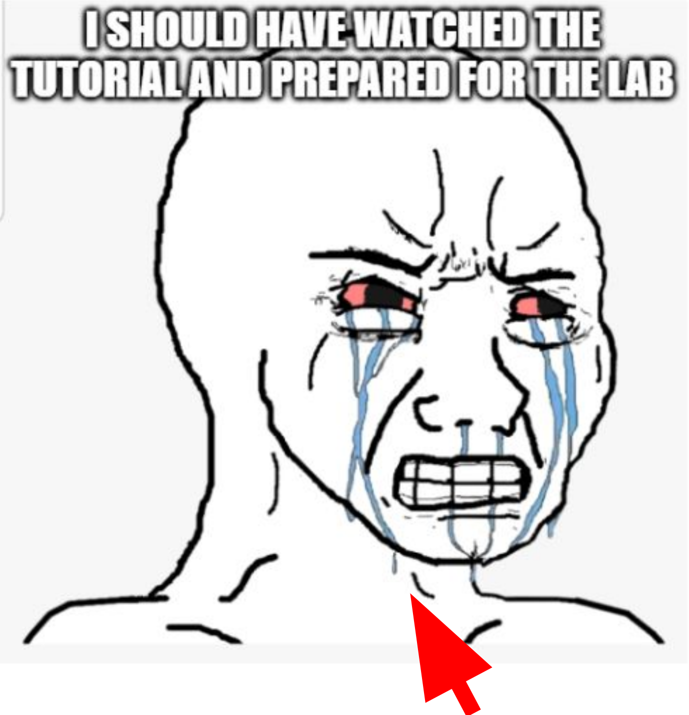
- 4 programming assignments (25% each)

Min 3 non-zero submissions to pass!



Week	Lab	Assignment
1	Introduction and Orientation	
2	Tutorial: Java to C++ Transition	
3	Tutorial: Java to C++ Transition	PA1: Array & Matrices
4	Tutorial: Java to C++ Transition	
5	Tutorial: Java to C++ Transition	
6	Office hour, Recitation	PA2: Linked list
7	Office hour, Recitation	
8		PA3: Stack & Queue
9	Office hour, Recitation	
10		PA4: Trees
11	Office hour, Recitation	
12	Office hour, Recitation	
13		
14	Office hour, Recitation	

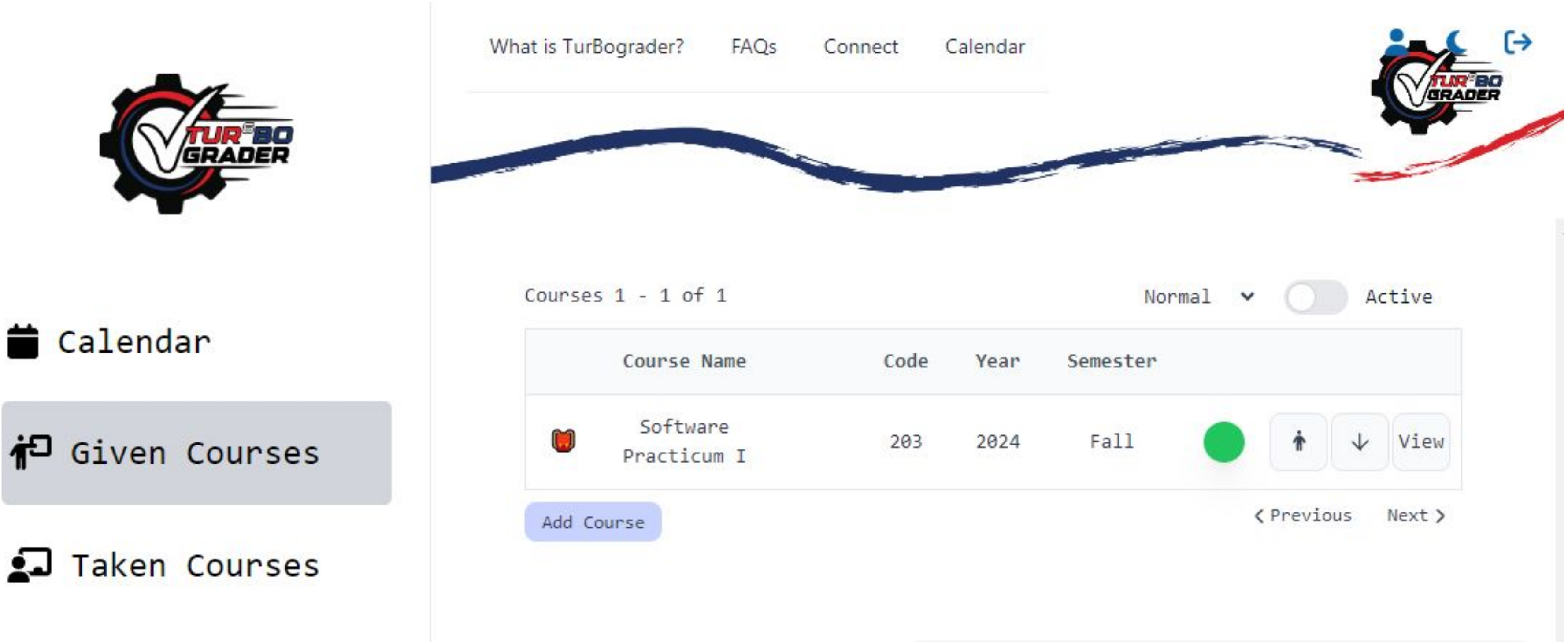
Lab Logistics - How to Prepare?



Don’t be like this guy!

- Watch the tutorial video recording for the week **before the lab**!
- Otherwise, you will not be able to complete the exercises.

Grading Platform https://test-grader.cs.hacettepe.edu.tr/



What is TurBograder? FAQs Connect Calendar

Calendar

Given Courses

Taken Courses

Courses 1 - 1 of 1

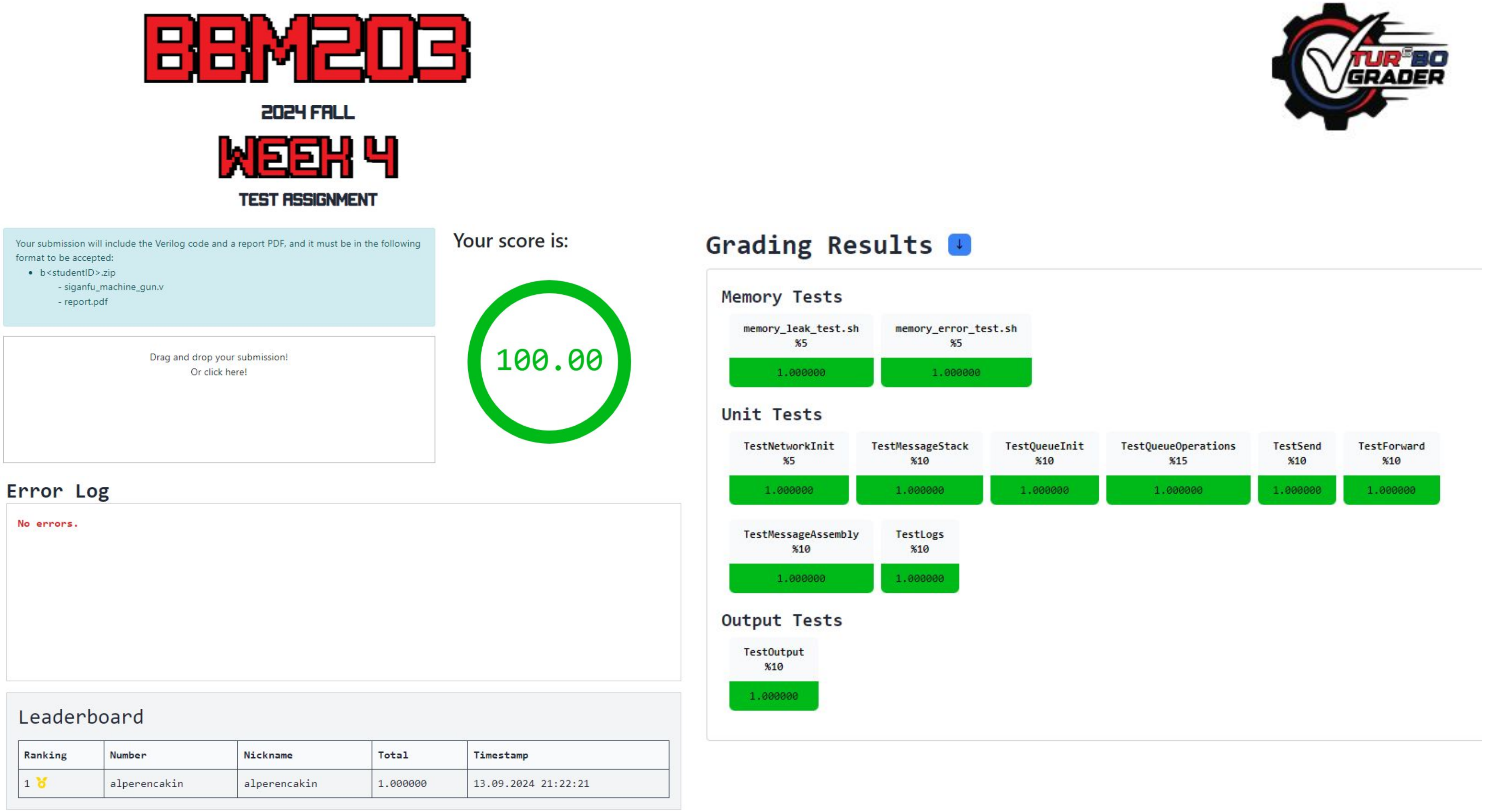
Normal Active

	Course Name	Code	Year	Semester		
	Software Practicum I	203	2024	Fall	●	View

Add Course

< Previous Next >

* You will be able to test your code before submission.



BBM203

2024 FALL

WEEK 4

TEST ASSIGNMENT

TURBO GRADER

Your submission will include the Verilog code and a report PDF, and it must be in the following format to be accepted:

- b<studentID>.zip
  - siganfu_machine_gun.v
  - report.pdf

Drag and drop your submission!
Or click here!

Your score is:

100.00

Grading Results ↓

Memory Tests

memory_leak_test.sh %5	memory_error_test.sh %5
1.000000	1.000000

Unit Tests

TestNetworkInit %5	TestMessageStack %10	TestQueueInit %10	TestQueueOperations %15	TestSend %10	TestForward %10
1.000000	1.000000	1.000000	1.000000	1.000000	1.000000

TestMessageAssembly %10	TestLogs %10
1.000000	1.000000

Output Tests

TestOutput %10
1.000000

Error Log

```
No errors.
```

Leaderboard

Ranking	Number	Nickname	Total	Timestamp
1 🥇	alperencakin	alperencakin	1.000000	13.09.2024 21:22:21

Involvement on Piazza

(or any other kind of helpful contribution to this course and to answering your classmates’ publicly asked questions)

May earn you extra credit!

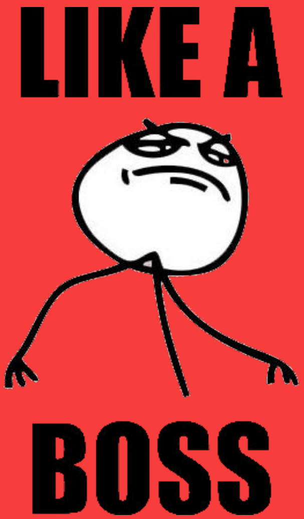
Lab Involvement

We prefer our labs to be fun.

- **Solve the weekly practice problems correctly as fast as you can, and prove your superior coding skills.**

Objectives of this course:

- Demolish the given programming problems
- Improve coding skills like a boss.
- Have fun



> “Learning anything is **10% material** and **90% being excited** to learn.”
> *- Daniel Bourke*

Participate in challenges to earn fun awards!

Week 1: Java to C++ Transition Tutorial

Topics

- ➔ Introduction
- ➔ Build Processes

Introduction

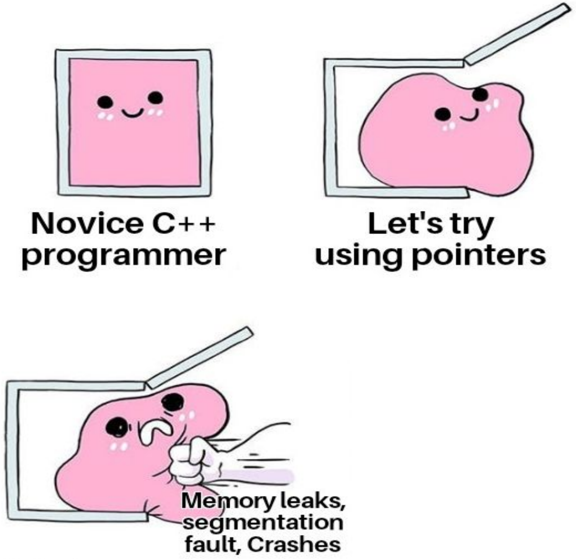
C++ is a fast, powerful, and flexible programming language.

But also expect:

```
Exception in thread "main" java.lang.ArrayIndexOutOfBoundsException: 4
        at OOB.main(OOB.java:5)

Segmentation Fault (core dumped)
```

Me think 'why waste time say lot word when few word do trick?'



Reading Materials - Books

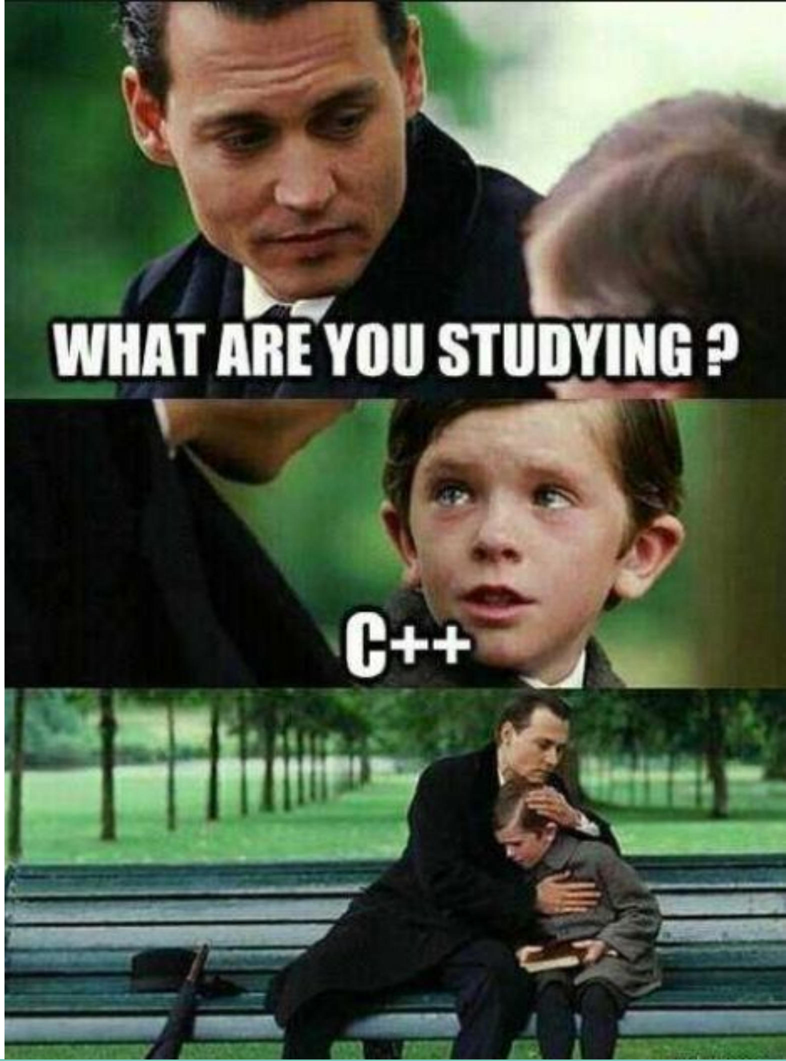
- **The C++ Programming Language,** by Bjarne Stroustrup (3rd Edition, Addison-Wesley, 1997). Bjarne Stroustrup is the creator of the C++ programming language, and this book is a good reference that he has written, but not a book you would sit down and read to learn the language.

- **C++ for Java Programmers,** by Timothy Budd (Addison-Wesley, 1999)

- **C++ Primer,** by Stanley B. Lippman (2nd Edition, Addison-Wesley, Reading, MA, 1991). This book is simpler to read than the Stroustrup book, but is not as good a reference manual.

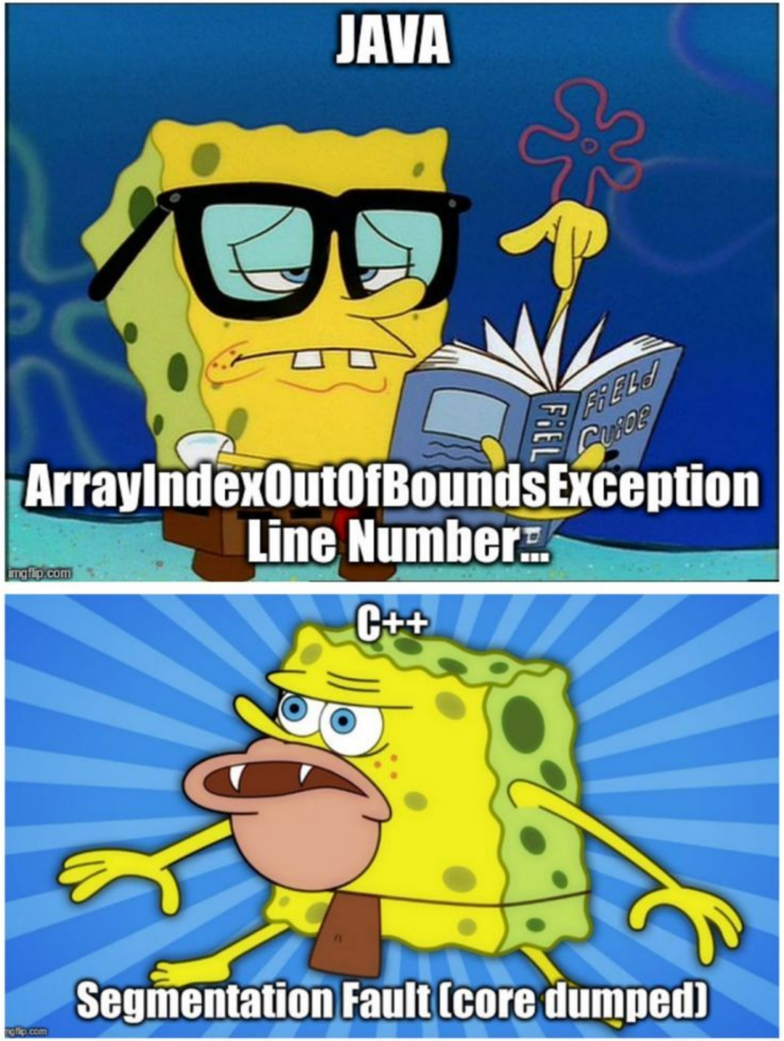
- **Effective C++: 50 Specific Ways to Improve Your Programs and Designs,** by Scott Myers (Addison-Wesley, Reading, MA, 1992). A book that is not geared for beginners but that is highly recommended once you have a grounding in the language. It covers some of the fine points of good C++ coding and design and avoiding pitfalls particular to the language.

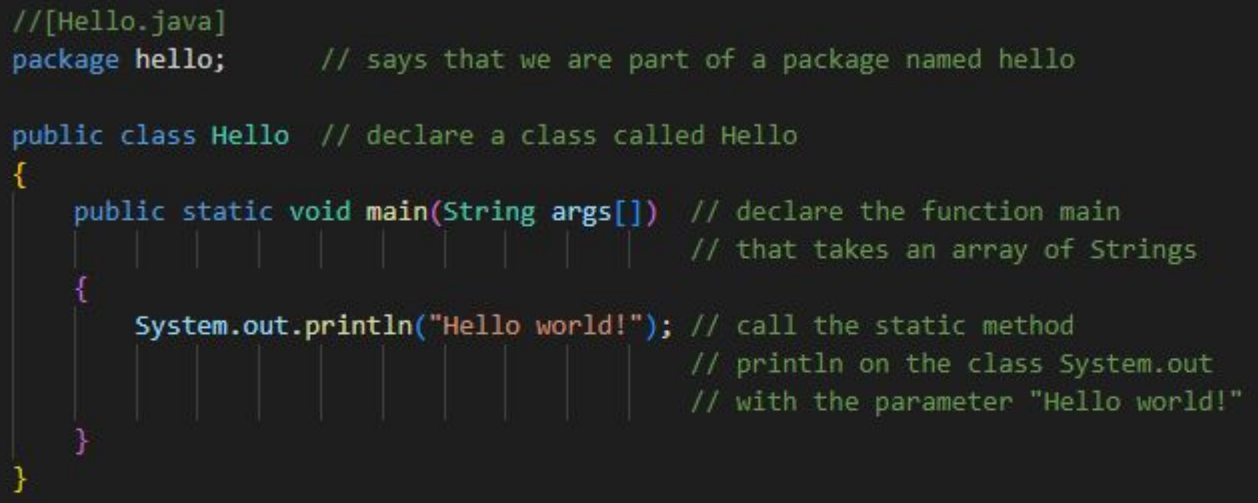
- **C++ Primer Plus: Teach Yourself Object-Oriented Programming,** by Stephen Prata (2nd Edition, Waite Group Press, Corte Madera, CA, 1995).



Reading Materials - Online

- http://cs.brown.edu/courses/cs149/handouts/javatoc.shtml (course instructors’ primary suggestion)
- http://pages.cs.wisc.edu/~hasti/cs368/CppTutorial/
- https://web.stanford.edu/class/cs106b-8/java_to_cpp#pointers

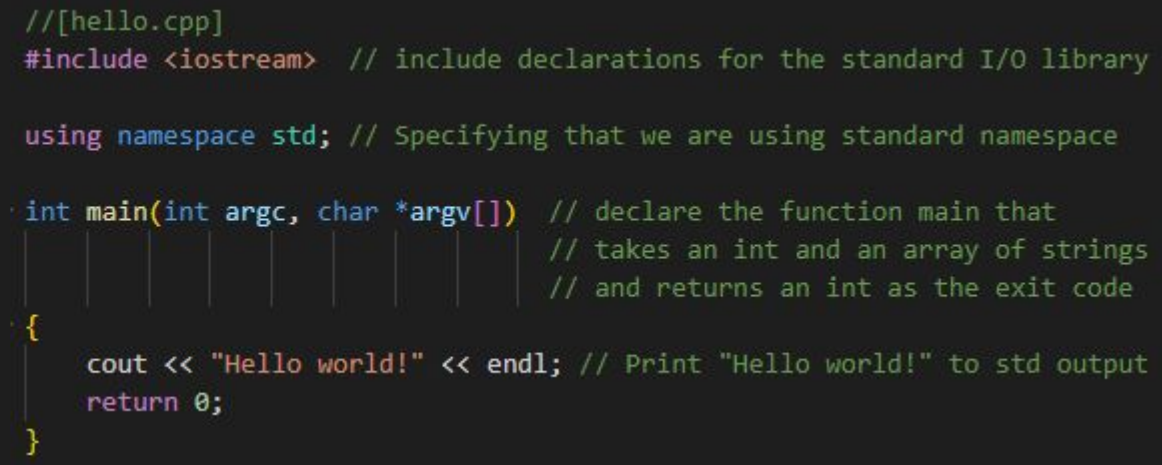

JAVA
FiELd Guide
ArrayIndexOutOfBoundsException
Line Number...
imgflip.com
C++
Segmentation Fault (core dumped)
imgflip.com



```java
//[Hello.java]
package hello;      // says that we are part of a package named hello

public class Hello  // declare a class called Hello
{
    public static void main(String args[])  // declare the function main
                                            // that takes an array of Strings
    {
        System.out.println("Hello world!"); // call the static method
                                            // println on the class System.out
                                            // with the parameter "Hello world!"
    }
}
```

Java



```cpp
//[hello.cpp]
#include <iostream>  // include declarations for the standard I/O library

using namespace std; // Specifying that we are using standard namespace

int main(int argc, char *argv[])  // declare the function main that
                                  // takes an int and an array of strings
                                  // and returns an int as the exit code
{
    cout << "Hello world!" << endl; // Print "Hello world!" to std output
    return 0;
}
```

C++

Some Similarities Between C++ and Java

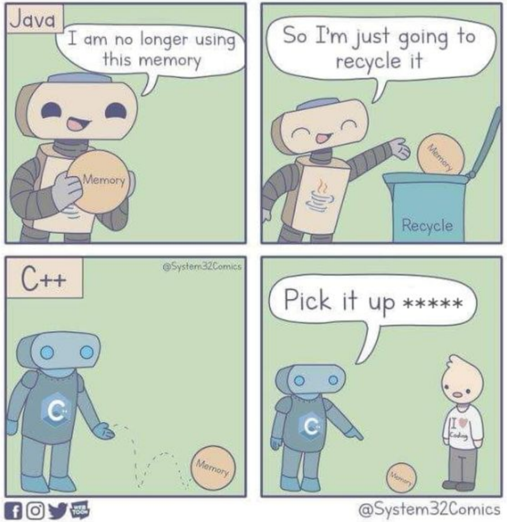
- Simple (primitive) types: int, double, char
- Control Structures if-else, switch, while, for
- Arithmetic expressions
- Both have a string type: C++ string, Java String.
- Arrays
- Both have classes.
- Both have a "main" function.

Some Differences Between C++ and Java

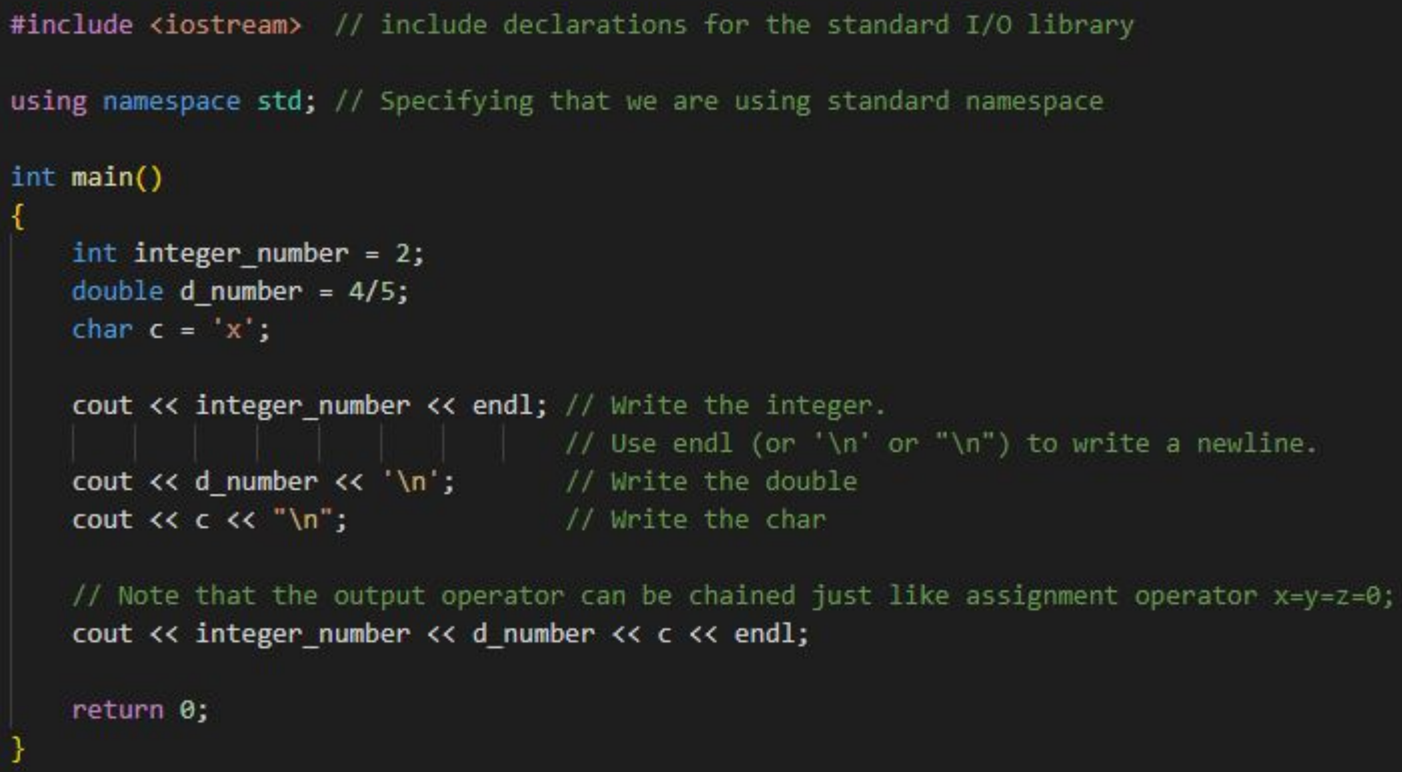
- Java has automatic garbage collection. C++ does not.
- C++ has operator overloading, Java does not.
- C++ says "function" Java says "method".
- Java program includes a package declaration, whereas C++ has no analogous concept of packages.
- In Java, the main method does not return a value, whereas in C++ it returns an integer.
- Function ‘main’ is not required to have any parameters. However, if you intend your program to be run with command-line arguments, you should declare the ‘main’ function as follows:

```
int main(int argc, char *argv[])
```

* argc (Argument Count) * argv (Argument Vector)



An Example C++ Program



```cpp
#include <iostream>  // include declarations for the standard I/O library

using namespace std; // Specifying that we are using standard namespace

int main()
{
    int integer_number = 2;
    double d_number = 4/5;
    char c = 'x';

    cout << integer_number << endl; // Write the integer.
                                    // Use endl (or '\n' or "\n") to write a newline.
    cout << d_number << '\n';       // Write the double
    cout << c << "\n";              // Write the char

    // Note that the output operator can be chained just like assignment operator x=y=z=0;
    cout << integer_number << d_number << c << endl;

    return 0;
}
```

Build Processes

Compiling and Running a C++ Program

- C++ source code is saved in a file with one of the following extensions:

```
    ".cpp", ".CPP", ".cxx", ".C", ".cp", ".c++", or ".cc"
```

- To compile the C++ program named `foo.cpp` and create an executable file named `a.out`, type:

```
    g++ foo.cpp
```

- Alternatively, to create an executable file named foo for the C++ program in `foo.cpp`, type:

```
    g++ foo.cpp –o foo
```

- To run your program, just type the name of the executable in the following way:

```
    ./executable_file_name
```

- For example, to run the executable named `foo`, just type `./foo` at the prompt.
- If your program spans more than one file, you can create an executable by compiling all files at once;

```
    g++ main.cpp foo.cpp –o my_program
```

Working in Linux Environment!

Mandatory for this course!

If you do not use Linux, here are some suggestions what to do for this course:

- Windows Subsystem for Linux (WSL) - a feature of Windows that allows developers to run a Linux environment without the need for a separate virtual machine or dual booting: https://learn.microsoft.com/en-us/windows/wsl/install

- Working on dev.cs.hacettepe.edu.tr - use an SSH client to connect to dev with your cs account. E.g., PuTTy (on Windows), Terminal (pre-installed on macOS), etc.

Practice Exercise: Test Yourself Now

Write a C++ program that uses a loop to sum the numbers from 1 to n (some positive integer n) and prints the result in the following format:

```
The sum is: X
```

Where X is the result.

Hint: Use variable declarations, and a **for** or **while** loop with the same syntax as in Java.

You must use a Linux environment to run your code. You can connect to dev and do the exercise there, or use an online C++ compiler for the first week only.

More Useful Resources For Practice:

- https://www.w3resource.com/cpp-exercises/basic/index.php
- https://www.w3schools.com/cpp/cpp_exercises.asp
- https://www.hackerrank.com/domains/cpp
- https://algoleague.com/

Questions?