COMP 322 Lecture 3 - C++ Basics

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Today's Outline

• Functions

Functions

- Same as in C and java
- Should be declared before being used
- Declaration should include the name, return type and arguments type
 - Also called prototype or signature of a function
- If the function doesn't return a value, its return type should be declared void
- Functions can be recursive

Functions Overloading

```
What's the output of the following code? (answer is 4 because of implicit conversion from double to int)

Floridate - destruction to the state of t
```

```
Multiple functions may have the same name but different number of arguments
Int max(int i, int j);
Int max(int i, int j, int k);
Multiple functions may have the same name and same number of arguments but different types
Int max(int i, int j);
Int max(int i, int j);
Int max(int i, int j);

Changing only the return type is not enough

Provided in the max(int i, int j);
I gloat max(int i, int j);
I
```

Function overloading is a feature in C++ that allows you to define multiple functions with the same name but different parameter lists. When you call an overloaded function, the compiler determines which function to call based on the provided parameter types or number.

```
#include <iostream>
// Function overloading example
int add(int a, int b) {
    return a + b;
}

// Overloaded function
double add(double a, double b) {
    return a + b;
}

int main() {
    int sum_int = add(3, 4); // Calls the first add function
    double sum_double = add(3.5, 4.2); // Calls the second add function

std::cout << "Sum of integers: " << sum_int << std::endl;
    std::cout << "Sum of doubles: " << sum_double << std::endl;
    return 0;
}</pre>
```

In this example, we define two functions named add, each taking different parameter types (one accepts integers, the other accepts double-precision floating-point numbers). When we call the add function in the main function, the compiler determines which version of the add function to call based on the provided parameter types.

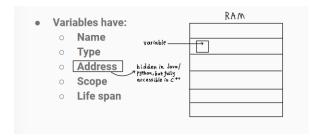
Thus, even though the function names are the same, the compiler can distinguish between them due to different parameter lists and selects the appropriate function to call. This is the essence of function overloading in C++.

Small Quiz

```
Rewrite the absolute value function from previous example using the ternary operator?

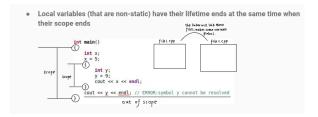
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```

More about variables ...



Scope and lifetime of a variable

- When declaring variables we specify the name and type, but we should also keep in mind their scope and lifetime
- Scope of a variable
 - A section of the program where the variable is visible (accessible)
- Lifetime of a variable
 - The time span where the state of a variable is valid (meaning that the variable has a valid memory)
- Local variables (that are non-static) have their lifetime ends at the same time when their scope ends
 - Local variables may also be called automatic variables because they are automatically destroyed at the end of their scope
 - Scope of local variables is comprised from the moment they are declared until the end of the block or function where they reside (in other terms, until the execution hits a closing bracket })

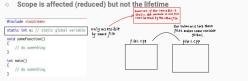


- Dynamically allocated variables have their lifetime starts when we explicitly
 allocate them (operator new, or malloc) and ends when we explicitly deallocate
 them (operator delete, or free)
 - Their lifetime is not decided by their scope (they may live even when they are out of scope)
 - We will get back to this in later chapters
 - O The sample code provided has a memory leak
 - and assuming that someFunction() was being called before the cout statement.



Scope and lifetime of a variable (static)

Global static variables have their lifetime ends when the execution of the program ends but their scope is limited to the file in which they are declared (file scope)
 Scope is affected (reduced) but not the lifetime



 Local static variables have their lifetime ends when the execution of the program ends but their scope is limited to the function in which they are declared (function scope)

