C++ Track

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Roadmap

- Training Period
  - Weekly Engagement: 10-12 hours
  - Short breaks will be provided
- Mix of Theory/Concept and Practice
- Resources used will be referred at the end of each session.

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Integrated Development Environments

- Dev C++
- Code Blocks
- Visual Studio Code

- You can use which ever suits you.

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Compliance Required

- In case of doubt, raise hand & we will discuss when I point out.

- Fill your details on following google form:

https://social.anupinder.com/cppsurvey

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Who am I?

I am a software engineer turned university professor and now a technical trainer.

https://social.anupinder.com/linkedin

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Integrated Development Environments

- Dev C++
- Visual Studio Code
- replit.com (for collaboration)

You can use which ever suits you.

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So lets get started with our program

Write a program which prints your NAME and Registration number on console.

Ex:

NAME: Anupinder Singh

Reg. No: 11002200

Hint* Use cout statements

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Structure of a Simple C++ Program

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Program Structure with Class

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C++ Program Structure

```
// my first program in C++
#include <iostream>

int main()
{
  std::cout << "Hello World!";
}
```

- Simple Comment
- (#)Directive instruct Preprocessor
- Special function to start program execution
- Code blocks, scope of identifiers
- Display output on the console
- Semicolon to separate the instruction statements
- Indentation doesn't matter

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You should not ignore Comments

// line comment

/* block comment */

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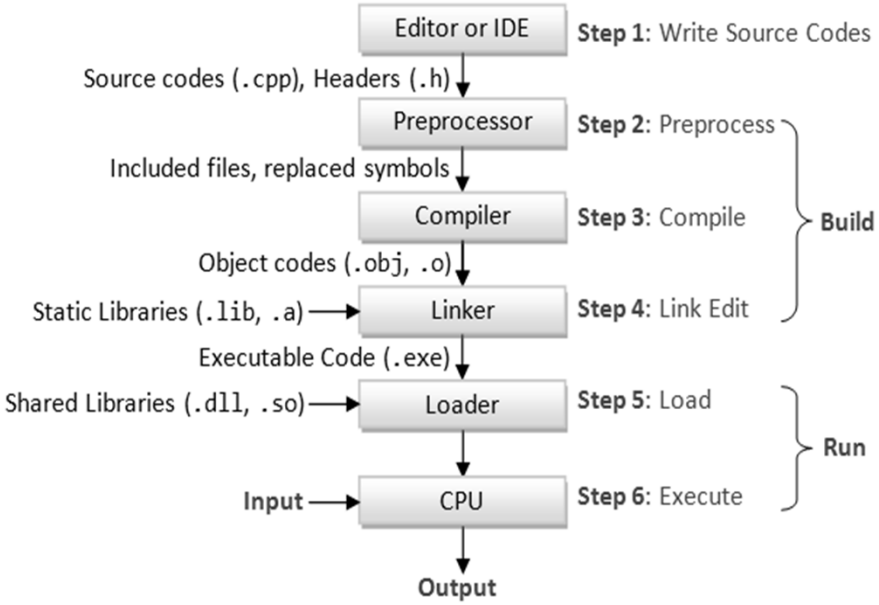
Compiler to Execution Flow



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Compilation…

- Code is compiled to native machine code(x_86,x_64)
- Linker:
  - Linking is process of collecting and maintaining piece of code and data into a single file.
  - Static Linking: Generate fully independent executable file
  - Dynamic Linking: Generate a file using a shared library already available on the computer machine.
- Loader:
  - Loader is the program of the operating system which loads the executable from the disk into the primary memory(RAM) for execution.
  - It allocates the memory space to the executable module in main memory and then transfers control to the beginning instruction of the program .

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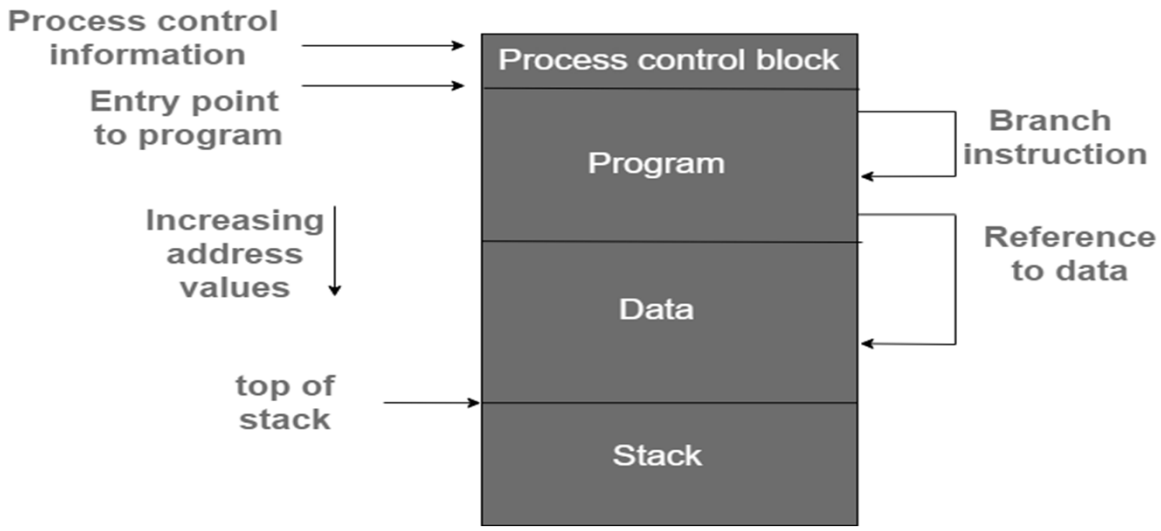
Let's visualize Loader in terms of OS Process



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Keyword & Identifiers

- Keywords implements C++ specific language features and are explicitly reserved, which can not be used by user e.g. double, float, int, switch etc.
- Identifier is basically referred to as names of:
  - Variables
  - Functions
  - Arrays
  - Classes or any other user defined token in a program.

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Common rules for user-defined Indentifiers

- Only alphabetic characters, digits and underscores are allowed.
- The name cannot start with a digit.
- Uppercase and lowercase letters are treated distinct.
- A declared keyword cannot be used as a variable name.
- ANSI C++ has No limit on the character length of the variable name, but may vary among different Operating systems.

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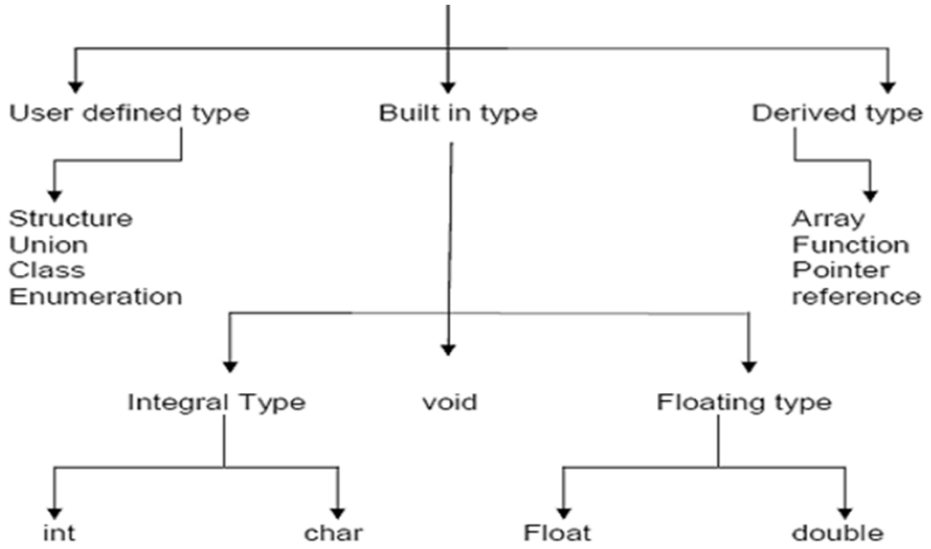
C++ Datatypes



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Variable Declaration and Initialization

```
int a;
float mynumber;
int a, b, c;
int a;
int b;
int c;
```

C like initialization

```
int x = 0;
```

Constructor Initialization

```
int x (0);
```

Uniform initialization

```
int x {0};
```

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Variable Naming conventions

- Use CamelCase for all names.
- Start types (such as classes, structs, and typedefs) with a capital letter, other names (functions, variables) with a lowercase letter.
- You may use an all-lowercase name with underscores if your class closely resembles an external construct (e.g., a standard library construct) named that way.
- C++ interfaces are named with a Interface suffix, and abstract base classes with an Abstract prefix.
- Member variables are named with a trailing underscore.
- Accessors for a variable foo_ are named foo() and setFoo().
- Global variables are named with a g_ prefix.
- Static class variables are named with a s_ prefix.
- Global constants are often named with a c_ prefix.

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Why boundary value conditions are important w.r.t. selection of identifier datatype?

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C++ Datatype Size & Range

Type	Definition	Control Character	Limits
int	Integer		-2147483648 to 2147483647
short	Short Integer		-32768 to 32767
long	Long Integer	l or L	-2147483648 to 2147483647
float	Floating Decimal Number	f or F	1.17549e-038 to 3.40282e+038
double	Double Decimal Number		2.22507e-308 to 1.79769e+308
long double	Long Decimal Number		2.22507e-308 to 1.79769e+308
char	Character		-128 to 127
unsigned int	Unsigned Integer		0 to 4294967295
unsigned short	Unsigned Short Integer		0 to 65535
unsigned long	Unsigned Long Integer		0 to 4294967295
unsigned char	Unsigned Character		0 to 255
bool	True or False		True = 1 and False = 0

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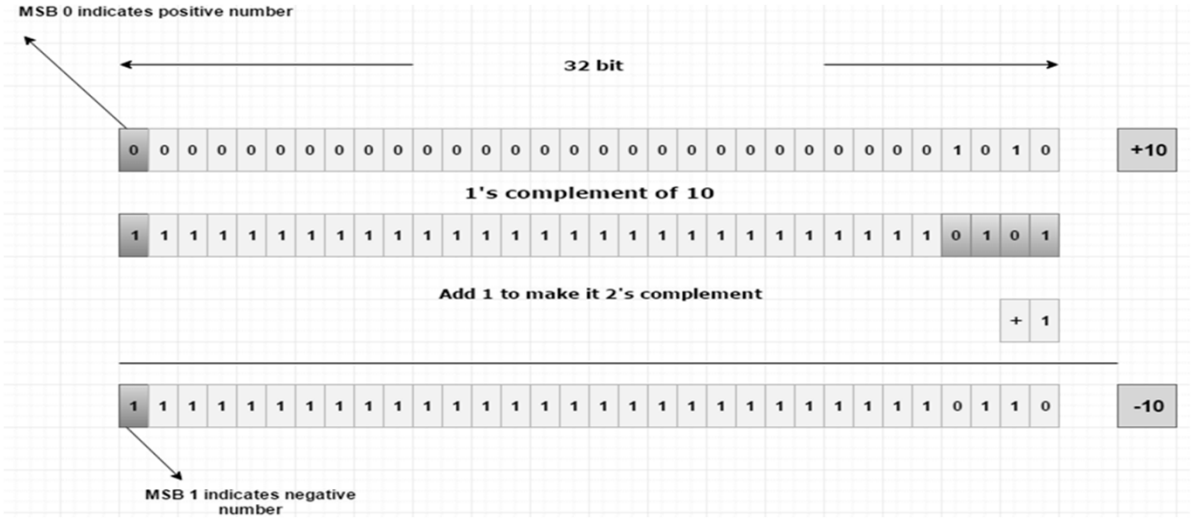
Singned Integer/long memory representation



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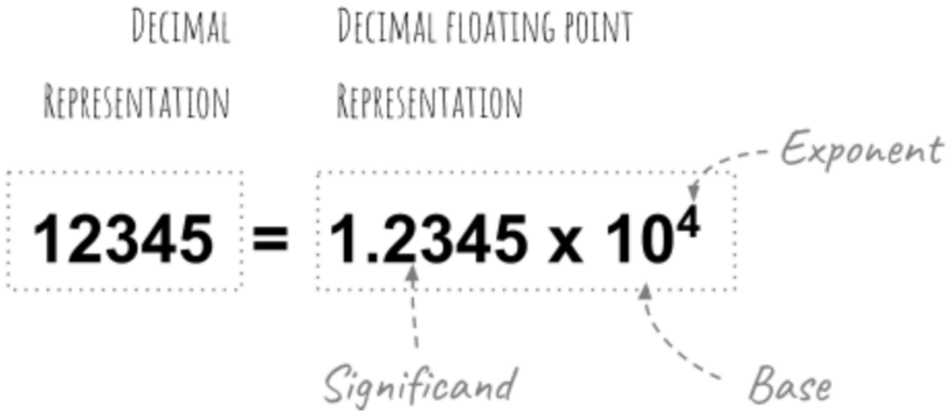
How memory representation differ for float/double?



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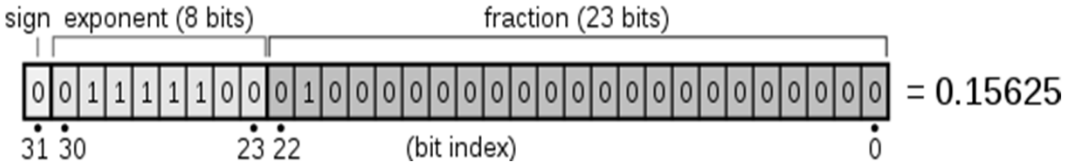
Single-precision floating-point format(IEEE-754)



https://en.wikipedia.org/wiki/Single-precision_floating-point_format

https://en.wikipedia.org/wiki/IEEE_754

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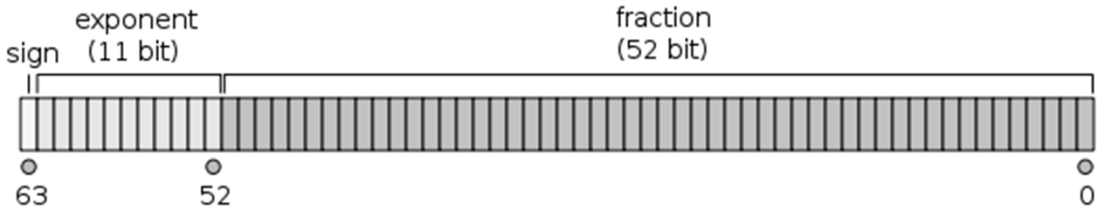
Double-precision floating-point (IEEE-754-2008)



https://en.wikipedia.org/wiki/Double-precision_floating-point_format

https://en.wikipedia.org/wiki/IEEE_754-2008

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Lets Code

Write a program where you will define each variable type and print its memory allocation.

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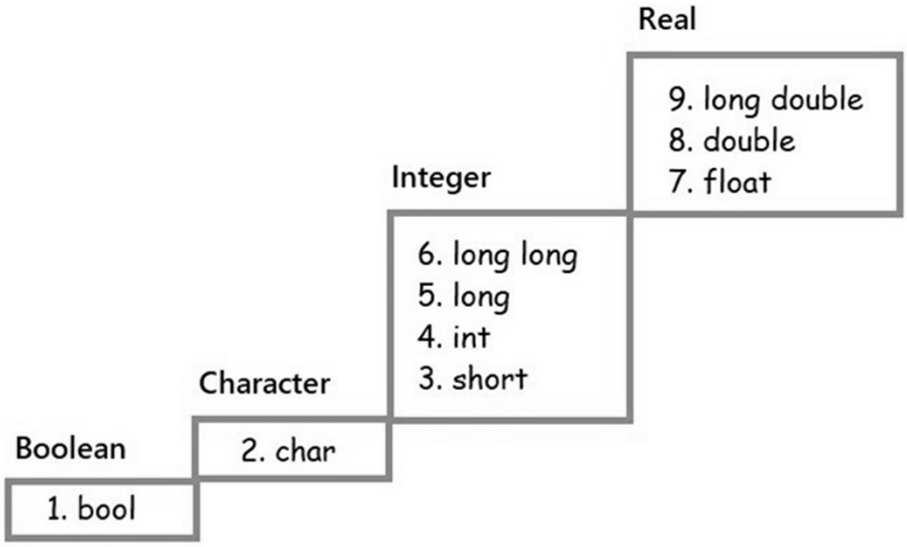
Type Conversions



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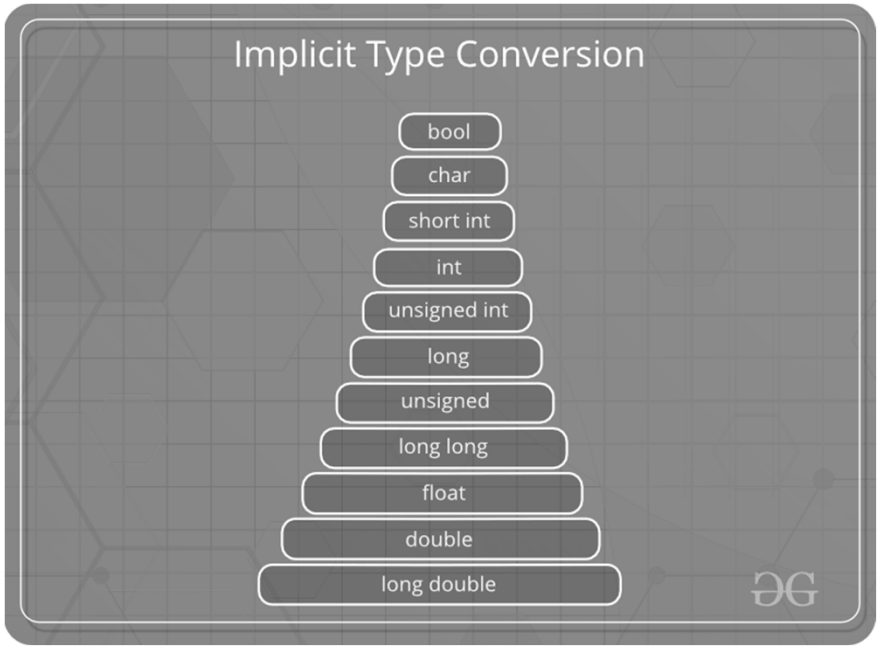

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Basic Input & Output

- cin: Input
- cout: output

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Lets code

Write a program to accept roll number, cgpa and gender of a student.

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Lets code

Write a program that will ask for a temperature in Fahrenheit and display in Celsius.

°C = [(°F-32)×5]/9

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Write a program to add an 8% sales tax to a given amount.

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Cascading I/O operations

- Multiple use of << or >> in a cout/cin statement

cout<<“some text ”<<variableName<<“ some more text”;

cin>>variableName1>>variablename2;

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Constants

- Constants are expressions with a fixed value
- C++ Constants
  - Literals: value explicitly provided in code like 56
  - Typed Constant Expressions: value is assigned to typed variable like const double pi = 3.14159;
  - Preprocessor definitions

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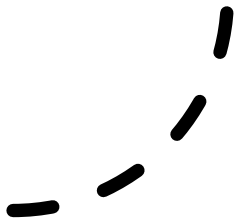
Preprocessor definitions

```
#include <iostream>
using namespace std;
#define PI 3.14159
#define NEWLINE '\n'
int main ()
{
      double r=5.0;
      double circle;
      circle = 2 * PI * r;
      cout << circle;
      cout << NEWLINE;
}
```



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Formatting output

Manipulator	Scope	Use
endl	One time	New line
hex	Permanent	Formats output as hexadecimal
oct	Permanent	Formats output as octal
dec	Permanent	Formats output as decimal
fixed	Permanent	Sets floating-point decimals
showpoint	Permanent	Shows decimal in floating-point values
setw(...)	One time	Sets width of output fields
setprecision (...)	Permanent	Specifies number of decimals for floating point
setfill(...)	Permanent	Specifies fill character

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