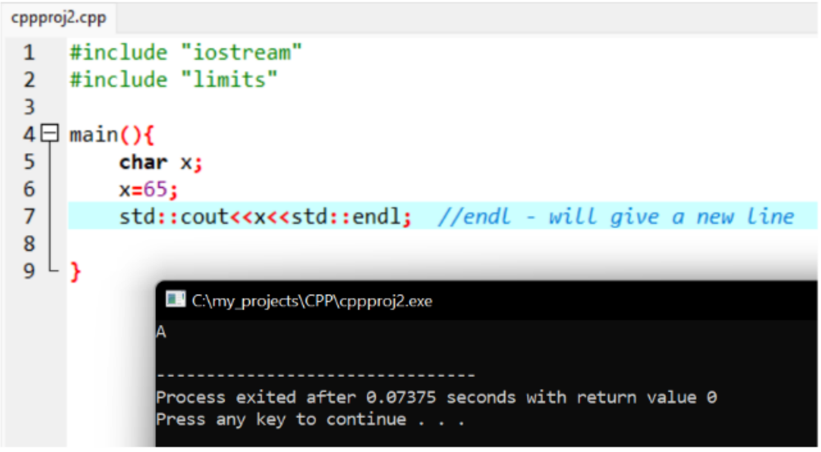
CPP Summary Session 4 (11-10-22)

- **Typecasting** is a method in the C language of converting one data type to another.
- If I create a *char data type* and store an integer value in it, then while reading this value, the CPU will read it as “char” because we have defined its data type as a character, So in output, you will get the character “A” instead of 65 (Binary notation of A and 65 is same)



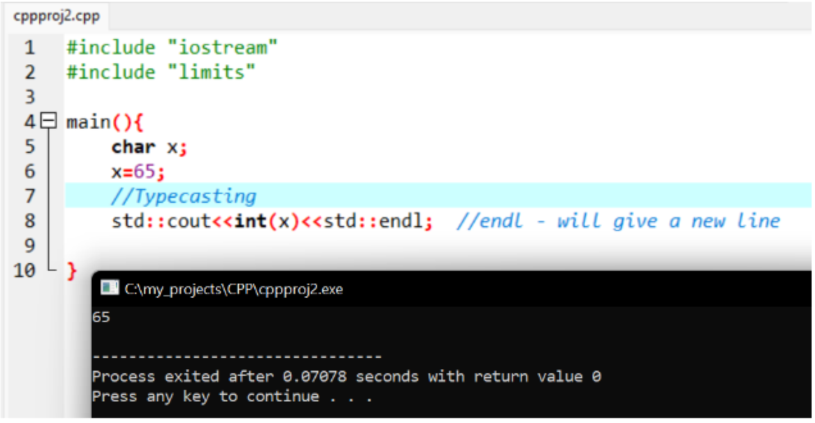
cppproj2.cpp

```
#include "iostream"
#include "limits"

main(){
    char x;
    x=65;
    std::cout<<x<<std::endl;  //endl - will give a new line

}
```

C:\my_projects\CPP\cppproj2.exe

```
A

--------------------------------
Process exited after 0.07375 seconds with return value 0
Press any key to continue . . .
```

Now, If I want to do **Typecasting** So that our CPU will read data as Integer instead of character, then we can do it something like -



cppproj2.cpp

```
#include "iostream"
#include "limits"

main(){
    char x;
    x=65;
    //Typecasting
    std::cout<<int(x)<<std::endl;  //endl - will give a new line

}
```

C:\my_projects\CPP\cppproj2.exe

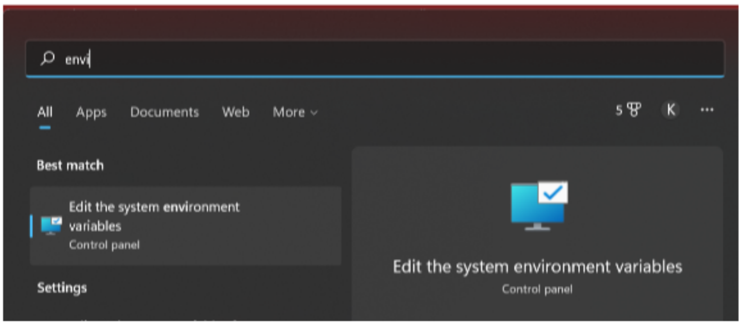
```
65

--------------------------------
Process exited after 0.07078 seconds with return value 0
Press any key to continue . . .
```

- **std::endl** - will give a new line in the console
- To do multi-line comment in DevCPP use - /*   **<your comments>**   */

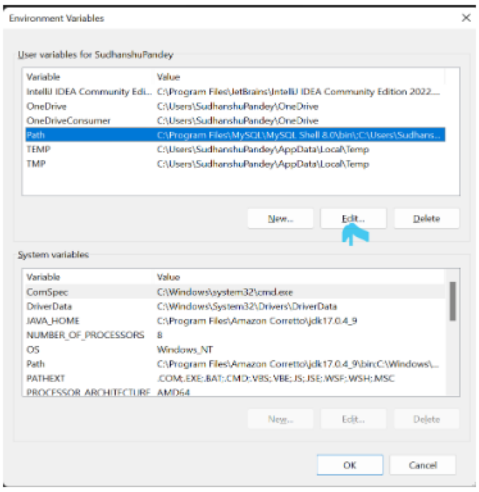
- **Compiler** - The compiler acts like a translator and converts our High-level language to low-level language/Assembly language/ Machine code that our Processors understand.
- **High-level languages**- A high-level language is any programming language that enables the development of a program in a much more user-friendly programming, java CPP, python are all high-level languages(although we sometimes count CPP as mid-level language)
- **Low-level languages** - Low-level languages can convert to machine code without a compiler or interpreter, they are written directly in a way which machine understands, it requires memorizing or looking up numerical codes for every instruction, and is extremely difficult to modify
- Mingw is the compiler we are using in DevC++
- **Compilation time** - time consumed to convert the CPP code into machine code
- **Run time** - Time consumed in the execution of machine code in the CPU
- In DevCPP when we compile our code, then behind the scene it runs an application named **"C++"** Which is commonly stored in this location of your system **C:\Program Files (x86)\Dev-Cpp\MinGW64\bin**

  Now, if we want to compile our code from the command line, we will first have to set the location of our "C++" application in the environment variable.

  For this Go to windows and search for "*edit environment variable*"


envi
All
Apps
Documents
Web
More
5
K
Best match
Edit the system environment variables
Control panel
Settings
Edit the system environment variables
Control panel

Now Select "**PATH**" and then click on "**Edit**"


Environment Variables

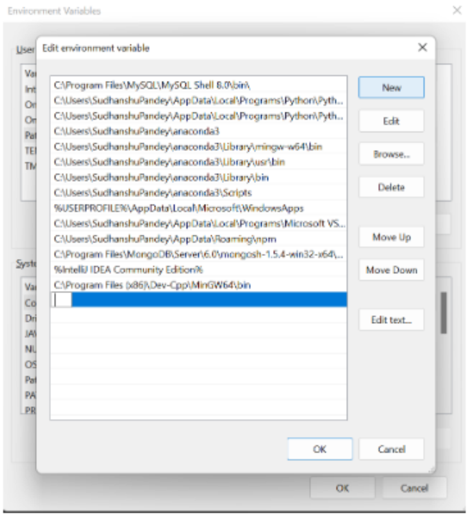
User variables for SudhanshuPandey

Variable	Value
IntelliJ IDEA Community Edi...	C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022...
OneDrive	C:\Users\SudhanshuPandey\OneDrive
OneDriveConsumer	C:\Users\SudhanshuPandey\OneDrive
Path	C:\Program Files\MySQL\MySQL Shell 8.0\bin\;C:\Users\Sudhans...
TEMP	C:\Users\SudhanshuPandey\AppData\Local\Temp
TMP	C:\Users\SudhanshuPandey\AppData\Local\Temp

System variables

Variable	Value
ComSpec	C:\Windows\system32\cmd.exe
DriverData	C:\Windows\System32\Drivers\DriverData
JAVA_HOME	C:\Program Files\Amazon Corretto\jdk17.0.4_9
NUMBER_OF_PROCESSORS	8
OS	Windows_NT
Path	C:\Program Files\Amazon Corretto\jdk17.0.4_9\bin;C:\Windows\...
PATHEXT	.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE	AMD64

Now on the right side click on “**New**” and then paste the location you have copied, and press **OK.**



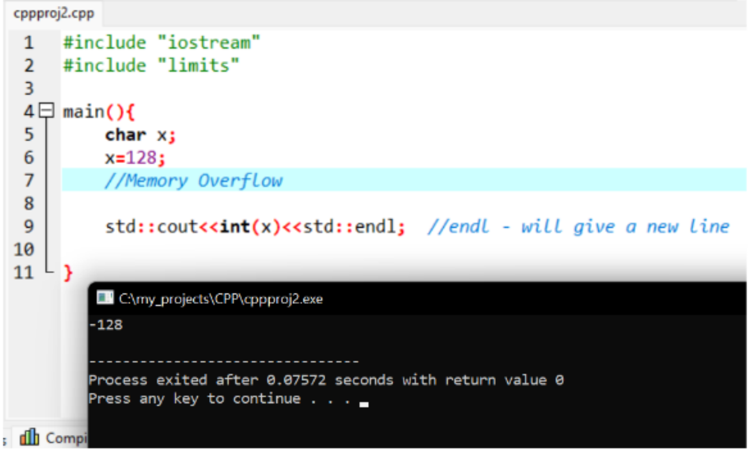
```
C:\Program Files\MySQL\MySQL Shell 8.0\bin\
C:\Users\SudhanshuPandey\AppData\Local\Programs\Python\Pyth...
C:\Users\SudhanshuPandey\AppData\Local\Programs\Python\Pyth...
C:\Users\SudhanshuPandey\anaconda3
C:\Users\SudhanshuPandey\anaconda3\Library\mingw-w64\bin
C:\Users\SudhanshuPandey\anaconda3\Library\usr\bin
C:\Users\SudhanshuPandey\anaconda3\Library\bin
C:\Users\SudhanshuPandey\anaconda3\Scripts
%USERPROFILE%\AppData\Local\Microsoft\WindowsApps
C:\Users\SudhanshuPandey\AppData\Local\Programs\Microsoft VS...
C:\Users\SudhanshuPandey\AppData\Roaming\npm
C:\Program Files\MongoDB\Server\6.0\mongosh-1.5.4-win32-x64\...
%IntelliJ IDEA Community Edition%
C:\Program Files (x86)\Dev-Cpp\MinGW64\bin
```

- When the environmental variable is successfully set, Open a new command prompt heading toward your CPP code directory, and then we can compile our CPP code with the help of the command -

  #c++ cppproj.cpp -o myapp.exe - ***It will create an executable file named “myapp.exe” now we can directly run this executable file as “#myapp.exe”***

- **#c++ cppproj.cpp -S** - It will convert our CPP code to assembly language (you can find this file with extension **.s**)
- **Char** is a **signed** data type that reserves 1 byte of space in RAM to store the *sign* of a variable, When we store a variable of datatype *char* in RAM then it reserves the first bit from left(***MSB - Most Significant bit***) for the sign of variable, where 0 means +ve and 1 means -ve.

- **Memory Overflow** - When our Program allocates the data in the MSB bit also, Then it is called *memory overflow*, As we know the first bit from the left is reserved for storing the “Sign” of the variable, Now when this bit gets overwritten then this is called memory overflow. For example, the range of the *char* datatype is -128 to 127, now if I try to store “128”, then it will affect the MSB bit and then a wrong output will be returned. Check the below code.



```
#include "iostream"
#include "limits"

main(){
    char x;
    x=128;
    //Memory Overflow

    std::cout<<int(x)<<std::endl;  //endl - will give a new line

}
```

```
C:\my_projects\CPP\cppproj2.exe
-128

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Process exited after 0.07572 seconds with return value 0
Press any key to continue . . .
```
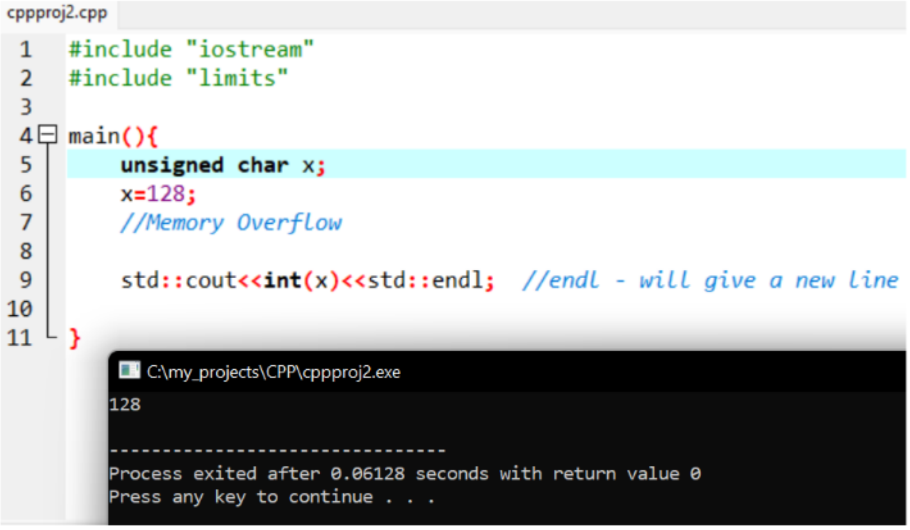

- C++ Is also called a **mid-level language**, Because it provides us the facility to write code in human-readable form(behaving like high-level language) as well as in C++ we can go deep and change the way it is interacting with real devices like RAM and CPU, So it behaves like low-level language too, hence we call it as mid-level language
- CPP provides us a way that if we wanted to store a number in *char* data type, And we as the developer know that it will be always positive (like salary, dates) then we can *unreserve* that first bit from storing the “Sign” of variable, It will give us more space and so now we can store values ranging 0 to 255 in the variable.



```
#include "iostream"
#include "limits"

main(){
    unsigned char x;
    x=128;
    //Memory Overflow

    std::cout<<int(x)<<std::endl;  //endl - will give a new line

}
```

```
C:\my_projects\CPP\cppproj2.exe
128

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Process exited after 0.06128 seconds with return value 0
Press any key to continue . . .
```