What is Pointer?

In this lesson, you will be introduced to the most powerful feature of C++ programming known as pointers.

We'll cover the following

Introduction

Suppose your friend asks for a good source to study data structures. You will find some good sources and send a hyperlink to them; right?

Since downloading all the content from the web pages and then sending them in an email requires a lot of memory, you would just send a link to the source. Whenever your friend wants to read the content, they can visit the link, and they are good to go.

Pointers are similar to the hyperlink that stores the location of some other data.

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*In C++, a **pointer** is a variable that stores the address of another variable.*

Pointer declaration

To declare a variable as a pointer, it's identifier must be preceded by an asterisk `*`. When we use `*` before the identifier, it indicates that the variable being declared is a pointer.

DataType *identifier ;

See the code given below!

```
#include <iostream>

using namespace std;

int main() {
  // Declares a pointer variable John
  int *John;
  return 0;
}
```

The statement on **Line No.** 7 declares a pointer `John`, and its sole purpose is to store the address of some other variable. Here, `John` only points to the value whose data type is `int`. Therefore, we can say **John is a pointer to int**.

> 💡 It's a good practice to use ptr in a pointer's variable name. It indicates that a variable is a pointer, and it must be handled differently.

> 📝 If we declare multiple pointers in the same line, we must use an asterisk `*` before each identifier.

Pointer initialization

To initialize a pointer, we must store the address in it. The basic syntax for storing an address of another variable in the pointer variable is given below:

ptrVariable = &Variable ;

Example program

Consider the same analogy given in this lesson. Let's say `Alice`'s storage house is located at the address **1000**. Whereas `John`'s house is located at the address **1004**. `Alice` has stored **5** in its storage house. Whereas, `John` has stored the address of Alice storage house, which is **1000**.

Here, John 's storage house is pointing to Alice 's storage house, so John is a **pointer**.

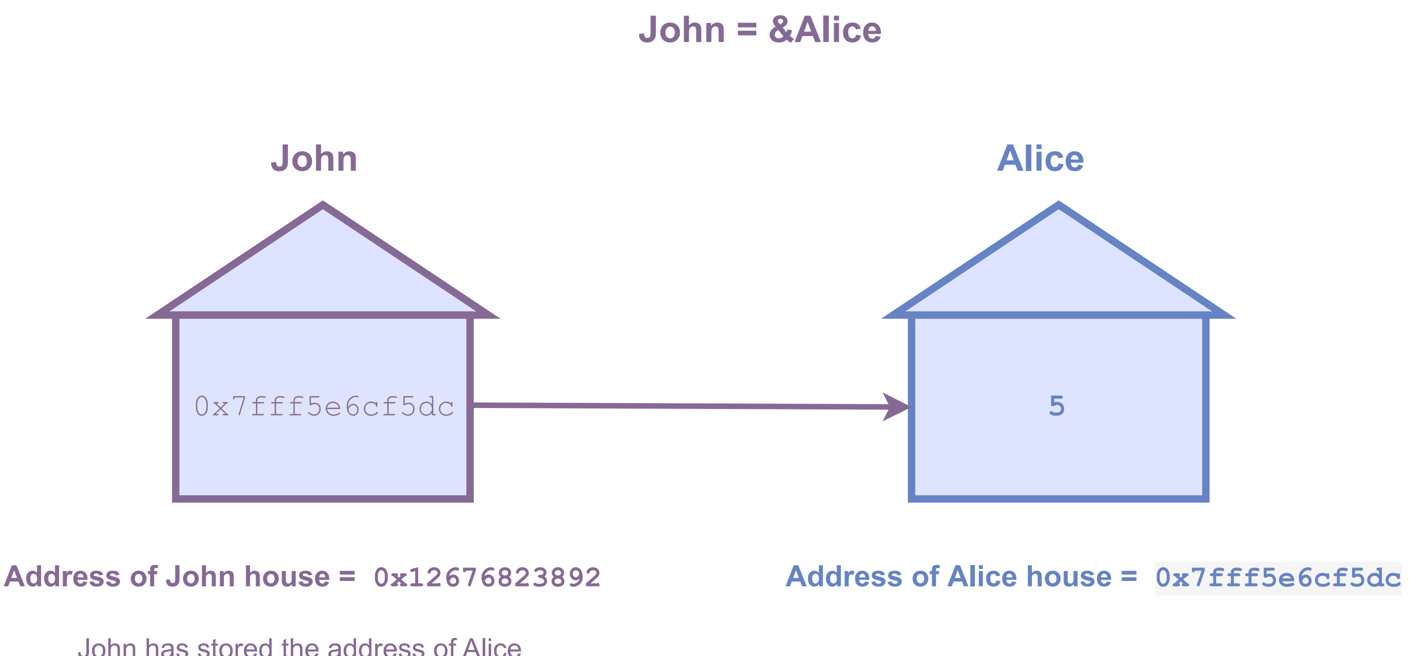
Let's translate this example into a C++ program!

```
#include <iostream>

using namespace std;

int main() {
  // Declares a variable Alice
  int Alice = 5;
  // Declares a pointer variable John that can point to int value
  int *John;
  // Stores the address of Alice in John
  John = &Alice;
  // Prints value of Alice
  cout << "Value of Alice = " << Alice << endl;
  // Prints value (address of Alice) of John
  cout << "Value of John = " << John << endl;

  return 0;
}
```

Explanation

Line No. 11: `John` is a pointer, and `&Alice` gives us the memory address of `Alice`. Therefore, here we are storing the address of `Alice` in `John`. We can say `John` is pointing to `Alice`.

Using ampersand `&` is like getting the address of Alice instead of seeing what Alice has stored in its storage house.


John = &Alice
John
Alice
0x7fff5e6cf5dc
5
Address of John house = 0x12676823892
Address of Alice house = 0x7fff5e6cf5dc
John has stored the address of Alice

house.Therefore, John is a pointer. We will say john is pointing to Alice house
Alice has stored 5 in its house

Pointer

> 📝 An error occurs when the pointer points to the variable of a different data type.

Null pointer

If the pointer is pointing to nothing, then it should be initialized to **nullptr**. It is known as a null pointer. The value of the null pointer is **0**.

> 📝 If we don't initialize a pointer, it is automatically initialized to **0**.

Press the **RUN** button and see the output!

```
#include <iostream>

using namespace std;

int main() {
  int *John;
  John = nullptr;
  cout << John;
}
```

In the code above, we initialize the `John` to **nullptr**. It means `John` is pointing to nothing.

Quiz

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Which of the following will declare pointer `valuePtr` and `outputPtr` of type `int`?

You can select multiple correct answers.

Retake Quiz

So far, we have seen the basic syntax for declaring and initializing a pointer. Let’s dive right in and see how we can access the value pointed by the pointer in C++.