#### More Kinds of Constructors

After the default and parameterized constructors, we will study a few more constructor types that make classes more convenient.

#### WE'LL COVER THE FOLLOWING ^

- Copy constructors
- Move constructors
- Explicit constructors
  - Example

# Copy constructors #

The copy constructor allows a class to create an object by copying an existing object.

They expect a constant reference to another instance of the class as their argument.

```
class Account{
public:
    Account(const Account& other);
};
```

All the values of other can be copied into the new object. Both objects will have the same values afterward.

## Move constructors #

The move constructor allows the data of one object to be transferred completely to another object.

They are a more efficient alternative to the copy constructor since everything is being *moved* instead of *copied*.

They expect a non-constant **rvalue-reference** to an instance of the class as their argument.

```
class Account{ public:
     Account(Account&& other);
};
```

After the move operation, other is in a moved-from state. Accessing it will result in undefined behavior. To use it again, we would have to re-initialize it.

# Explicit constructors #

The explicit constructor is used to avoid implicit calls to a class's constructor.

Consider the following Account constructor:

```
public:
    Account(double b): balance(b){}
private:
    double balance;
    std::string cur;
};
```

An instance can be created like this:

```
Account acc = 100.0;
```

A double is being assigned to an Account object, but the compiler implicitly calls the constructor that takes a double as an argument. Hence, the operation works without any errors.

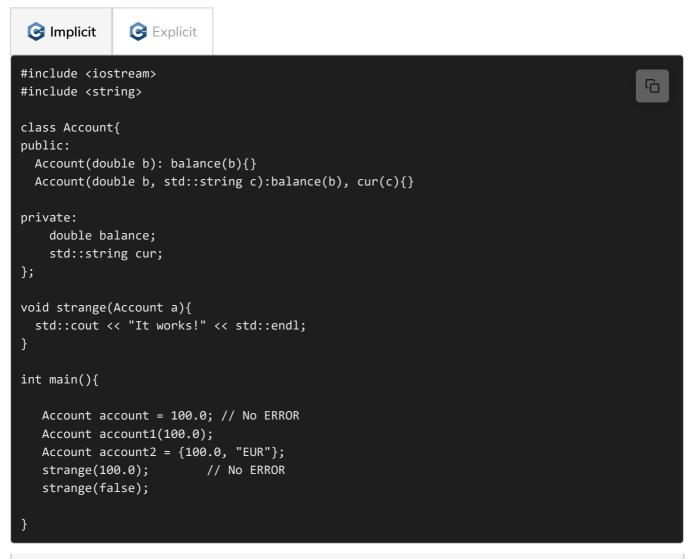
If the constructor had been made explicit, this statement would not have worked. For this, we would have to use the explicit keyword.

```
class Account{
public:
    explicit Account(double b): balance(b){}
    Account (double b, std::string c): balance(b), cur(c){}
private:
    double balance;
    std::string cur;
};
Account account = 100.0; // ERROR: implicit conversion
Account account(100.0); // OK: explicit invocation
Account account = {100.0, "EUR"}; // OK: implicit conversion
```

Now, the assignment operator won't work as it did before, though it still works for Account(double b, std::string c) since it has not been made explicit.

### Example #

Here's a complete example showing the use of the explicit keyword:







- In the implicit approach, the assignment operations in lines 20 and 22 do not cause an error.
- In the implicit approach, the function strange has an Account parameter, but passing it a double or bool implicitly calls the Account constructor, as done in lines 23 and 24.
- When the explicit keyword is introduced in the code, implicit constructor calls are restricted.
- Uncomment the lines to observe the error shown by the compiler in the **explicit** code tab.

The next lesson deals with the concept of **instance initializers**.