Introduction to C++

Language basics – operators

Arithmetic

- The usual arithmetic operators

  `+ - * /`

- Some handy shortcuts

  `+= -= *= /=`

- Increment and decrement

  `i++ ++i  i-- --i`

- Modulo – remainder after dividing

  `17 % 2` is `1`

- There is no “power of” or exponent operator

Comparisons

- Less than, greater than, etc

```
< > <= >=
```

- Not equal to

```
!=
```

- Equal to

```
==
```

- And, Or (shortcutting)

```
&& ||
 if (x && foo(x))
```

- Not

```
!
```

Bitwise Operators

- **Boolean operators (&&, ||, !) convert integers to bool**
  - □ 4 && 1 becomes true && true which is true
- **Bitwise operators (& | ^) do the operations bit by bit**
  - □ 100 & 001 is 000 which is false
  - □ Used to set or test individual bits that have been packed into an integer
  - □ Chances are, you do not want to use bitwise operators when you're a beginner

- **Bit shift operators also not for beginners**
  - □ 4 >> 1 is 2
  - □ 4 << 1 is 8

Operator Overloading

- **User defined types can do everything fundamental types can do**

  ```
  int i = j +3;
  Order newOrder = oldOrder + newItem;
  ```

- **Author of the class writes a function that defines the operator for the class**
  - Usually a member function
  - Occasionally a free function that takes an instance of the class
- **Standard Library has plenty of useful overloads**
  - So useful they’re invisible
  - `firstname + " " + lastname` works because std::string overloads +
  - << and >> are also overloads of the bit-shift operator
  - Collections have iterators; ++ moves to the next item in the collection
- **You can overload every operator you’ve seen in this module**
  - And more you haven’t

Writing an Overload

- **myObject < something**
  - bool MyClass::operator<(OtherType something)
  - Can operate on two MyClass objects or different types
- **something < myObject**
  - bool operator<(OtherType something, MyClass mc)
  - Free function
  - Access member variables of MyClass through public functions
  - Or be declared a friend

Summary

- **C++ has a LOT of operators**
- **Not all behave the way you think**
  - && || shortcut
  - & | ^ bitwise
  - == vs =
- **It’s possible to write VERY concise code**
- **Operator overloading is a very powerful technique that sets C++ apart**