C++ Type Conversion

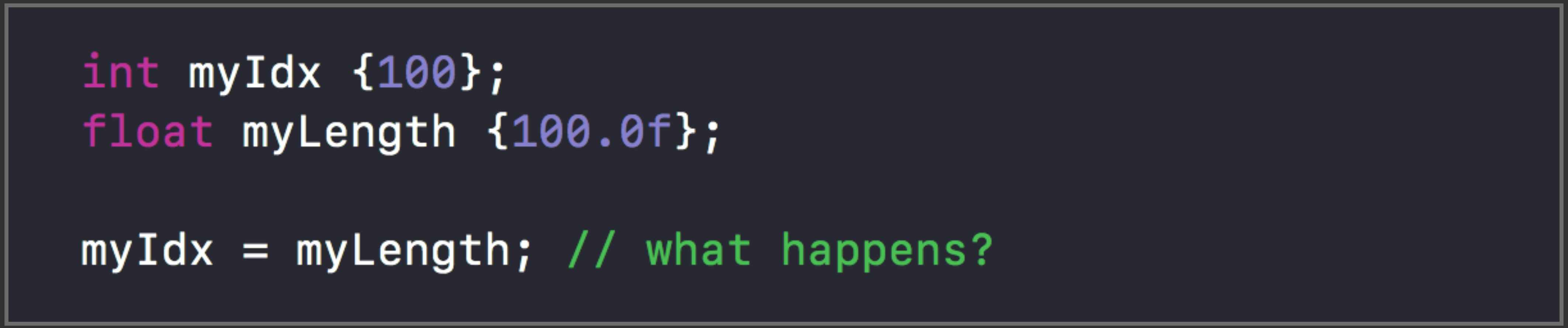
Type Conversion

- When defining a variable, the value stored in the variable is associated with a certain data type, i.e.,
  - “**int** myIdx {100};”
  - “**float** myLength {100.0f};”

- This association tells the compiler how to interpret the value

- What happens, when you start assigning variables or values to myIdx, that are of different type, i.e., float than myIdx?

Type Conversion



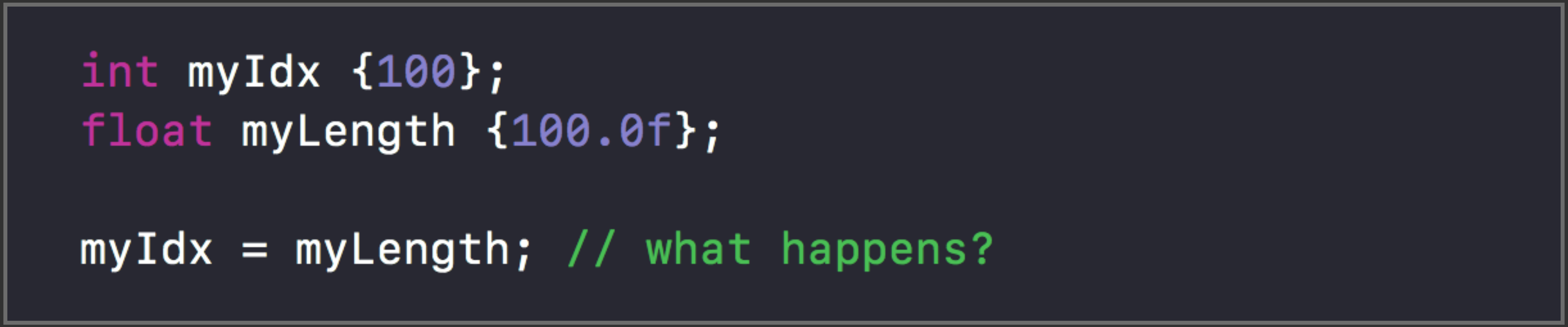
```
int myIdx {100};
float myLength {100.0f};

myIdx = myLength; // what happens?
```

- When compiling the code, the variable defined in (high level) code is translated into machine code, its binary representation

- Binary representation (machine code) of an integer is not the same as machine code of a floating point data type!

Implicit Type Conversion



```
int myIdx {100};
float myLength {100.0f};

myIdx = myLength; // what happens?
```

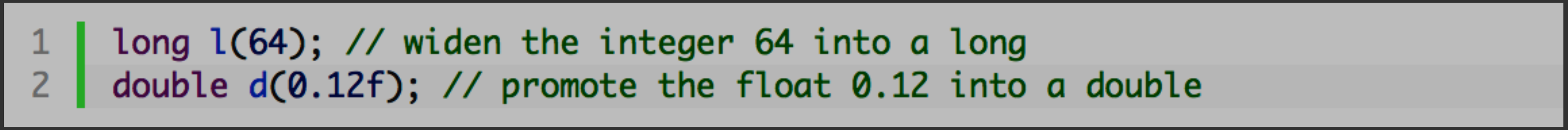
- In the above example, the compiler cannot simply assign the float value to the int variable — instead, it **implicitly converts** it from float to int

- Implicit type conversion works fine for primitive data types (i.e., int, float, double, char, etc.)

Implicit Type Conversion

- Implicit type conversion works fine when small types are converted into large types

  — **numeric promotion**

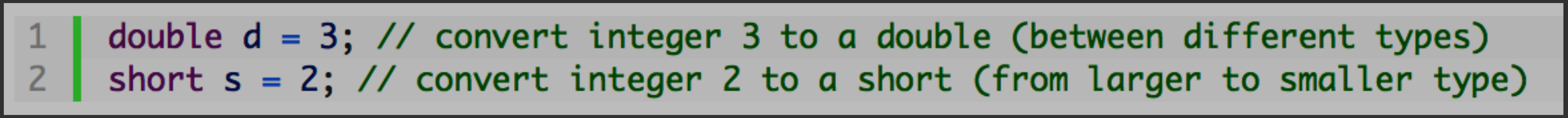


```
long l(64); // widen the integer 64 into a long
double d(0.12f); // promote the float 0.12 into a double
```

Image credit: http://www.learncpp.com/cpp-tutorial/44-implicit-type-conversion-coercion/

- Implicit type conversion might lead to loss of data when large types are converted into smaller or different types

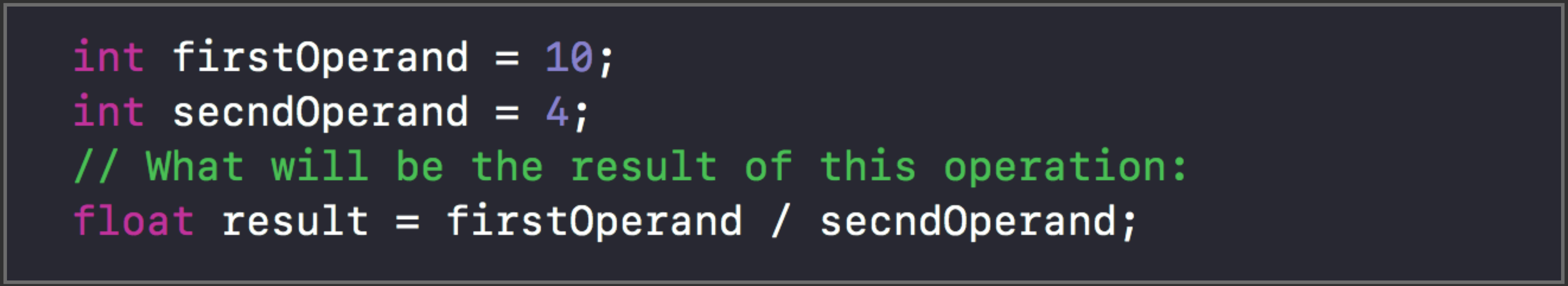
  — **numeric conversion**



```
double d = 3; // convert integer 3 to a double (between different types)
short s = 2; // convert integer 2 to a short (from larger to smaller type)
```

Image credit: http://www.learncpp.com/cpp-tutorial/44-implicit-type-conversion-coercion/

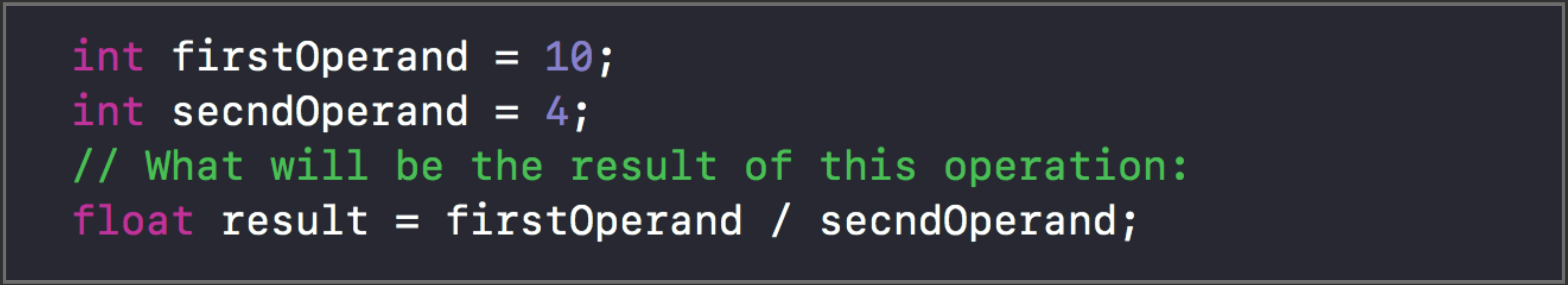
Implicit Type Conversion



```
int firstOperand = 10;
int secndOperand = 4;
// What will be the result of this operation:
float result = firstOperand / secndOperand;
```

?

Implicit Type Conversion

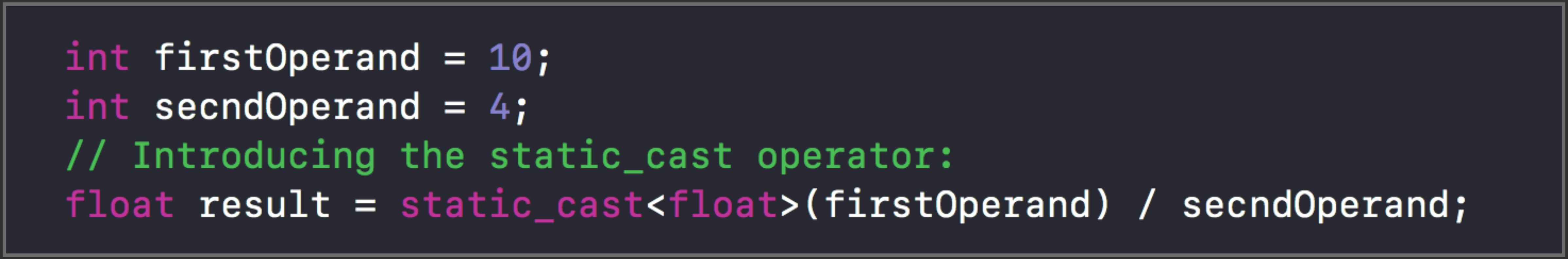


```
int firstOperand = 10;
int secndOperand = 4;
// What will be the result of this operation:
float result = firstOperand / secndOperand;
```

- The result will be “2” because the compiler interprets the variables as integer variables

- To overcome this issue, explicit type conversion, or **type casting**, from the integer data type to the floating point data type is required

Explicit Type Conversion



```
int firstOperand = 10;
int secndOperand = 4;
// Introducing the static_cast operator:
float result = static_cast<float>(firstOperand) / secndOperand;
```

- Syntax of the operator:
  “`static_cast<data_type>(value_or_var)`”

- Always use the `static_cast<>()` operator to make clear what is happening in the code