

CS150 Intro to CS I

Fall 2015

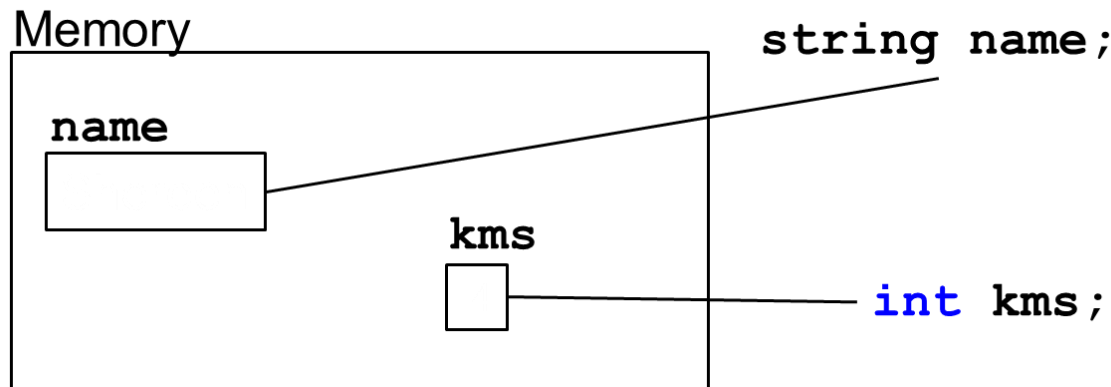
Chapter 2

Introduction to C++

- Reading: Chapter 2 (2.4 to 2.10), Chapter 3 (3.1)
- Good Problems to Work: pp. 40 [2.5], pp.47 [2.7, 2.8], pp.53 [2.11, 2.12, 2.15]

Variables

- Named storage location for holding data
 - named piece of memory
- You need to determine what variables you need in your program
 - what data do we need to handle?



Variable Definition

`int number;`

- Tells the compiler
 - the variable's type (int)
 - the variable's name (number)

`int` is short for integer

- Variable definitions end with a semicolon
- Every variable must be defined

C++ Assignment Statement

```
number = 5;
```

- = is an operator that copies the value from the right into a variable on the left
- The item to the left of the = operator must be a variable
- You cannot write 5 = number;

Variables in a program

```
1 // This program has a variable called number
2 #include <iostream>
3 #include <string>
4 using namespace std;
5
6 int main() // what is the output of this program?
7 {
8     int number;
9
10    number = 5;
11    cout << "Number is " << number << endl;
12
13    number = 7;
14    cout << "Now number is " << number << endl;
15
16    return EXIT_SUCCESS;
17 }
```

cin object

- cin is an executable statement
- cin is the standard input object
- The keyboard is the standard input device
- cin is a stream object and works with streams of data
- The executable statement
`cin >> number;`
places the value a user types at the keyboard into the variable number?

cin object

- Input operator (extraction operator): `>>`
- Standard input (from keyboard): `cin`
- Whatever the user types in is stored in the variable to the right of the operator (the right operand)
 - All variables must be previously declared
- When reading in the data typed by the user
 - Any spaces before the data item are skipped
 - Reading continues until the user hits return

What is the output?

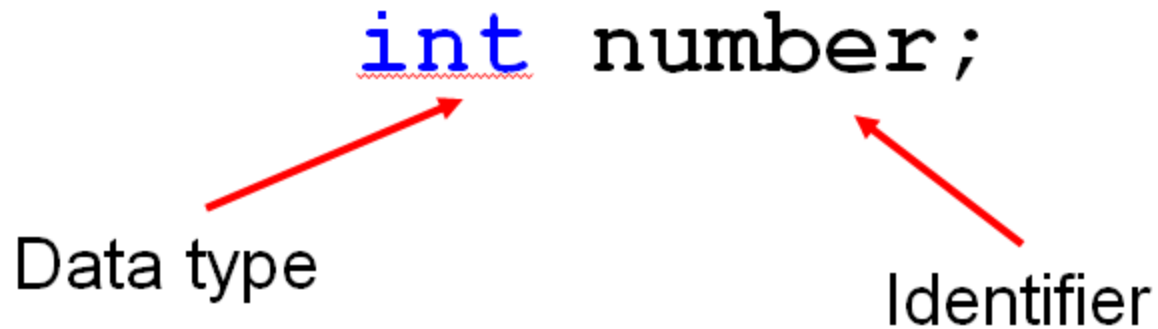
- Consider the following program:

```
int num1;  
int num2;  
  
cout << "Enter two numbers: ";  
cin >> num1 >> num2;  
  
cout << num1 << " " << num2 << endl;
```

- What is output if the user enters: 10 12
What is the output if the user enters: 5 10 15

Variable Definition

We now know that:



What is an identifier?!

Identifiers (Variables)

- Programmer-defined names that represent some element of a program
- C++ limits on variable names:
 1. Identifiers must begin with a letter or an underscore
 2. Identifiers must consist of letters, numbers and underscore, nothing else
 3. Identifiers cannot be a *keyword*

Identifiers (Variables)

- Identifiers are case sensitive

```
int totalCost;
```

```
int TotalCost;
```

- Use meaningful variable names

```
int width;
```

```
int w;
```

Data types

- A data type defines:
 - how the computer interprets data in memory
- C++ has many data types including:
 - Numerical data: `int`, `double`, `float`
 - Textual data: `string`
 - Character data: `char`
 - Binary data: `bool`

Integer (`int`)

- The main integer data type is `int`
 - Others are `short` and `long`
- `ints` are finite (why?)
- An `int` without a sign (+ or -) is assumed to be positive
- 2,353 is not an `int` while 2353 is an `int`
- Operations?

Character (**char**)

- The **char** data type is used to store a single character (a letter, a digit, or a special character)
 - ASCII is the internal representation for a **char**
- Character literals are enclosed in single quotes
- Examples of character literals are: 'A', 'a', '*', '2', '\$'

Program

```
#include <iostream>

using namespace std;

int main()
{
    char letter;

    letter = 'A';
    cout << letter << ' ';
    letter = 'B';
    cout << letter << endl;
    return EXIT_SUCCESS;
}
```


string Class

- string is used to store a list of characters
- Need to include the preprocessor directive

```
#include <string>
```

- why?

string Questions

- How do we declare a variable of type string?
- How do we assign a value to the variable?
- How do we output a string literal and a string variable?
- What is the difference between 'A' and "A"?

Floating-Point (**double**)

- **double, float, long double**
 - positive and negative
 - no unsigned float!
- Scientific Notation
- Examples:
 - 1.0, -2.3, -0.3, 12E5, -1E-2, 1.4e+8
- 2,353.99 is not a **double**
- 2353.99 is a **double**

Examples

- Remember, the format for declaring variables is:
 - **data-type** identifier;
- You can declare variables of the different data types as follows

```
int num1;
```

```
double num2;
```

```
char letter;
```

```
string name;
```

Boolean (**bool**)

- Variables of type **bool** can be either **true** or **false**
 - They cannot be any other value
 - For coding standards, we precede boolean variables with a **b**
- Example

```
bool bValue;  
bValue = true;  
cout << bValue << endl;  
bValue = false;  
cout << bValue << endl;
```

Identifier Problem

- Which of the following declarations are invalid and why?
 1. `char Letter1;`
 2. `char lletter;`
 3. `double inches, kms;`
 4. `double inches*num;`
 5. `int joe's;`
 6. `Int cent_per_inch;`
 7. `double two-dimensional;`
 8. `char hello;`
 9. `int return;`
 10. `size int;`