CS150 Intro to CS I

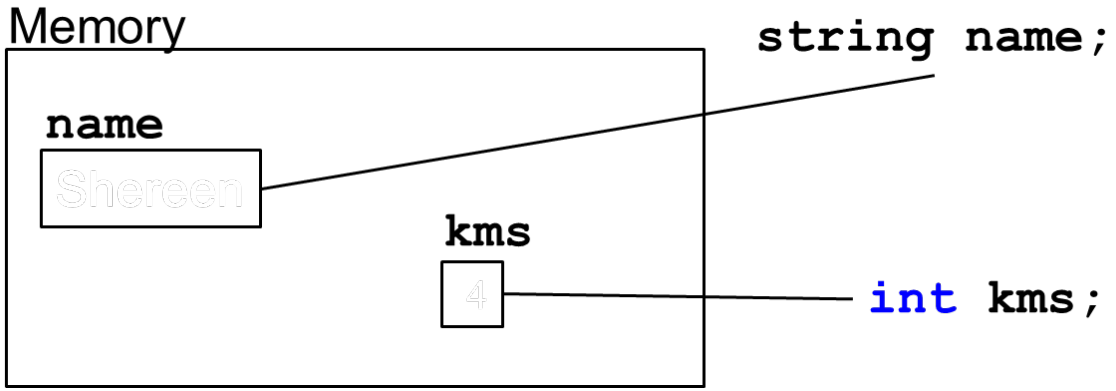
Fall 2014

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?

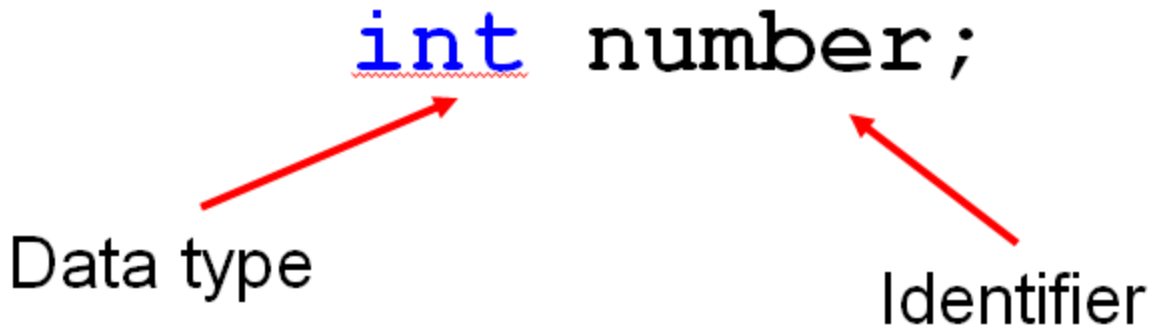
- Consider the following program:

```
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`
- `int`s 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 1letter;
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;
```