C++ Reading a Line of Text

Because there are times when you do not want to skip whitespace before inputting a character, there is a function to input the next character in the stream regardless of what it is. The function is named **get** and is applied as shown.

```
cin.get(character);
```

The next character in the input stream is returned in **char** variable **character**. If the previous input was a numeric value, **character** contains whatever character ended the inputting of the value.

There are also times when you want to skip the rest of the values on a line and go to the beginning of the next line. A function named **ignore** defined in file **<iostream>** allows you to do this. It has two parameters. The first is an **int** expression and the second is a character. This function skips the number of characters specified in the first parameter or all the characters up to and including the character specified in the second parameter, whichever comes first. For example,

```
cin.ignore(80, '\n');
```

skips 80 characters or skips to the beginning of the next line depending on whether a newline character is encountered before 80 characters are skipped (read and discarded).

As another example, consider:

```
cin.ignore(4,’g’);
cin.get(c);
cout << c << endl;
```

If the input to this program is “agdfg” then the input is ignored up to and including the ‘g’ so the next character read is ‘d’. The letter “d” is then output.

If the input to this program is “abcdef” then the input is ignored for the first four characters, so the next character read is ‘e’. The letter “e” is then output.

We said that initial whitespace is skipped when reading data into a variable of type **string** and that the next whitespace character encountered stops the reading. How, then, can we get blanks or other whitespace characters into a string? We can use the function **getline**, which takes two parameters. The first is the name of the input stream, and the second is the name of the **string** variable into which the string is to be read. For example,

```
getline(cin, newString);
```

begins immediately reading and collecting characters into **newString** and continues until a newline character is encountered. The newline character is read but not stored in **newString**.

To illustrate the difference, consider the following snippet of code:

```
string s1;
cout << "Enter your name " << endl;
cin >> s1;
cout << s1;
```

If we run this program and enter “Bill Gates” then as output we will have:

```
Enter your name
Bill Gates
Bill
```

That is, string s1 only contains “Bill” because the space between Bill and Gates is whitespace and is used to denote the end of the input string. If we want to include everything up to the newline then we would use getline:

```
string s1;
cout << "Enter your name" << endl;
getline(cin, s1);
cout << s1;
```

If we run this program and enter “Bill Gates” then as output we will have:

```
Enter your name
Bill Gates
Bill Gates
```

We now get the entire string up to the newline character.

Mixing getline with cin

It is worthwhile to point out problems that can arise if we have code that mixes both cin and getline. **getline removes the newline from the input stream while cin does not**. This does not cause any problems if our program uses all cin’s, because cin will ignore whitespace. But since getline does not ignore the whitespace, it can lead to undesirable results, namely empty strings. Consider the following example:

```
string s;
char c;
getline(cin, s);
cout << s << endl;
cin >> c;
cout << c << endl;
getline(cin, s);
cout << s << endl;
```

If our input to such a program is:

```
Bill Gates
Z
Foobar
```

Then we would expect the output to be

```
Bill Gates
Z
Foobar
```

Instead, our output is:

```
Bill Gates
Z
(blank, an empty string)
```

What is the reason for the empty string? In the line "cin >> c" we input the letter 'Z' into variable c. However, the newline when we hit the carriage return is left in the input stream. If we use another cin, this newline is considered whitespace and is ignored. However, if we use getline, this is not ignored. Instead we read a newline into the second getline, and exit. A blank string has been read into s in the second getline.

This is illustrated in the following code:

```
string s;
char c;
getline(cin, s);
cout << s << endl;
cin >> c;
cout << c << endl;
cin.get(c);
cout << int(c) << endl;
getline(cin, s);
cout << s << endl;
```

If our input is the same, the output is now:

```
Bill Gates
Z
10
Foobar
```

Here we explicitly read the newline with an extra cin.get() function call, and printed it's ASCII value out (which is 10). In general, if we want to immediately throw away the newline that follows using cin, then use cin.ignore() immediately after a "cin >>" to discard the next value:

```
string s;
char c;
getline(cin, s);
cout << s << endl;
cin >> c;
cin.ignore();                          // Ignore NEWLINE
cout << c << endl;
getline(cin, s);
cout << s << endl;
```

Reading Lines in Java

To read a whole line in Java we can use the method nextLine():

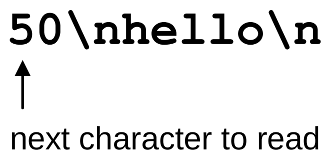
```
	public static void main(String[] argv)
	{
		int i;
		String s;
		Scanner keyboard = new Scanner(System.in);

		System.out.println("Enter an integer. ");
		i = keyboard.nextInt();
		System.out.println("You entered: " + i);

		System.out.println("Enter a line of text. ");
		s = keyboard.nextLine();
		System.out.println("Your line was: " + s);
	}
```

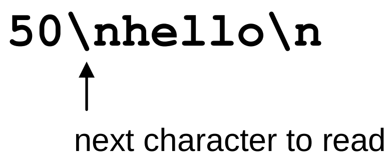
You would probably expect it to behave like the first program, but the program immediately ends without prompting you to enter a line of text. The reason is because the nextLine() method behaves a little differently than the other methods. Basically we have the same problem that we did in C++!

Java interprets its input as a stream of characters. When you press the enter key, a newline character is inserted into the stream. Let's say that you are giving the input of "50" for the integer and "hello" for the text. Java sees this input as:



The \n is a single character for newline.

When we execute: i = keyboard.nextInt();
Java reads the 50 and advances its input buffer to reference the next character in the stream, the \n:



If we execute: s = keyboard.next(); (or nextInt() or nextDouble, etc.)

then Java will **skip any whitespace** characters looking for a word that is surrounded by whitespace. You can test this by entering leading spaces, newlines, tabs, etc. They will all be skipped and Java will return back only the word you enter.

However, if we execute: s = keyboard.nextLine();

then Java will stop until it hits a newline character, and consume it. It just so happens that the next whitespace is the \n so we end up with:

```
50\nhello\n
   ↑
next character to read
```

And the string s contains a blank string.

The solution? Use an extra nextLine() after reading an int or word to skip the whitespace character if you want to later read in an entire line:

```
public static void main(String[] argv)
{
      int i;
      String s;

      Scanner keyboard = new Scanner(System.in);

      System.out.println("Enter an integer. ");
      i = keyboard.nextInt();
      System.out.println("You entered: " + i);

      keyboard.nextLine();   // Skip \n character

      System.out.println("Enter a line of text. ");
      s = keyboard.nextLine();
      System.out.println("Your line was: " + s);
}
```