The Java™ Tutorials

Trail: Learning the Java Language
Lesson: Numbers and Strings

The Java Tutorials have been written for JDK 8. Examples and practices described in this page don't take advantage of improvements introduced in later releases.

Strings

Strings, which are widely used in Java programming, are a sequence of characters. In the Java programming language, strings are objects.

The Java platform provides the `String` class to create and manipulate strings.

Creating Strings

The most direct way to create a string is to write:

```
String greeting = "Hello world!";
```

In this case, "Hello world!" is a *string literal*—a series of characters in your code that is enclosed in double quotes. Whenever it encounters a string literal in your code, the compiler creates a `String` object with its value—in this case, `Hello world!`.

As with any other object, you can create `String` objects by using the `new` keyword and a constructor. The `String` class has thirteen constructors that allow you to provide the initial value of the string using different sources, such as an array of characters:

```
char[] helloArray = { 'h', 'e', 'l', 'l', 'o', '.' };
String helloString = new String(helloArray);
System.out.println(helloString);
```

The last line of this code snippet displays `hello`.

Note: The `String` class is immutable, so that once it is created a `String` object cannot be changed. The `String` class has a number of methods, some of which will be discussed below, that appear to modify strings. Since strings are immutable, what these methods really do is create and return a new string that contains the result of the operation.

String Length

Methods used to obtain information about an object are known as *accessor methods*. One accessor method that you can use with strings is the `length()` method, which returns the number of characters contained in the string object. After the following two lines of code have been executed, `len` equals 17:

```
String palindrome = "Dot saw I was Tod";
int len = palindrome.length();
```

A *palindrome* is a word or sentence that is symmetric—it is spelled the same forward and backward, ignoring case and punctuation. Here is a short and inefficient program to reverse a palindrome string. It invokes the `String` method `charAt(i)`, which returns the i^{th} character in the string, counting from 0.

```
public class StringDemo {
    public static void main(String[] args) {
        String palindrome = "Dot saw I was Tod";
        int len = palindrome.length();
        char[] tempCharArray = new char[len];
        char[] charArray = new char[len];

        // put original string in an
        // array of chars
        for (int i = 0; i < len; i++) {
            tempCharArray[i] =
                palindrome.charAt(i);
        }
```

```
            // reverse array of chars
            for (int j = 0; j < len; j++) {
                charArray[j] =
                    tempCharArray[len - 1 - j];
            }

            String reversePalindrome =
                new String(charArray);
            System.out.println(reversePalindrome);
        }
    }
```

Running the program produces this output:

```
doT saw I was toD
```

To accomplish the string reversal, the program had to convert the string to an array of characters (first `for` loop), reverse the array into a second array (second `for` loop), and then convert back to a string. The `String` class includes a method, `getChars()`, to convert a string, or a portion of a string, into an array of characters so we could replace the first `for` loop in the program above with

```
palindrome.getChars(0, len, tempCharArray, 0);
```

Concatenating Strings

The `String` class includes a method for concatenating two strings:

```
string1.concat(string2);
```

This returns a new string that is string1 with string2 added to it at the end.

You can also use the `concat()` method with string literals, as in:

```
"My name is ".concat("Rumplestiltskin");
```

Strings are more commonly concatenated with the **+** operator, as in

```
"Hello," + " world" + "!"
```

which results in

```
"Hello, world!"
```

The **+** operator is widely used in `print` statements. For example:

```
String string1 = "saw I was ";
System.out.println("Dot " + string1 + "Tod");
```

which prints

```
Dot saw I was Tod
```

Such a concatenation can be a mixture of any objects. For each object that is not a `String`, its `toString()` method is called to convert it to a `String`.

Note: The Java programming language does not permit literal strings to span lines in source files, so you must use the `+` concatenation operator at the end of each line in a multi-line string. For example:

```
String quote =
    "Now is the time for all good " +
    "men to come to the aid of their country.";
```

Breaking strings between lines using the `+` concatenation operator is, once again, very common in `print` statements.

Creating Format Strings

You have seen the use of the `printf()` and `format()` methods to print output with formatted numbers. The `String` class has an equivalent class method, `format()`, that returns a `String` object rather than a `PrintStream` object.

Using `String's` static `format()` method allows you to create a formatted string that you can reuse, as opposed to a one-time print statement. For example, instead of

```
System.out.printf("The value of the float " +
                  "variable is %f, while " +
                  "the value of the " +
                  "integer variable is %d, " +
                  "and the string is %s",
                  floatVar, intVar, stringVar);
```

you can write

```
String fs;
fs = String.format("The value of the float " +
                   "variable is %f, while " +
                   "the value of the " +
                   "integer variable is %d, " +
                   " and the string is %s",
                   floatVar, intVar, stringVar);
System.out.println(fs);
```

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