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TUTORIAL

Java : Wrapper Classes

Topics

Variables that are declared using the primitive Java types are not objects and cannot be created and accessed using methods. Primitive types also cannot be subclassed. To get around the limitations of primitive types, the java.lang package defines class wrappers for these types. These class wrappers furnish methods that provide basic capabilities such as class conversion, value testing, hash codes, and equality checks. The constructors for the wrapped classes allow objects to be created and converted from primitive values and strings.

The Boolean Class

The Boolean class is a wrapper for the boolean primitive type. It provides the getBoolean(), toString(), valueOf(), and booleanValue() methods to support type and class conversion. The toString(), equals(), and hashCode() methods override those of class Object.

The Character Class

The Character class is a wrapper for the char primitive type. It provides several methods that support case, type, and class testing and conversion.

The Byte, Short, Integer, and Long Classes

These classes wrap the byte, short, int, and long primitive types. They provide the MIN_VALUE and MAX_VALUE constants, as well as a number of type and class testing and conversion methods. The

parseInt() and parseLong() methods are used to parse String objects and convert them to Byte, Short, Integer, and Long objects.

The Double and Float Classes

The Double and Float classes wrap the double and float primitive types. They provide the MIN_VALUE, MAX_VALUE, POSITIVE_INFINITY, and NEGATIVE_INFINITY constants, as well as the NaN (not-a-number) constant. NaN is used as a value that is not equal to any value, including itself.

These classes provide a number of type and class testing and conversion methods, including methods that support conversion to and from integer bit representations.

The Number Class

The Number class is an abstract numeric class that is subclassed by Byte, Short, Integer, Long, Float, and Double. It provides several methods that support conversion of objects from one class to another.

In the following code use of wrapper classes is shown: -

Wrapper Classes Implementation

Java

```
class Main {
  public static void main(String args[]) {
    Boolean b1 = new Boolean("TRUE");
    Boolean b2 = new Boolean("FALSE");
    System.out.println(b1.toString()+" or "+b2.toString());
    for(int j=0;j<16;++j)
      System.out.print(Character.forDigit(j,16));
    System.out.println();
    Integer i = new Integer(Integer.parseInt("ef",16));
    Long l = new Long(Long.parseLong("abcd",16));
    long m=l.longValue()*i.longValue();
    System.out.println(Long.toString(m,8));
    System.out.println(Float.MIN_VALUE);
    System.out.println(Double.MAX_VALUE);
  }
```

```
16 }
17
```

The program examines some of the more useful methods provided by the wrapped classes. It creates two objects of class Boolean from string arguments passed to their constructors. It assigns these objects to b1 and b2 and then converts them back to String objects when it displays them. They are displayed in lowercase, as boolean values are traditionally represented.

The program then executes a for loop that prints out the character corresponding to each of the hexadecimal digits. The static forDigit() method of the Character class is used to generate the character values of digits in a number system of a different radix. The static parseInt() and parseLong() methods are used to parse strings according to different radices. In the example, they are used to convert strings representing hexadecimal numbers into Integer and Long values. These values are then multiplied together and converted to a string that represents the resulting value in base 8. This is accomplished using an overloaded version of the toString() method.

The sample program concludes by displaying the minimum float value and the maximum double value, using the predefined class constants of the Float and Double classes. The program's output is as follows:

```
true or false
0123456789abcdef
50062143
1.4E-45
1.7976931348623157E308
```

Math Class

The Math class provides an extensive set of mathematical methods in the form of a static class library. It also defines the mathematical constants E and PI. The supported methods include arithmetic, trigonometric, exponential, logarithmic, random number, and conversion routines. The following code shows some of them:

Math Class Implementation

```java
class Main {
  public static void main(String args[]) {
    System.out.println(Math.E);
    System.out.println(Math.PI);
    System.out.println(Math.abs(-1234));
    System.out.println(Math.cos(Math.PI/4));
    System.out.println(Math.sin(Math.PI/2));
    System.out.println(Math.tan(Math.PI/4));
    System.out.println(Math.log(1));
    System.out.println(Math.exp(Math.PI));
    for(int i=0;i<3;++i)
      System.out.print(Math.random()+" ");
    System.out.println();
  }
}

```

This program prints the constants e and π, |-1234|, cos(π/4), sin(π/2), tan(π/4), ln(1), eπ, and then three random double numbers between 0.0 and 1.1. Its output is as follows:

```
2.718281828459045
3.141592653589793
1234
0.7071067811865476
1.0
0.9999999999999999
0.0
23.140692632779267
0.35427790837560935 0.9715756983822087 0.8834487155382024
```

The random numbers you generate may differ from those shown here.