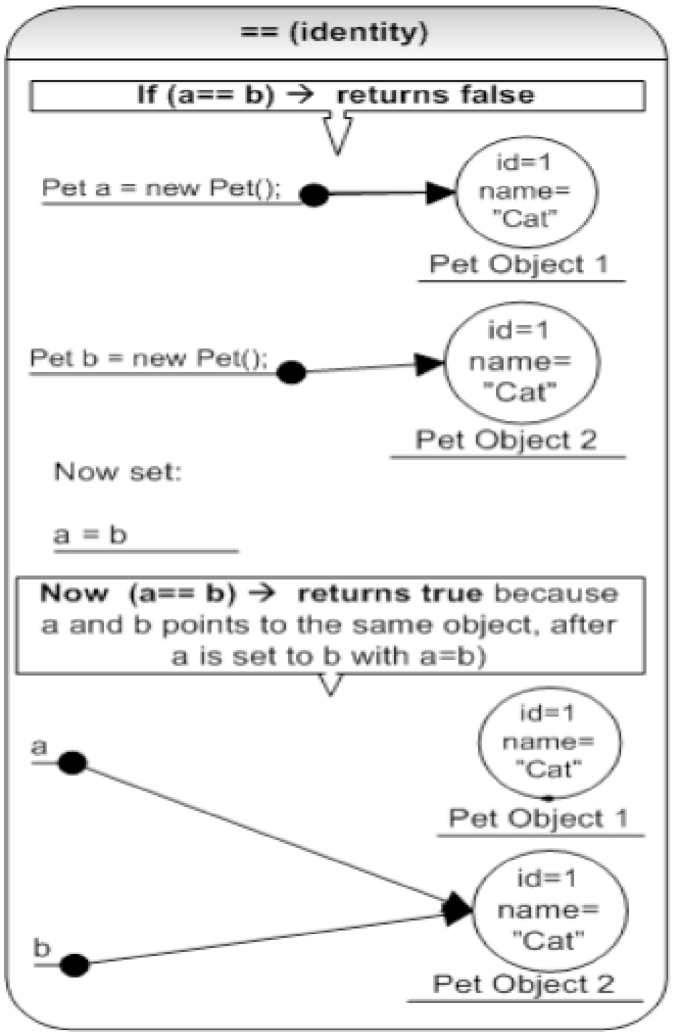
♦♥ Object equals Vs == and pass by reference Vs value

Posted on August 16, 2014 by Arulkumaran Kumaraswamipillai — 4 Comments ↓

Q1. What is the difference between "==" and equals(..) method when comparing 2 objects?
A1.It is important to understand the difference between identity (i.e. ==) comparison, which is a shallow comparison that compares only the object references, and the equals( ) comparison, which is a **deeper comparison** that compares the object attributes. The diagram below explains the difference between the two. There are some exceptional conditions when using primitives, String objects, and enums.

If the equals(..) method is not overridden, then the Object class's default implementation is invoked, which only compares the object references. Invoking the equals(..) method of the Object class is equivalent to making a shallow comparison with "==". This is why it is imperative to override the **equals( )** method, and the **hashCode( )** methods in your custom classes like Pet. The Java API objects like String, and the wrapper classes like Integer, Double, Float, etc override the equals(..), hashCode( ), and the toString(..) methods. These methods are meant to be overridden as discussed in detail at "5 Java Object class methods interview questions & answers"



Java identity ==

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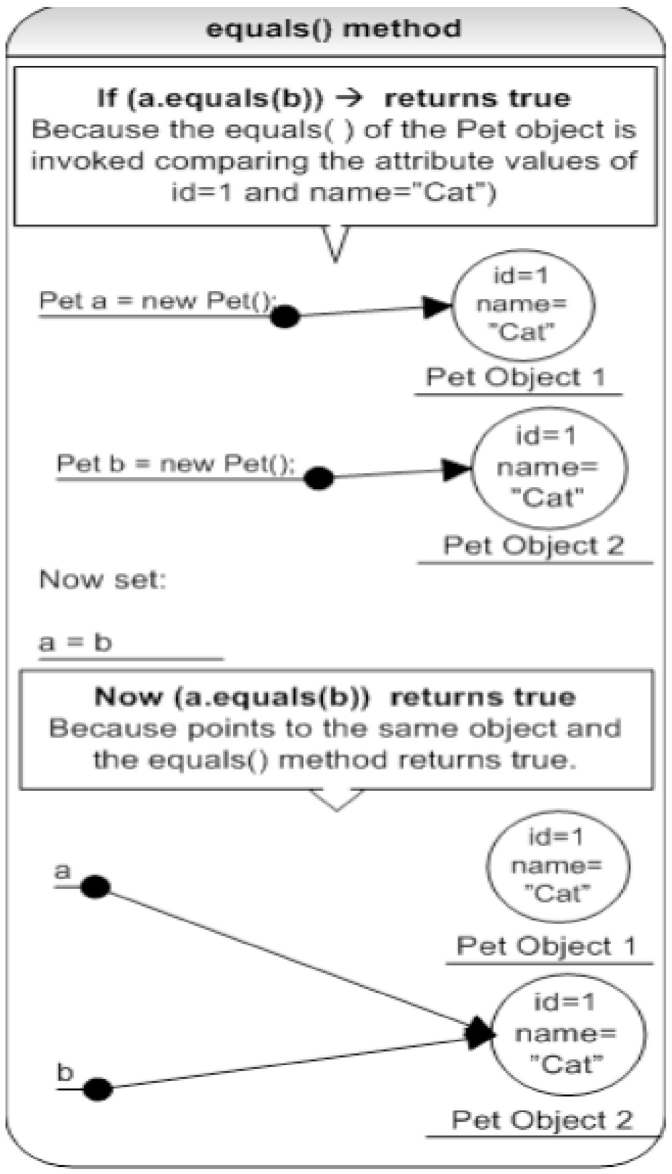
equals() method
If (a.equals(b)) → returns true
Because the equals( ) of the Pet object is invoked comparing the attribute values of id=1 and name="Cat")
Pet a = new Pet();
id=1 name= "Cat"
Pet Object 1
Pet b = new Pet();
id=1 name= "Cat"
Pet Object 2
Now set:
a = b
Now (a.equals(b)) returns true
Because points to the same object and the equals() method returns true.
a
id=1 name= "Cat"
Pet Object 1
b
id=1 name= "Cat"
Pet Object 2

Deeper equals( ) compares values by invoking equals( ) method

If you were to implement the equals(…) and hashCode(…) methods:

```
public final class Pet {
    int id;
    String name;

    @Override
    public boolean equals(Object that){
        if ( this == that ) return true;

        if ( ! (that instanceof Pet) ){
            return false;
        }

       Pet pet = (Pet)that;
```

be a typical Java EE architecture?

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```
        return  this.id == pet.id  && this != nul
    }

    @Override
    public int hashCode( ) {
        int hash = 9;
        hash = (31 * hash) + id;
        hash = (31 * hash) + (null == name ? 0 :
        return hash;
    }
}
```

You can learn more at “**Sorting objects in Java interview Q&As**”

Q2. What happens when you run the following code?

```
Boolean b1  = new Boolean(false);
Boolean b2  = Boolean.FALSE;

 if(b1 == b2) {
      System.out.println("Equal");
 }
 else{
      System.out.println("Not Equal");
 }
```

A2. Prints “Not Equal”.

The == is a shallow comparison that only compares the references. The references are not equal. If you want to print “Equal”, perform a deeper comparison as shown below, which compares the values.

```

If (b1.equals(b2)){
    System.out.println("Equal");//gets printed
}
else {
    System.out.println("Not Equal");
}
```

Or, you need to take advantage of the **flyweight design pattern** that reuses objects.

```
Boolean b1 = Boolean.valueOf("false"); // create
Boolean b2 = Boolean.FALSE; //points to the same
```

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```

```

or

```
Boolean b1 = Boolean.valueOf("false"); // create
Boolean b2 = Boolean.valueOf("false"); //points t

```

Q3. Can you discuss the output of the following code?

```

public class PrimitiveAndObjectEquals {

    public static void main(String[ ] args) {
        int a = 5;
        int b = 5;

        Integer c = new Integer(5);
        Integer d = new Integer(5);

        if (a == b) {  //Line 1
            System.out.println("primitives a and
        }

        if (c == d) {  //Line 2
            System.out.println("Objects c and d
        }

        if (c.equals(d)) {  //Line 3
            System.out.println("Objects c and d
        }

        if (a == d) { //Line 4
           System.out
               .println("Primitive a and Object
        }
    }
}
```

A3. **Output is:**

```

primitives a and b are ==
Objects c and d are equals( )
Primitive a and Object d are == due to auto unbox

```

1) Line 1 is printed as both a and b are primitive data types, and primitives are compared with == as they don't have an equals() method.

2) Line 2 will not get printed as they are comparing the object references (shallow comparison). Line 3 will get printed as they are comparing the actual values (deep er comparison).

3) Line 4 is printed because the object reference “d” is auto-unboxed to a primitive int value and then compared with the primitive reference “a”. This also illustrates a hidden chance of a **NullPointerException** being thrown if the reference “d” were to be null.

Q4. Can you discuss the output of the following code?

```
public class EnumEquals {

  public enum Action {START, STOP, CONTINUE}

  private static Action action = Action.STOP;

  public static void main(String[ ] args) {

      if(Action.STOP == action){
          System.out.println("Enumurations can b
      }

      if(Action.STOP.equals(action)){
          System.out.println("Enumurations can b
      }
    }
}

```

A4. Output is:

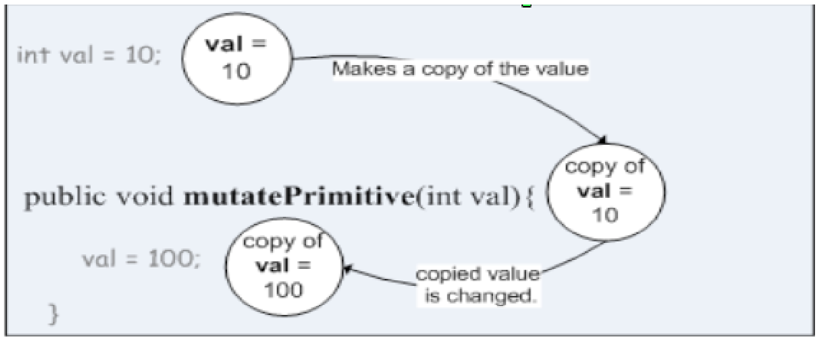
```

Enumurations can be compared to ==.
Enumurations can be compared to equals( ) also.

```

The best practice is to use the referential == for enums.

Q5. Explain the statement Java is always pass by value?
A5. Other languages use pass-by-reference or pass-by-pointer. But in Java, no matter what type of argument (i.e. a primitive variable or an object reference) you pass, the corresponding parameter will get a copy of that data, which is exactly how pass-by-value (i.e. copy-by-value) works. Even though the definition is quite straight forward, the way the

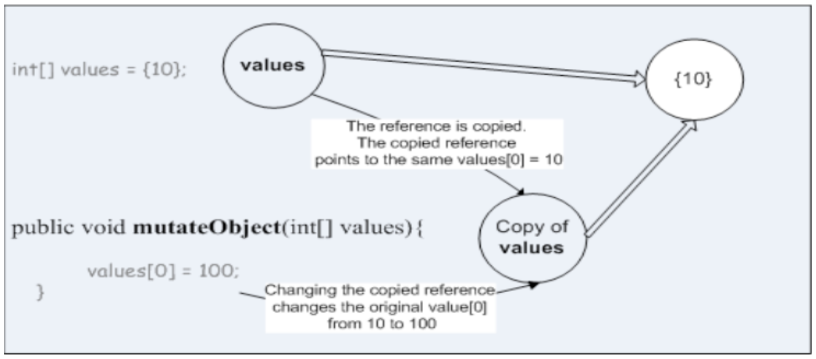
primitives and object references behave when passed by value, will be different.

For example, If the passed in argument was a primitive value like int, char, etc, the passed in primitive value is copied to the method parameter. Modifying the copied parameter will not modify the original primitive value.



pass-by-value primitive variables like int, long, etc

On the contrary, if the passed in argument was an object reference, the passed in reference is copied to the method parameter. The copied reference will still be pointing to the same object. So if you modify the object value through the copied reference, the original object will be modified.


int[] values = {10};
values
{10}
The reference is copied. The copied reference points to the same values[0] = 10
public void mutateObject(int[] values){
values[0] = 100;
}
Copy of values
Changing the copied reference changes the original value[0] from 10 to 100

pass by value for objects like int[], Pet, Car, etc

Q6. The value of Point p before the following method calls is (10,20). What will be the value of Point p after executing the following method calls?

Scenario 1:

```java
static void mutatePoint(Point p) {
      p.x =  50;
      p.y=100;
}

```

Scenario 2:

```java
static void mutatePoint(Point p) {
      p = new Point(50,100);
}
```

A6.

Scenario 1:

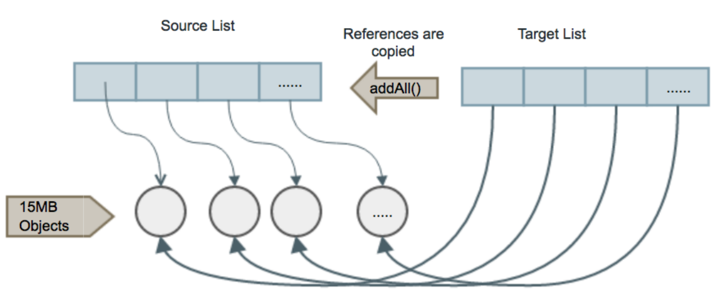
Point p = (50,100), as the copied reference will still be pointing and modifying the original Point (10,2 0) object through the mutatePoint( ) method.

Scenario 2:

Point p = (10,20), as the copied reference will be creating and pointing to the newly created Point (50, 100) object.

Q7. If there is a source array list with 15MB of data, and then you create a new target empty array list and copy the source to target with target.addAll(source). How much memory will be consumed after invoking the addAll(…) method?

A7. The memory will still be 15MB because of "**pass-by-value**" where new objects are not created when addAll(…) is invoked. Only the references are copied, but the copied references will still be pointing to the source list objects. For example,



Java is pass by value

```java

package com.test;

import java.util.ArrayList;
import java.util.Arrays;
import java.util.List;

public class PassByReference {


	public static void main(String[] args) {

		List<String> source = Arrays.asLis

		List<String> target = new ArrayLis

		target.addAll(source);

		//memory will still be 15MB, why?

		System.out.println(source.get(0) =

		//This is because source and targe
		//No new objects are created by ad
		//Only the references are copied
	}
}


```

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4 comments on "♦♥ Object equals Vs == and pass by reference Vs value"

Rishi Raj says:
February 22, 2016 at 4:10 pm

Hi ArulKumaran,
hashCode() and equals() are overridden in Integer. Also hashCode() returns same value for equal-valued Integer objects, and equals() compares "value" member of Integer objects. Then, why c == d does not come out to be true? Where and why is it established that c is not going to be equal to d – in hashCode() or in equals()?

Reply

Arulkumaran Kumaraswamipillai says:
February 22, 2016 at 8:13 pm

Hi Rishi,

If you create c & d as shown below

```
Integer c = new Integer(5);
Integer d = new Integer(5);
```

Then c & d are NOT "==", but equals().

If you create it as shown below then:

Integer c = Integer.valueOf(5);
Integer d = Integer.valueOf(5);

Both “==” and equals() will return true. This is because the c & d will be pointing to the same single object. The references are ==, and so are the values (i.e. equals()).

Reply

Antonio Gil says:
February 20, 2016 at 9:25 am

I think your tutorials are great. Love your approach to java.

Reply

Arulkumaran Kumaraswamipillai says:
February 20, 2016 at 10:37 am

Thanks.

Reply

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