Esercitazione di lunedì

- TUTTE LE MATRICOLE -

Pre-esercitazione

- Prova a fare il primo esercizio guidato in modo da riprendere le fila del discorso fatto a lezione su come strutturare un progetto.
- E inizia a pensare a come sviluppare il progetto legato al negozio online. Mi piacerebbe che aveste un'idea sul come farlo e che si potesse discutere direttamente un paio di soluzioni.

Uguaglianza e Identità

(no, non avete sbagliato corso...)

Fondamenti di Java

Che vuol dire "uguaglianza"?

Che vuol dire "Identità"?

Class P

```
class P {
  int x; int y;
  public String toString() {
     return ("x="+x+" ; y="+y);
  }
}
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      int k1 = 1;
      int k2 = 1;
      System.out.println(k1==k2);
 }
}
```

```
true
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
}
}
```

P1 e p2 sono uguali?

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1==p2);
  }
}
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1==p2);
 }
}
```

```
false
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      int k1 = 1;
      int k2 = k1;
      System.out.println(k1==k2);
 }
}
```

```
true
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=p1;
      System.out.println(p1==p2);
 }
}
```

Uguaglianza

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=p1;
      System.out.println(p1==p2);
 }
}
```

```
true
```

Uguaglianza

```
int k1=1;
int k2=1;

   k1==k2 ?     TRUE
```

```
int k1=1;
int k2=k1;

   k1==k2 ?     TRUE
```

```
P p1=new P();
p1.x=1; p1.y=2;
P p2=new P();
p2.x=1; p2.y=2;

   p1==p2 ?     FALSE
```

```
P p1=new P();
p1.x=1; p1.y=2;
P p2= p1;


   p1==p2 ?     TRUE
```

PERCHE' ? (ricordiamoci del'allocazione di memoria…)

```
public class Test {
  public static void main(String a[]) {new Test();}
  Test() {
     P p1=new P();
     p1.x=1; p1.y=2;
     System.out.println(p1);
     P p2=new P();
     p2.x=1; p2.y=2;
     System.out.println(p2);
     p1.x=3;
     System.out.println(p1);
     System.out.println(p2);
  }
}
```

```
x=1 ; y=2


x=1 ; y=2

x=3 ; y=2
x=1 ; y=2
```

Main di test

```
public class Test {
  public static void main(String []a){new Test();}

 Test() {
      P p1=new P();
      p1.x=1;
      p1.y=2;
      System.out.println(p1);
      P p2=p1;
      p2.x=3;
      System.out.println(p1);
   }
}
```

```
class P {
  int x; int y;
  public String toString() {
      return ("x="+x+" ; y="+y);
  }
}
```

Main di test

```
public class Test {
  public static void main(String []a){new Test();}

 Test() {
      P p1=new P();
      p1.x=1;
      p1.y=2;
      System.out.println(p1);
      P p2=p1;
      p2.x=3;
      System.out.println(p1);
   }
}
```

```
class P {
  int x; int y;
  public String toString() {
      return ("x="+x+" ; y="+y);
  }
}
```

```
x=1 ; y=2
x=3 ; y=2
```

p1 and p2 refer to te same object!

Come testare l'eguaglianza?

```
public class Test {
  public static void main(String a[]){new Test();}
  Test() {
     P p1=new P();
     p1.x=1; p1.y=2;
     P p2=new P();
     p2.x=1; p2.y=2;
     // come testare l'uguaglianza di p1 e p2?
  }
}
```

Operatore ==

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1==p2);
  }
}
```

```
false
```

java.lang

Class Object

java.lang.Object

`public class Object`

Class `Object` is the root of the class hierarchy. Every class has `Object` as a superclass. All objects, including arrays, implement the methods of this class.

Since:

JDK1.0

See Also:

`Class`

Constructor Summary

Constructors

Constructor and Description
`Object()`

Method Summary

Methods

Modifier and Type	Method and Description
`protected Object`	`clone()` Creates and returns a copy of this object.
`boolean`	`equals(Object obj)` Indicates whether some other object is "equal to" this one.

Metodo equals()

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1.equals(p2));
  }
}
```

Metodo equals()

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1.equals(p2));
  }
}
```

```
false
```

Metodo equals()

The equals method for class Object implements the most discriminating possible equivalence relation on objects;

that is, for any reference values x and y, this method returns true if and only if x and y refer to the same object (x==y has the value true).

Ma allora a che serve?

equals per la classe P

Equals di Object è la base per implementare il vostro equals

```
class P {
  int x; int y;
  public String toString() {
     return ("x="+x+" ; y="+y);
  }
  public boolean equals(P var){
    return (x==var.x && y==var.y)
  }
}
```

equals() e ==

```
public class Test {
  public static void main(String[] a){new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=new P();
      p2.x=1; p2.y=2;
      System.out.println(p1.equals(p2));
      System.out.println(p1==p2);
 }
}
```

```
true
false
```

Problema 1...

```
public class Test {
  public static void main(String[] a)}new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      P p2=null;
      System.out.println(p1.equals(p2));
      System.out.println(p1==p2);
 }
}
```

Error!

equals per la classe P, v.2

```
class P {
  int x; int y;
  public String toString() {
      return ("x="+x+" ; y="+y);
  }
  public boolean equals(P var){
    if(var==null) return false;
    return (x==var.x && y=var.y)
  }
}
```

java.lang

Class Object

java.lang.Object

public class Obje

Class Object is the root

Since:

JDK1.0

See Also:

Class

Ma abbiamo fatto overriding o overloading?

```
class P {
   public boolean equals(P var) …
…}
```

Constructor Su

Constructors

Constructor and Description
Object()

Method Summary

Methods

Modifier and Type	Method and Description
protected Object	clone() Creates and returns a copy of this object.
boolean	equals(Object obj) Indicates whether some other object is "equal to" this one.

java.lang

Class Object

java.lang.Object

public class Obje

Class Object is the root

Since:

JDK1.0

See Also:

Class

Constructor Su

Constructors	
Constructor and De	
Object()	

Method Summa

Methods	
Modifier and Type	
protected Object	Creates and returns a copy of this object.
boolean	equals(Object obj) Indicates whether some other object is "equal to" this one.

Ma abbiamo fatto overriding o overloading?

```
class P {
   public boolean equals(P var) …
…}
```

che succede se

```
P p1=new P();
p1.x=1; p1.y=2;
Integer p2=new Integer(3);
System.out.println(p1.equals(p2));
```

Problema 2...

Equals deve comparare due Objects!

```
public class Test {
  public static void main(String[] a)}new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      Integer p2=new Integer(3);
      System.out.println(p1.equals(p2));
      System.out.println(p1==p2);
 }
}
```

```
false
false
```

equals per la classe P, v.3

```
class P {
  int x; int y;
  public String toString() {
     return ("x="+x+" ; y="+y);
  }
  public boolean equals(Object var){
    if(var==null) return false;
    if (!(var instanceof P)) return false;
    return (x==((P)var).x && y=((P)var).y)
  }
}
```

Problema 3...

```
public class Test {
  public static void main(String[] a)}new Test();}
  Test() {
      P p1=new P();
      p1.x=1; p1.y=2;
      Q p2=new Q();
      p2.x=1; p2.y=2;
      System.out.println(p1.equals(p2));
      System.out.println(p1==p2);
 }
}
```

```
Class Q extends P {
    int z;
}
```

```
true
false
```

equals per la classe P, v.3b

```
class P {
  int x; int y;
  public String toString() {
     return ("x="+x+" ; y="+y);
  }
  public boolean equals(Object var){
    if(var==null) return false;
    if (var.getClass() != this.getClass())
            return false;
    return (x==((P)var).x && y=((P)var).y)
  }
}
```

e ora...

```
public class Test {
  public static void main(String[] a)}new Test();}
  Test() {
      P z1=new P();
      p1.x=1; P1.y=2;
      Q p2=new Q();
      p2.x=1; p2.y=2;
      System.out.println(p1.equals(p2));
      System.out.println(p1==p2);
 }
}
```

```
Class Q extends P {
    int z;
}
```

```
false
false
```

Quale soluzione scegliere?

```
if (o.getClass() != this.getClass())
   return false;

oppure

if (!(var instanceof P)) return false;

?

Dipende...
```

Proprietà richieste ad equals

The equals method implements an equivalence relation:

- It is reflexive: for any reference value x, x.equals(x) should return true.
- It is symmetric: for any reference values x and y, x.equals(y) should return true if and only if y.equals(x) returns true.
- It is transitive: for any reference values x, y, and z, if x.equals(y) returns true and y.equals(z) returns true, then x.equals(z) should return true.

Proprietà richieste ad equals

Additional properties:

- It is consistent: for any reference values x and y, multiple invocations of x.equals(y) consistently return true or consistently return false, provided no information used in equals comparisons on the object is modified.

- For any non-null reference value x, x.equals(null) should return false.

Fondamenti di Java

hashCode

equals e hashCode

Programmers should take note that

any class that overrides the Object.equals method must also override the Object.hashCode method

in order to satisfy the general contract for the Object.hashCode method.

In particular, c1.equals(c2) implies that c1.hashCode()==c2.hashCode()

(the vice versa need not be true)

equals e hashCode

c1.equals(c2) => c1.hashCode()==c2.hashCode()

c1.hashCode()==c2.hashCode() ‡> c1.equals(c2)

uguaglianza implica hashCode uguali

diversità di hashCode implica non uguaglianza

equals e hashCode

if (c1.hashCode()!=c2.hashCode())

c1 e c2 diversi

if (c1.hashCode()==c2.hashCode())

per sapere se c1 è uguale a c2

devo usare la equals

E' un meccanismo di "fail quick"

esempio di hashCode()?

"ABBA" => 65+66+66+65 = 262

"ABBB" => 65+66+66+66 = 263

ma

"ABAB" => 65+66+65+66 = 262

ATTENZIONE!

As much as is reasonably practical, the hashCode method defined by class Object does return distinct integers for distinct objects.

(This is typically implemented by converting the internal address of the object into an integer, but this implementation technique is not required by the Java programming language.)

Nel dubbio...

```
public int hashCode() {
      int hash = 0;
      return hash;
}
```

Inefficiente, ma corretto!

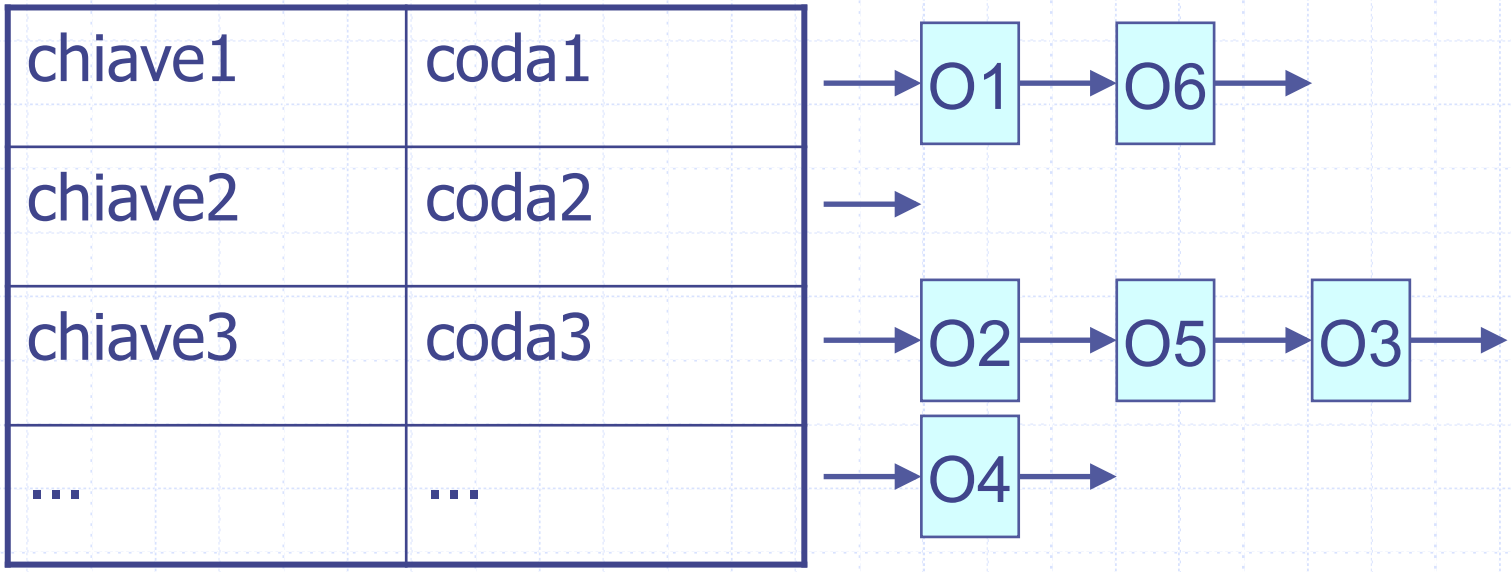
Per approfondimenti:

http://eclipsesource.com/blogs/2012/09/04/the-3-things-you-should-know-about-hashcode/

A che serve hashCode?

Tabelle associative

Dato un oggetto O1 è possibile calcolarne la chiave C1



Esercizio

Definire la classe "Automobile" con variabili di istanza Marca (es. VW), Tipo (Es, Golf), Colore (es. Bianco), Cilindrata (es. 1600), Targa, Proprietario.

Identificare diversi scenari di uso che abbiano differenti scenari di "equals":

- es. uno scenario in cui una Tipo e una Golf siano considerate "uguali", ed uno in cui due Golf di colore diverso sono considerate "uguali"

- implementare la equals per i diversi scenari.

Esercizio

Definire una hashCode corretta. Aggiungere tre diverse istanze di automobili "uguali" a un set, e controllare la dimensione del set ottenuto. Vi torna il valore ottenuto per la dimensione del set?

Definire una hashCode non corretta. Aggiungere tre diverse istanze di automobili "uguali" a un set, e controllare la dimensione del set ottenuto. Vi torna il valore ottenuto per la dimensione del set? Potete spiegare quel che osservate?