University of British Columbia
CPSC 111, Intro to Computation
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Class Design

Lecture 9, Mon Jan 24 2010

borrowing from slides by Paul Carter and Wolfgang Heidrich
http://www.cs.ubc.ca/~tmm/courses/111-10

News

- If you have a midterm conflict with first midterm, let me know by end of day **today** at the latest
  - Mon 2/8 6:30-8pm

Reading Assignments

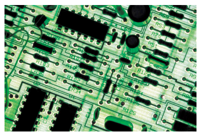
- Chapter 3

Recap: References vs Values

- You copy a CD for your friend. Her dog chews it up. Does that affect your CD?
  - no: different values
  - like primitive types
- You and your friend start eating a slice of cake on one shared plate. You get up to make a cup of tea. Her dog jumps on the table and eats the cake. Does that affect your half of the dessert?
  - yes: both forks reference the same plate
  - like objects

Recap: Abstraction

- Abstraction: process whereby we
  - hide non-essential details
  - provide a view that is relevant
- Often want different layers of abstraction depending on what is relevant



Recap: Encapsulation

- Encapsulation: process whereby
  - inner workings made inaccessible to protect them and maintain their integrity
  - operations can be performed by user only through well-defined interface.
  - aka information hiding
- Cell phone example
  - inner workings encapsulated in hand set
    - cell phone users can't get at them
  - intuitive interface makes using them easy
    - without understanding how they actually work

Recap: Designing `Die` Class

- Blueprint for constructing objects of type `Die`
- Think of manufacturing airplanes or dresses or whatever
  - design one blueprint or pattern
  - manufacture many instances from it
- Consider two viewpoints
  - client programmer: wants to use `Die` object in a program
  - designer: creator of `Die` class

Recap: Designer

- Decide on inner workings
  - implementation of class
- Objects need state
  - attributes that distinguish one instance from another
  - many names for these
    - state variables
    - fields
    - attributes
    - data members
  - what fields should we create for `Die`?

Implementing `Die`

```
/**
   Provides a simple model of a die
   (as in pair of dice).
*/
public class Die
{




}
```

Random Numbers

- `Random` class in `java.util` package
  - `public Random()`
    - Constructor
  - `public float nextFloat()`
    - Returns random number between 0.0 (inclusive) and 1.0 (exclusive)
  - `public int nextInt()`
    - Returns random integer ranging over all possible int values
  - `public int nextInt( int num )`
    - Returns random integer in range 0 to (num-1)

Implementing `Die`

```
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   Provides a simple model of a die
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*/
public class Die
{




}
```

`return` Statement

- Use the `return` statement to specify the return value when implementing a method:

```
int addTwoInts (int a, int b) {
  return a+b;
}
```

- Syntax: `return` *expression*;
- The method stops executing at that point and "returns" to caller.

Implementing `Die`

```
/**
   Provides a simple model of a die
   (as in pair of dice).
*/
public class Die
{




}
```

Information Hiding

- Hide fields from client programmer
  - maintain their integrity
  - allow us flexibility to change them without affecting code written by client programmer
- Parnas' Law:
  - "Only what is hidden can by changed without risk."

Public vs Private

- `public` keyword indicates that something can be referenced from outside object
  - can be seen/used by client programmer
- `private` keyword indicates that something cannot be referenced from outside object
  - cannot be seen/used by client programmer
- Let's fill in public/private for `Die` class

Public vs. Private Example

```
public class Die {
...
  public int roll()
  ...
  private void cheat(int nextRoll)
...
}
```

Public vs. Private Example

```
Die myDie = new Die();

int result = myDie.roll();  // OK
myDie.cheat(6);            //not allowed!
```

Implementing `Die`

```
/**
  Provides a simple model of a die
  (as in pair of dice).
*/
public class Die
{





}
```

Trying It Out!

- **`Die`** class has no main method.
- Best is to write another class that instantiates some objects of your new class and tries them out.
  - Sometimes called a “tester” or “testbench”

Implementing `RollDice`

```
public class RollDice
{
   public static void main ( String [] args)
   {





}
```