University of British Columbia
CPSC 111, Intro to Computation
Jan-Apr 2006
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# Class Design III

**Lecture 8, Tue Jan 31 2006**

based on slides by Paul Carter

http://www.cs.ubc.ca/~tmm/courses/cpsc111-06-spr

## Reading This Week

- Chap 3 (today)
- Re-read Chapter 4.3-4.5 (Thursday)

- reminder - code examples created in class posted by slides and assigned reading

## News

- Assignment 1 due today 5pm
- Wed office hours 11:30-12:30 not 11-12
  - reminder: in X661
- Windows home setup guide posted to WebCT
- Reminders
  - CSLC is available if you need help
  - Check ugrad email account regularly (or forward to active account)
    - grade info sent there

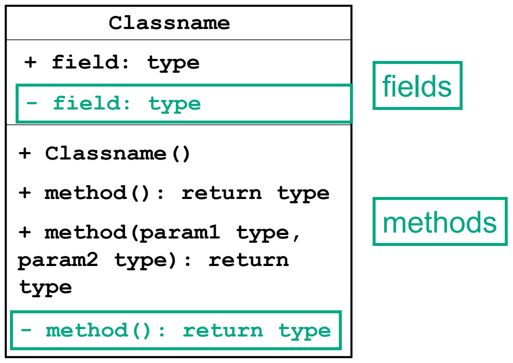
## Exam

- Midterm reminder: Tue Feb 7, 18:30 - 20:00
  - Geography 100 & 200
- Exam conflict: email me today

- DRC: Disability Resource Center
  - academic accomodation for disabilities
  - forms due one week before exam (today!)
  - http://students.ubc.ca/access/drc.cfm

## Correction: UML

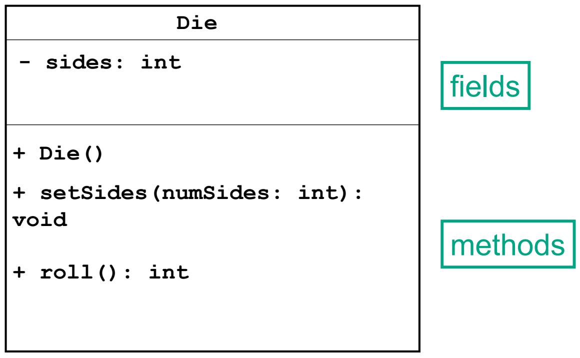
- UML diagram representing class design



```
Classname
----------------------------------
+ field: type
- field: type
----------------------------------
+ Classname()
+ method(): return type
+ method(param1 type,
param2 type): return
type
- method(): return type
```

## Recap: UML

- UML diagram for `Die` class we designed



```
Die
----------------------------------
- sides: int
----------------------------------
+ Die()
+ setSides(numSides: int):
void
+ roll(): int
```

## Objectives

- understand how to design new classes using abstraction and encapsulation
- understand how to implement new classes in Java
- understand how to comment classes using javadoc conventions
- understand how to create documentation using javadoc
- understand how to finish refining code

## Recap: Separation and Modularity

- Design possibilities
  - `Die` and `RollDie` as separate classes
  - one single class that does it all
- Separation allows code re-use through modularity
  - another software design principle
- One module for modeling a die: `Die` class
- Other modules can use die or dice
  - we wrote one, the `RollDice` class
- Modularization also occurs at file level
  - modules stored in different files
  - also makes re-use easier

## Recap: Control Flow Between Modules

- So far, easy to understand control flow: order in which statements are executed
  - march down line by line through file
- Now consider control flow between modules

Client code

```
int rollResult;
myDie.setSides();
rollResult = myDie.roll();
```

Die class methods

```
public int roll()
{
    …
}

public void setSides()
{
    …
}
```

## Key Topic Summary

Borrowed phrasing from Steve Wolfman

- Generalizing from something concrete
  - fancy name: abstraction
- Hiding the guts from the outside
  - fancy name: encapsulation
- Keeping one part from stomping on another
  - fancy name: modularity
- Breaking down a problem
  - fancy name: functional decomposition

## Implementing `Point` and `PointTest`

```
public class Point {







}
```

## Commenting Code

- Conventions
  - explain what classes and methods do
  - plus anywhere that you've done something nonobvious
    - often better to say why than what
      - not useful

        `int wishes = 3; // set wishes to 3`
      - useful

        `int wishes = 3; // follow fairy tale convention`

## `javadoc` Comments

- Specific format for method and class header comments
  - running javadoc program will automatically generate HTML documentation
- Rules
  - `/**` to start, first sentence used for method summary
  - `@param` tag for parameter name and explanation
  - `@return` tag for return value explanation
  - other tags: `@author`, `@version`
  - `*/` to end
- Running

```
% javadoc Die.java
% javadoc *.java
```

## `javadoc` Method Comment Example

```
/**
 Sets the die shape, thus the range of values it can roll.
 @param numSides the number of sides of the die
*/
public void setSides(int numSides) {
  sides = numSides;
}

/**
 Gets the number of sides of the die.
 @return the number of sides of the die
*/
public int getSides() {
  return sides;
}
```

## `javadoc` Class Comment Example

```
/** Die: simulate rolling a die
 * @author: CPSC 111, Section 206, Spring 05-06
 * @version: Jan 31, 2006
 *
 * This is the final Die code. We started on Jan 24,
 * tested and improved in on Jan 26, and did a final
 * cleanup pass on Jan 31.
 */
```

## Cleanup Pass

- Would we hand in our code as it stands?
  - good use of whitespace?
  - well commented?
    - every class, method, parameter, return value
  - clear, descriptive variable naming conventions?
  - constants vs. variables or magic numbers?
  - fields initialized?
  - good structure?
  - follows specification?
- ideal: do as you go
  - commenting first is a great idea!
- acceptable: clean up before declaring victory

## Formal vs. Actual Parameters

- formal parameter: in declaration of class
- actual parameter: passed in when method is called
  - variable names may or may not match
- if parameter is primitive type
  - call by value: value of actual parameter copied into formal parameter when method is called
  - changes made to formal parameter inside method body will not be reflected in actual parameter value outside of method
- if parameter is object: covered later

## Scope

- Fields of class are have class scope: accessible to any class member
  - in **`Die`** and **`Point`** class implementation, fields accessed by all class methods
- Parameters of method and any variables declared within body of method have local scope: accessible only to that method
  - not to any other part of your code
- In general, scope of a variable is block of code within which it is declared
  - block of code is defined by braces { }