Course Overview / Review

Recall the software life cycle:

Analysis
- define the problem
- develop program specifications

Design

Coding

Testing
- black box vs white box
- test coverage
- test cases: positive, negative, boundary

Deployment (or operation or maintenance)
- bug fixes
- add new features

Design

Choose classes, methods, data, etc.

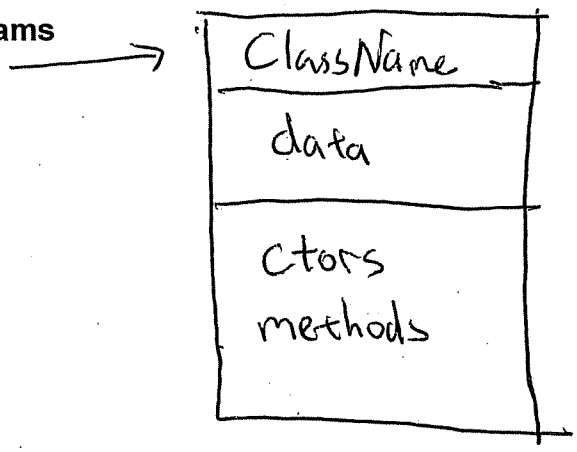
Recognize relationships between classes

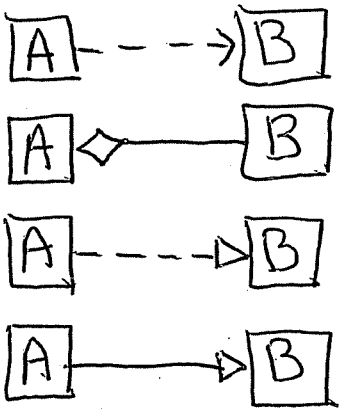
Goals:

- **maximize cohesion**
- **minimize coupling**

Describing the design using UML diagrams

- **class diagrams**
- **class relationship diagrams**





Coding

- Edit - compile - run cycle
- Variables
- Data types: primitive vs reference
- Sending messages (calling methods)
- Defining classes
  - data members
  - constructors
  - methods
  - visibility modifiers
  - class vs instance
- Control-flow constructs
  - selection statements: `if`, `if-else`, `switch`
  - repetition statements: `for`, `while`, `do-while`
- Building connections between classes
  - interfaces
  - inheritance – is-a relationships
  - polymorphism
- Handling problems
  - building in checks for "bad" input
  - exceptions
    - defining
    - throwing
    - handling using `try-catch` or by passing down the call stack
    - checked vs unchecked exceptions
- Input and output
  - console
  - file – text based

Three Themes

Compatibility

Accessibility

Compile-time vs run-time

Compatibility – assignment & casting

primitive types double f = 7;

but not ~~int x = 3.14;~~ → int x = (int)3.14;

reference types

interfaces: TaskList list = anything that implements TaskList
(TaskList: interface)

inheritance: Super t = subClass value
Vehicle t = new Car();

casting Car c = (Car)t; → use instanceof before casting to avoid ClassCastException

Accessibility public vs private
static vs non-static
of inherited data & methods

Compile-time vs Runtime

Compile-time errors vs run-time errors

polymorphism
compile-time → type of var determines what can be done with the var
run-time → type of object determines which code to execute

exceptions
compile-time → must handle checked exceptions
run-time → how an exception gets handled

What's next?

CS major

need 302, 367, and 240 to declare

CS certificate

6 courses:

- 302, 367
- up to 2 other under -400 level courses
- at least 2 400+ level classes

See `http://www.cs.wisc.edu/ugac/` for full details

What's next next?

CS 367: Introduction to Data Structures and Algorithms

Data structures

- **stacks**
- **queues**
- **priority queues**
- **linked lists**
- **trees**
- **graphs**

Algorithms

- **recursion**
- **searching**
- **sorting**
- **hashing**

Analysis of data structures and algorithms

- **complexity**

Example: array of addresses

look up an address - how long does it take

Unsorted

best case: 1 step
worst case: N steps (N = size of array)
avg case: N/2 steps

Sorted

best case: 1 step
worst case: on the order of $\log_2 N$ steps
avg case: " " " " " "