



## COMP2511

### Object-Oriented Design and Programming

#### Object-Oriented Programming

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## OOP vs ADTs

- What is an abstract data type?
- What is a class?
- How is a class different from an ADT?



## Today's Lecture

- Inheritance
- OOP vs ADTs
- Dynamic Binding
- Liskov Substitution Principle
- Equality and Cloning



## OOP vs ADTs

- Processing more distributed
- Harder to access multiple data items
- Allow multiple class implementations
- Harder to add new operations
- Can extend classes by inheritance
- Harder to verify correctness



## Dynamic Binding

### ■ Consider

- ◆ Employee  $e$  = new Manager("Brad", 100000);

### ■ What happens with

- ◆  $e.toString()$ ;



## Liskov Substitution Principle

### ■ Formal (but possibly wrong) version

- ◆  $s$  is a subclass of  $t$  if every method of  $s$  can be defined in terms of methods of  $t$



## Liskov Substitution Principle

### ■ Informal (suitable to Java?) version

- ◆ A method of class  $t$  "should work" when called on an object that is actually a subclass of  $t$

### ■ How to reason with historical properties

- ◆ ... that may not hold for subclasses



## LSP and Inheritance

### ■ Can Square extend Rectangle?

### ■ Can Circle extend Point?



## Equality and Cloning

- Can there be two Employees with the same name and salary?
- Can a Manager be equal to an Employee?
- If an object's fields are changed, should the fields of its clone change too?



## Next Week

- Design/Programming by Contract
- JUnit and Test Driven Development