

2 Understanding class definitions

Looking inside classes

Main concepts to be covered

- instance variables
- constructors
- methods
- parameters
- assignment statements
- conditional statements

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Lecture 2 2

Ticket machines - an external view

- Exploring the behavior of a typical ticket machine.
 - Use the *naive-ticket-machine* project.
 - Machines supply tickets of a fixed price.
 - How is that price determined?
 - How is 'money' entered into a machine?
 - How does a machine keep track of the money that is entered?

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Ticket machines - an internal view

- Interacting with an object gives us clues about its behavior.
- Looking inside allows us to determine how that behavior is provided or implemented.
- All Java classes have a similar-looking internal view.

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Basic class structure

```
public class TicketMachine
{
    Inner part of the class omitted.
}
```

The outer wrapper of TicketMachine

```
public class ClassName
{
    Instance variables
    Constructors
    Methods
}
```

The contents of a class

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Instance variables

- Instance variables store values for an object.
- They are also known as *fields*.
- Use the *Inspect* option to view an object's instance variables.
- Instance variables define the state of an object.

```
public class TicketMachine
{
    private int price;
    private int balance;
    private int total;
    Further details omitted.
}
```

visibility modifier type variable name
private int price;

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Constructors

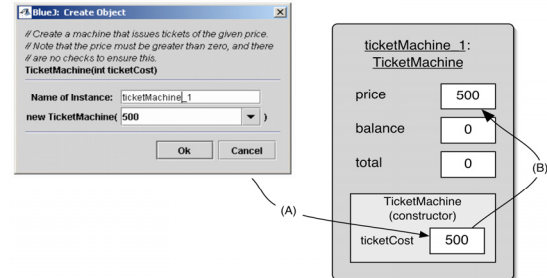
- Constructors initialize an object.
- They have the same name as their class.
- They store initial values into the instance variables.
- They often receive external parameter values for this.

```
public TicketMachine(int ticketCost)
{
    price = ticketCost;
    balance = 0;
    total = 0;
}
```

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Passing data via parameters



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Assignment

- Values are stored into instance variables (and other variables) via assignment statements:
 - *variable = expression;*
 - `price = ticketCost;`
- A variable stores a single value, so any previous value is lost.

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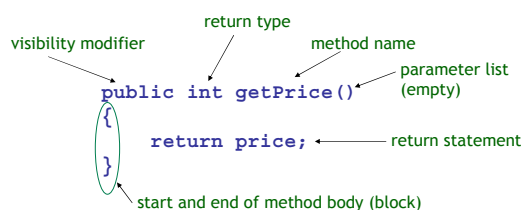
Accessor methods

- Methods implement the behavior of objects.
- Accessors provide information about an object.
- Methods have a structure consisting of a header and a body.
- The header defines the method's *signature*.
`public int getPrice()`
- The body encloses the method's statements.

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Accessor methods



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Mutator methods

- Have a similar method structure: header and body.
- Used to *mutate* (i.e., change) an object's state.
- Achieved through changing the value of one or more instance variables.
 - Typically contain assignment statements.
 - Typically receive parameters.

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Mutator methods

visibility modifier return type method name parameter

```
public void insertMoney(int amount)
{
    balance = balance + amount;
}
```

instance variable being mutated assignment statement

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Printing from methods

```
public void printTicket()
{
    // Simulate the printing of a ticket.
    System.out.println("#####");
    System.out.println("# The BlueJ Line");
    System.out.println("# Ticket");
    System.out.println("# " + price + " cents.");
    System.out.println("#####");
    System.out.println();

    // Update the total collected with the balance.
    total = total + balance;
    // Clear the balance.
    balance = 0;
}
```

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Reflecting on the ticket machines

- Their behavior is inadequate in several ways:
 - No checks on the amounts entered.
 - No refunds.
 - No checks for a sensible initialization.
- How can we do better?
 - We need more sophisticated behavior.

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Making choices

```
public void insertMoney(int amount)
{
    if (amount > 0) {
        balance = balance + amount;
    }
    else {
        System.out.println("Use a positive amount: " +
            amount);
    }
}
```

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Making choices

'if' keyword boolean condition to be tested actions if condition is true

```
if (perform some test) {
    Do these statements if the test gave a true result
}
else {
    Do these statements if the test gave a false result
}
```

'else' keyword actions if condition is false

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Local variables

- Instance variables are one sort of variable.
 - They store values through the life of an object.
 - They are accessible throughout the class.
- Methods can include shorter-lived *local* variables.
 - They exist only as long as the method is being executed.
 - They are only accessible from within the method.

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Local variables

```
public int refundBalance()  
{  
    int amountToRefund;  
    amountToRefund = balance;  
    balance = 0;  
    return amountToRefund;  
}
```

No visibility modifier

A local variable

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Review

- Class bodies contain instance variables, constructors and methods.
- Instance variables store values that determine an object's state.
- Constructors initialize objects.
- Methods implement the behavior of objects.

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Review

- Instance variables, parameters and local variables are all variables.
- Instance variables persist for the lifetime of an object.
- Parameters are used to receive values into a constructor or method.
- Local variables are used for short-lived temporary storage.

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Review

- Objects can make decisions via conditional (if) statements.
- A true or false test allows one of two alternative courses of actions to be taken.

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