Decisions

CSE 142, Summer 2002

Computer Programming 1

http://www.cs.washington.edu/education/courses/142/02su/

Readings and References

- Reading
  - » Chapter 6, *An Introduction to Programming and Object Oriented Design using Java*, by Niño and Hosch
  - » Chapter 11, *Introduction to Programming in Java*, Dugan

Implementing Interesting Behavior

- We need to be able to make decisions in order to have objects behave in interesting ways
  - » Has the Shape moved to the edge of the window?
  - » Did the user supply any arguments to the program?
  - » Is the display window visible?
  - » How many shapes are moving around on the screen?
- The **`if`** statement is our primary tool for changing the flow of control in the program

Sequences and Blocks

```
/* Simple sequence */
statement1;
statement2;
/* Block - can replace a single statement anywhere */
{
   statement1;
   statement2;
}
```

The `if` statement

```
if (condition) {
    this block is executed if the condition is true
} else {
    this block is executed if the condition is false
}
```

- The condition is a logical expression that is evaluated to be **`true`** or **`false`**, depending on the values in the expression and the operators

operators that produce boolean results

- All of the normal arithmetic comparison operators are available

`>`	:	greater than
`<`	:	less than
`>=`	:	greater than or equal
`<=`	:	less than or equal
`==`	:	equal
`!=`	:	not equal

`BooleanDemo.java`

examples

- numeric comparisons are extremely common

```
if (count == limit) {
   messageDialog.warn("count has reached limit");
}
```

- methods can return boolean values too

```
if (arg.equals("green")) {
  myColor = Color.green;
} else {
  myColor = defaultColor;
}
```


Compound expressions

- We can combine various logical expressions together to make one larger expression

```
if (arg != null && args.equals("begin")) {
   process the beginning of something …
}
```

- There are operators for "and", "or" and "not"

`&&`	**:**	**and**
`||`	**:**	**or**
`!`	**:**	**not**

examples

- the "not" operator can be handy for clarity in some cases, but it can also be confusing, so use carefully

```
if (!ready) {
    messageDialog.warn("system not ready");
}
```

- the **&&** and || operators are "shortcut" operators
  - » they stop evaluation as soon as the logical condition is satisfied

```
if (arg != null && arg.equals("green")) {
   myColor = Color.green;
}
```


Use braces and parentheses liberally

- Better safe than sorry
  - » Braces surround a block of code, even one line
  - » Parentheses surround parts of an expression

```
if ((a==b) && ((c+d) == e)) {
  state.advance(a);
} else {
  state.retreat(e);
}
```


multiple cases

- You can chain **if** statements together to select one of several possibilities

```
if (arg.equals("green")) {
   myColor = Color.green;
} else if (arg.equals("blue")) {
   myColor = Color.blue;
} else {
   myColor = defaultColor;
}
```


boolean expressions and variables

- If you find yourself doing something like this

```
if (pageNumber == lastPage) {
  allDone = true;
} else {
  allDone = false;
}
```

- there is an easier way

```
allDone = (pageNumber == lastPage);
```

boolean variable boolean expression

conditional operator (3 operands)

- If you find yourself doing something like this

```
if (score < 0) {
  color = Color.red;
} else {
  color = Color.black;
}
```

- there is an easier way

```
color = (score < 0) ? Color.red : Color.black;
```

variable

boolean expression

use this value if expression is true

use this value if expression is false

returning a boolean value

- It is often convenient to return a boolean expression from a method

```
public boolean isEmpty() {
  return (this.itemCount == 0);
}
```

itemCount is an instance variable in this example

comparing floating point numbers

- Never, never test for exact equality of two floating point numbers using ==
  - » double and float values are approximate values which may vary slightly way out to the right of the decimal point
  - » 1.00000000000000000000000001
  - » 1.00000000000000000000000002
  - » Are they equal?

    NO. But probably close enough for our purposes ...

floating point compare

- check for exceeding a limit

```
if (xVal >= maxX) { …
if (yVal < 0.0) { …
```

- check for difference less than some small amount

```
double epsilon = 0.00001;
if (Math.abs(xVal-xGoal) < epsilon) {...
```

switch statement

```
switch (integral type) {

   case value1 : {
      statement1;
      break; //Break out of switch
   }
   case value2 : {
      statement2;
      break;
   }
   default : {
      statement3;
   }

}
```

there are lots of limitations and potential bugs in using this, so be careful!

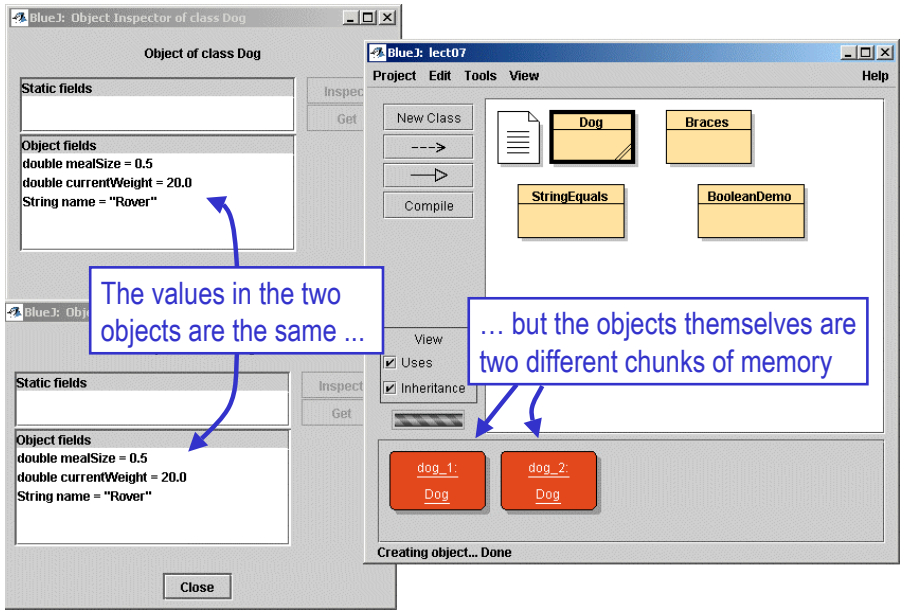
comparing objects for "equality"

- so far we've been comparing mostly simple values

```
if (count == limit) {
   messageDialog.warn("count has reached limit");
}
```

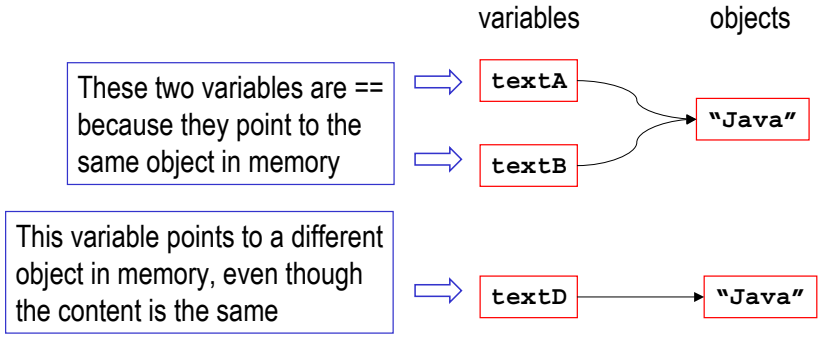
- but the situation is more complex with objects
  - » when are two String objects equal?
  - » when are two Dog objects equal?

StringEquals.java, Dog.java



== operator tests for literal equality

- Two object references are == if they point to exactly the same object



equals() method tests for content equality

- Two object references are equal if the content is deemed to be the same