More Loops, Ifs, and math

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CMPSCI 121, Spring 2012

Introduction to Problem Solving with Computers

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Assignments: Check OWL

Requirement Status	Assignment	Due Date
R	✔ Chapter 4 Exercises	2/17/2012 11:30 PM
R	Prefix	2/21/2012 11:30 PM
R	✔ eBook - Chapter 5: Methods	2/22/2012 11:30 PM
R	Chapter 5 Exercises	2/23/2012 11:30 PM

Today

- More Math
  - random numbers
  - other functions
- For loops
- If statements
- Fun with graphics

Converting between types

```
int i=3;
double d;
d=i;    // No problem.
d=3.5;
i=d;    // Java doesn't like.
i= (int) d;   // This is OK.
```

Some basic math

- ```
  int j=3;
  ```
- ```
  j=j+1;
  ```
- ```
  j=j*2;
  ```
- ```
  j=j/j;
  ```
- ```
  j=10-j;
  ```

Shortcuts

- Instead of
  - `j=j+1;`
  - `j++;`

Shortcuts

- Instead of
  - `j=j-1;`
  - `j--;`

Shortcuts

- Instead of
  - `j=j+5;`
  - `j+=5;`

Shortcuts

- Instead of
  - `j=j-7;`
  - `j-=7;`

Shortcuts

- Instead of
  - `j=j*7;`
  - `j*=7;`

The danger of i++

- Yesterday we say weird behavior from the following code:

```
int i=3;
i = (i++);

// Strangely, i still has a
value of 3!
```

Moral of the story

- Do not use i++ with an assignment, just let it stand on it's own.

static methods

- String s="Erik";
- char letter=s.charAt(1);

static methods

- String s="Erik";
- char letter=s.charAt(1);

- What about this:

```
charAt(7);          // Which string are
                    // we talking about?
```

static methods

- Most methods in Java work on a specific *instance* of an object, but not all of them.

- Example

  Math.sqrt(2);   // The information
                     // needed is in the
                     // argument.

- Why not write:

  2.sqrt();

- Why not write:

2.sqrt();

Because 2 is not an object, so it cannot be used to call a method.

static method

- nameOfClass.methodName();

- Math.sqrt(2);
- Math.random();
- Math.exp(3);

Math.random();

- Gives number between 0 and 1.
  - Can be a 0, but can't be a 1.

Why are random numbers so useful?

- Simulation: solve math problems that are otherwise too difficult.

```
 1 public class HalfTest{
 2   public static void main(String[] args){
 3     int runs = 1000;
 4     int count = 0;
 5     for(int j = 0; j < runs; j++){
 6       if (Math.random() < .5) count++;
 7     }
 8     System.out.println("count = " + count);
 9     System.out.println("fraction below .5 = " + ((double)count/runs));
10   }
11 }
```

Throwing dice

```java
public class SimpleDice{

  public int tossDie(){
    return(1+ (int)(Math.random()*6));
  }


  public int throwDice(){
    return (tossDie() +  tossDie());
  }
}
```

DrJava

For loops

```java
for(int j = 1; j < 100; j = j*4){
  System.out.print(j + " ");
}
```

For loops

```
for(int j = 1; j != 100; j = j*4){
    System.out.print(j + " ");
}
```

For loops

```
for(int k = 2; k <= 20 ; k = k + 3){
    System.out.print(k + " ");
}
```

For loops

```java
for(int k = 1; k <= 20 ; k++){
    if (k % 3 == 2)
        System.out.print(k + " ");
}
```

And here's a third way:

```java
for(int k = 0; k < 7 ; k++){
    System.out.print((3*k + 2) + " ");
}
```

DrJava Line Drawing. How to try it yourself.

- I did a variety of line-drawing examples in DrJava. All of the actual drawing occurs in a file called TryoutPanel.java. The code for one of the examples is on the next slide. The code that you can try changing is below a comment that says // CODE YOU CAN CHANGE IS BELOW HERE.

- You will also need a file called WindowDriver.java. Just copy the code (which is on the slide right after the TryoutPanel.java slide) and save it as WindowDriver.java.

- If you want to try the program, make sure you save both files, compile both files, and then make sure you select (in the lefthand panel), the file WindowDriver.java before you click run. Otherwise DrJava will try to run TryoutPanel.java, which doesn't have a "main" method.

TryoutPanel.java

```java
import java.awt.*;
import javax.swing.*;

public class TryoutPanel extends JPanel{
    private Color myColor;
    public TryoutPanel(Color c){
        myColor = c;
    }
    public void paintComponent(Graphics g){
        super.paintComponent(g);
        setForeground(myColor);

        // CODE YOU CAN CHANGE IS BELOW HERE.
        int oldx=0,oldy=0;
        for (int i=0; i<10; i++) {
            int newx=(int) (Math.random()*600);
            int newy=(int) (Math.random()*400);
            g.drawLine(oldx,oldy,newx,newy);
            oldx=newx;
            oldy=newy;
        }
        // CODE YOU CAN CHANGE IS ABOVE HERE.

    }
}
```

WindowDriver.java

- `import java.awt.*;`

- `public class WindowDriver{`

- `  public static void main(String[] args){`
- `    DisplayWindow d = new DisplayWindow();`
- `    TryoutPanel p = new TryoutPanel(Color.blue);`
- `    d.addPanel(p);`
- `    d.showFrame();`
- `  }`
- `}`

End for today