CS 121 – Intro to Programming:Java - Lecture 5

Announcements

Course home page:
http://twiki-edlab.cs.umass.edu/bin/view/Moll121/WebHome

Third programming assignment now up, due in Friday.
Program 2 not graded yet
OWL assignments due as indicated

MidTerm: Monday, 10/17, 615-715, Thompson 104
(I’ll say more later..)

Office hours - now posted; held in LGRT 220; Lab time in 213 as indicated
Arithmetic and Operator Precedence

Key features:

1) +, -, * behave in the standard way. Division / is different

2) $5/3 = 1$ (but $5.0/3 = 5/3.0 = 1.6666$)

3) In the absence of parentheses, *, /, have higher precedence than +, - This means that $(3 + 5 * 2) = 13$

4) The remainder operator is %: $10 \% 3 = 1$
Conditional Statements in Java

Conditional statements and looping statements are flow of control constructions

At a primitive level, Java programs are made up of statements, and it often makes sense to

1) have statements repeat in a systematic way; and

2) have statements execute conditionally
if (n % 2 == 0) System.out.println(“n is even”);

Lots going on here: statement says: “if the remainder after dividing n by 2 is equal to (==) 0, then report that n is an even number

if (n % 2 != 0) System.out.println(“n is odd”);

    else System.out.println(“n is even”);

An important point: (n % 2 == 0) is a boolean expression (returns a boolean value) -- a boolean must go into the test slot of an if stmt!
The for loop

for(int j = 0; j < 100; j++){
    // j++ means -> j = j + 1
    System.out.println("I will not talk in class");
}

for(int j = 3; j < 12; j = j + 2){
    System.out.println(j);
} // prints what?

for(int j = 30; j > 20; j = j - 2){
    System.out.println(j);
} // prints what?
for(int j = 3; j < 12; j = j*j){
    System.out.println(j);}    // prints what?

for(int j = 3; j != 12; j = j + 2){
    System.out.println(j);}    // prints what?
public class CubeTester{

public static void main(String[] args){
    SumOfCubes C = new SumOfCubes();
    int sum,cur,ones,tens, hundreds;
    for(int j = 100; j < 1000; j++)
        if (C.cubeSum(j) == j) System.out.println(j);
}
}
class SumOfCubes{

    public int cubeSum(int k){
        int sum,cur,ones,tens, hundreds;
        cur = k;
        ones = cur % 10;
        cur = cur / 10;
        tens = cur % 10;
        cur = cur / 10;
        hundreds = cur % 10;
        return (cube(ones) + cube(tens) + cube(hundreds));
    }

    public int cube(int k){
        return (k*k*k);
    }
}

We’re interested in creating a class that makes forming patterns of rows of stars or other symbols easy - patterns like these:

***********
***********
***********
***********
***********
***********
***********

or

*
**
***
****
*****
******
public class Rows{

    char sym;
    int width;

    public Rows(char s, int w){
        sym = s;
        width = w;
    }

    public char getSym(){
        return sym;
    }
    public int getWidth(){
        return width;
    }

    final char BLANK = ' '; // a constant!
public void makeRow(){
    for(int j = 0; j < width; j++)
        System.out.print(sym);
}

public void varyRow(int k){
    for(int j = 0; j < k; j++)
        System.out.print(sym);
}

public void spacedRow(){
    for(int j = 0; j < width; j++)
        if (j % 2 == 0) System.out.print(sym);
        else System.out.print(BLANK);
}

    public void newLine(){System.out.println();}
public class RowTester{
    public static void main(String[] args){
        Rows r = new Rows('*',5);
        for(int j = 0; j < 5; j++){
            r.makeRow();
            r.newLine();
        }
        for(int j = 0; j < 5; j++){
            r.varyRow(2+j);
            r.newLine();
        }
        for(int j = 0; j < 5; j++){
            r.spacedRow();
            r.newLine();
        }
    }
}
The Math class and static methods

- Not all methods are invoked by objects.
- The Math class, for example
  - Doesn’t make sense to attach a function like sqrt or max to an object
- All Math class functions are static, Math.sqrt() etc.
- One unusual function in the class:
  
  Math.random()

Gives a random value r, 0 <= r < 1

What does random mean? Basically: generating many in a row will reveal no pattern…
Area of quarter circle = $\pi/4$

Length = 1.0 - the unit square

Area of circle = $\pi \times 1.0 \times 1.0 = \pi = 3.14159$
public class RandomPi{
    public static void main(String[] args){
        Scanner s = new Scanner(System.in);
        int trials = 0; int inside = 0;
        System.out.println("Enter number of trials");
        trials = s.nextInt();
        System.out.println("Trials:" + trials);
        double x,y;
        for(int j = 0; j < trials; j++){
            x = Math.random(); y = Math.random();
            if ((x*x + y*y) < 1) inside++;
        }
        System.out.println("pi guess:" +
            (double)(4*inside)/trials);
    }
}
Enter number of trials
Trials: 100000
pi guess: 3.14116

Enter number of trials
Trials: 10000000
pi guess: 3.1415424