More Loops

Sep 27

for, nested loops

While loops

- Common thing to do with loops is

  - initialize a variable

  - Repeat

    - Check to make sure the variable is OK

    - Do something interesting

    - Change the variable

- This is so common there is another loop to do much of this in one line

compute $\text{sum}_{i=0..10}(2^i)$

"For" loop

```
for (INIT ; CONDITION ; UPDATE) {
    BODY
}
```

For-loops are preferred when you have the init/condition/body/update pattern, and/or when you know how many times you want the thing to run

compute $\text{sum}_{i=0..10}(2^i)$

Compute the nth Fibonacci number

Questions

```
for (int i = 0; i < 3; i++) {
    System.out.println("hi");
}
```

How many times is "hi" printed?

```
for (int i = 0; i < 3; i++) {
    int j=0;
    j = j+i;
    System.out.println(j);
}
```

What is printed?

```
int x = 1;
for (int i = 3; i <= 6; i++) {
    x *= i;   // this is shorthand for x = x*i
}
int jj = i;
```

What is the final value of x?
Does this even compile? If not, fix!

Chalkboards

- Compute the average of 1000 randomly drawn numbers from the range 0..1.0

- Write twice:

  - while loop

  - for loop

- What do you expect to be the answer?

- Recall to get a random number in the range 0..<1.0

  ```
  double rDoub = Math.random();
  ```

Loops in loops

- Question: is the random number generator really good?

  - One answer, do not just compute the sum of 1000

    - Instead, compute the sum of 1000, 1000 times!

    - If random is good, then all 1000 should be similar.

  - How??

    - Loop within a loop

Prime Numbers

- First, is a number prime?

- The find all primes less than 100?

  - This will require nested loops!

Lots of Loops

Things to worry about

- What changes in each loop

- How does the inner loop depend on the outer loop

- How is the work done in the inner loop affected by the outer loop

  - Resetting variables