CS 112 Spring 2017 Midterm Announcement

CAS CS 112 midterm is on Thursday, February 23, in class. Please bring a writing instrument and a spare. The exam is closed-book. No calculators or other equipment is allowed. Everything through Thursday February 16 inclusive is fair game on the exam. The following are some sample problems for you to practice with.

**Problem 1.** Your implementation of Selection Sort takes 3 seconds to sort all the first-year BU undergraduates alphabetically. Roughly how long will take to sort all BU undergraduates (assume there are four times as many total undergraduates as there are first-years).

**Problem 2.** Consider the array \{4, 1, 2, 3, 6, 5, 8, 7\}. Show the state of this array at the end of each iteration of the outer loop of Bubble Sort.

**Problem 3.** Indent this code segment correctly (indicate next to each line how many times it should be indented relative to the first line by putting the number 0, 1, 2, 3, ..., next to it)

```java
if (x=1)
y=2;
z=3;
for (int i = 0; i<z; i++) {
  while (x<10)
    x++;
}
if (a=2) {
  b=5;
c=6;
}
```

**Problem 4.** What will main print?

```java
public class Foo {
  public int i;
  Foo (int x) {
    i=x;
  }
}

public class Driver {
  public static void increment (Foo f) {
    f.i++;
  }

  public static void main (String [] args) {
    int i = 5;
    Foo f = new Foo (i);
    increment (f);
    System.out.println(f.i);
  }
}
```
Problem 5. What does mystery2 compute on an input $n$?

```java
public static int mystery2(int n) {
    int begin = 0;
    int end = n+1;
    while (begin+1<end) {
        int mid = (begin+end)/2;
        if(112*mid<=n) {
            begin = mid;
        } else {
            end = mid;
        }
    }
    return begin;
}
```

Problem 6. Consider merge sort for the array {6, 3, 5, 2, 1, 4, 8, 7}. How many comparisons will take place during the last invocation of `merge`?

Problem 7. Consider an array $a$ of positive integers.

```java
for (int i = 0; i<a.length-1; i++) {
    for (int j = i+1; j<a.length; j++) {
        if (a[i]==a[j]) return a[i];
    }
}
return -1;
```

What does this code segment do? How long does it take? How can you make it faster, using something you learned in class?