CS11 Part 1: Practice Questions
Basic Java, Control Flow, Looping, Methods, Arrays

1. Write a program that reads integers from the keyboard until a user enters zero. Have the program print
   - the sum of all the numbers entered,
   - the largest number entered,
   - the smallest number entered.

   Do not store the values in an array.

2. Show the for statement for a loop that counts from 1000 to 0 by −2.

3. What does the following code fragment print?

   ```java
   for(int i = 0; i<10; i++) {
       System.out.print(i + " ");
       if((i%2) == 0) continue;
       System.out.println();
   }
   ```

4. What is an infinite loop?

5. Show how a short-circuit AND operator (&&) can be used to prevent a divide-by-zero error.

6. Write a program that finds all of the prime numbers between 2 and 100. (Write the entire program.)

7. Given this output,

   ```
   One
   Two
   Three
   ```

   show the (single) println( ) statement that would produce it.

8. Rewrite the following code as indicated:
   (a) use a for loop instead of the while loop

   ```java
   int i = 1;
   while ( i <= 10 ) {
       if (i < 5 && i != 2 )
           System.out.println("X");
       i++;
   }
   ```

   (b) use a while loop instead of the for loop

   ```java
   int minutes;
   for ( minutes = 10; minutes > 0 ; minutes-- ) {
       System.out.println("You have " + minutes + " minutes left");
   }
   ```

   (c) use a switch statement instead of the if statement

   ```java
   //Find interest rate based on the number of years
   if (numOfYears == 7 )
       annualInterestRate = 7.25;
   else if (numOfYears == 15 )
       annualInterestRate = 8.50;
   ```
else if (numOfYears == 30 )
    annualInterestRate = 9.00;
else
    System.out.println("Wrong number of years");

9. Answer the following multiple choice questions (there might be more than one correct answer):

(a) When you invoke a method with a parameter, the value of the argument is passed to the parameter. This is referred to as ________.
   i. pass by name
   ii. pass by value
   iii. pass by reference
   iv. method invocation

(b) Analyze the following code.

```java
int x = 1;
while ( x > 0 && x < 100 )
    System.out.println(x++);
```
   i. The loop runs forever.
   ii. The code does not compile because the loop body is not in the braces.
   iii. The code does not compile because `0 < x && x < 100` does not use parentheses properly.
   iv. The numbers 1 to 99 are displayed.
   v. The numbers 2 to 100 are displayed.

(c) Consider the following code fragment:

```java
int [] list = new int[10];
for (int i = 0; i < list.length; i++) {
    list[i] = (int)(Math.random() * 10);
}
```
Which of the following statements is/are true?
   i. `list.length` must be replaced by 10
   ii. The loop body will execute 10 times, filling up the array with random numbers.
   iii. The loop body will execute 10 times, filling up the array with zeros.
   iv. The code has a runtime error indicating that the array is out of bound.

(d) What is the value in `count` after the following loop is executed?

```java
int count = 0;
do {
    System.out.println("Welcome to Java");
} while (count++ < 9);
System.out.println(count);
```
   i. 11
   ii. 0
   iii. 9
   iv. 8
   v. 10

(e) What is the value of `x` after the following statements?

```java
float x;
x = 15/4;
```
   i. 3.75
   ii. 4.0
   iii. 3.0
   iv. 60
(f) Which of the following expression yields an integer between 0 and 100, inclusive?
   i. (int)(Math.random() * 100 + 1)
   ii. (int)(Math.random() * 101)
   iii. (int)(Math.random() * 100)
   iv. (int)(Math.random() * 100) + 1
   v. (int)(Math.random() * 101) + 1

(g) A variable defined inside a method is referred to as ________.
   i. a local variable
   ii. a block variable
   iii. a global variable
   iv. a method variable

(h) Each time a method is invoked, the system stores parameters and local variables in an area of memory, known as ________, which stores elements in last-in first-out fashion.
   i. storage area
   ii. a heap
   iii. a stack
   iv. an array

(i) What is the result of 45 / 4?
   i. 11
   ii. 12
   iii. 10
   iv. 11.25

10. Write a complete Java program that prompts the user to enter an integer. If the number is a multiple of 5, print HiFive. If the number is divisible by 2 or 3, print New York, otherwise do not print anything.

Here are the sample runs:

```
Enter an integer: 6
New York
```
```
Enter an integer: 15
HiFive New York
```
```
Enter an integer: 25
HiFive
```
```
Enter an integer: 17
```

11. Write a loop that computes the following sum. (No need to write a complete program)

\[
\frac{1}{1} + \frac{99}{2} + \frac{98}{3} + \ldots + \frac{3}{98} + \frac{2}{99} + \frac{1}{100}
\]

12. What is the output of the following program lines when they are embedded in a correct Java program.

(a) Suppose the input is 2 3 4 5 0. What is the output of the following code?

```java
import java.util.Scanner;

public class Test {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        int number, max;
        number = input.nextInt();
        max = number;
```
13. Identify and correct the error(s) and/or problems, if any, in each of the following code fragments (assume that they are embedded in otherwise correct Java programs).

(a)
```java
int answer = 1;
Scanner input = new Scanner(System.in);
while ( answer = 1 ) {
    System.out.print("Do you want to play again? \n" + 
            "[type 1 for yes, and 0 for no]\n");
    answer = input.nextInt();
}
System.out.println("Thank you for playing!");
```

(b)
```java
final int NUMBER_OF_ROLLS = 10000;
int face;
for ( int roll = 1, roll <= NUMBER_OF_ROLLS, roll++ )
{
    // random number from 1 to 6
    face = 1 + (int)(Math.random() * 6);
}
```

(c)
```java
public class Test {
    public static void method( int x ) {
        //do something here
    }
    public static void method (int y ) {
        //do something else here
    }
}
```

14. Write a program that prompts the user to enter an integer \( n \) (assume \( n \geq 2 \)) and displays its largest factor other than itself.

15. Write a method that given an integer determines if it is even (returns \texttt{true} if it is, \texttt{false} otherwise). Make sure to use meaningful names and document the method.
16. Write a method that given a positive integer computes the sum of its digits. Your method should verify that the parameter passed to it is a positive number.
   HINT: you will need to use the modulus, %, operator. For example to extract the last digit of 6582, you can use 6582%10 to obtain 2.

17. Write a method that given three real numbers, prints them to standard output from smallest to largest.

18. Write a method that computes the area of a regular pentagon given the length of its side. The formula for the area of a pentagon is

\[ \text{Area} = \frac{5 \times s^2}{4 \times \tan \left( \frac{\pi}{5} \right)} \]

19. What is the output of the following program lines when they are embedded in a correct program and i is of type int and initialized as in the options listed below?

```java
int i = _____; // line to be replaced
switch (i)
{
    case 0: i = 15; break;
    case 1: i = 5*i;
    case 2: i = -i; break;
    case 3: i = 40;
    default: i = 0; break;
}
System.out.println( i );
```

(a) int i = 0;
(b) int i = 1;
(c) int i = 3;
(d) int i = 4;

20. Write a method that given an integer n, returns a random number between \(-n\) and \(n\).

21. Write a method that, given two sorted arrays of integers, merges the two arrays into a single sorted array that is returned.

22. Write a method that, given an array of integers, computes the sum of every other number (starting at the zero'th index) and returns true if the sum is divisible by 10 and false otherwise.

23. What is the output of the following program lines when they are embedded in a correct Java program.

```java
public class Test {
    public static void main(String[] args) {
        int number = 0;
        int[] numbers = new int[1];
        numbers[0] = 0;
        m(number, numbers);
        System.out.println("number is "+ number + " and numbers[0] is "+ numbers[0]);
    }

    public static void m(int x, int[] y) {
        x = 3;
    }
}
```
24. Write the following method that returns true if the list is already sorted in increasing order and false if it is not sorted.

```java
static boolean isSorted(int[] list)
```

25. Write a method that given a String s as a parameter, computes and returns the reverse of s.

26. Write a method that given a list of floating point numbers determines if a particular value is on the list. Your method should return the location of the item if it is found, or -1 if it is not found. Use the following method header:

```java
public static int find(double[] list, double key)
```

Use the searching algorithm of your choice.