CS101 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;
```

```java
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)

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

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
1 import java.util.Scanner;
2
3 public class Test {
4   public static void main(String[] args) {
5
6     Scanner input = new Scanner(System.in);
7     int number, max;
8     number = input.nextInt();
9     max = number;
```

```
10
11      while (number != 0) {
12        number = input.nextInt();
13        if (number > max)
14            max = number;
15      }
16
17      System.out.println("max is " + max);
18      System.out.println("number " + number);
19   }
20
21 }
```

(b)

```
int lower = 3, upper = 7, sum = 0, i;

for (i = lower; i <= upper; i++) {
  sum = sum + i;
  System.out.print( sum + " ");
}
```

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)

```
1   int answer = 1;
2   Scanner input = new Scanner(System.in);
3   while ( answer = 1 ) {
4     System.out.print("Do you want to play again? \n" +
5                        "[type 1 for yes, and 0 for no]\n");
6     answer = input.nextInt();
7   }
8   System.out.println("Thank you for playing!");
```

(b)

```
1   final int NUMBER_OF_ROLLS = 10000;
2   int   face;
3   for ( int roll = 1, roll <= NUMBER_OF_ROLLS, roll++ )
4   {
5     // random number from 1 to 6
6     face = 1 + (int)(Math.random() * 6);
7   }
```

(c)

```
1 public class Test {
2   public static void method( int x ) {
3     //do something here
4   }
5   public static void method (int y ) {
6     //do something else here
7   }
8 }
```

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

15. Write a method that given an integer determines if it is even (returns **true** if it is, **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

$$Area = \frac{5 \times s^2}{4 \times \tan\left(\frac{\pi}{5}\right)}.$$

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?

```
1  int i = _____; //line to be replaced
2
3  switch(i)
4  {
5    case 0: i = 15; break;
6    case 1: i = 5*i;
7    case 2: i = -i; break;
8    case 3: i = 40;
9    default: i = 0; break;
10 }
11
12 System.out.println( i );
13
```

   (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.

```
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;
```

```
    y[0] = 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.

```
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:

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

Use the searching algorithm of your choice.