Practice Questions for Midterm 1:
Basic Java, Flow Control, Looping, Methods, 1D 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.

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,
   ```plaintext
   One
   Two
   Three
   ```
   show the (single) println( ) statement that produced it.

8. Rewrite the following code as indicated:
   (a) write it using 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) write it using a while loop instead of the for loop
int minutes;
for ( minutes = 10; minutes > 0 ; minutes--) {
    System.out.println("You have "+ minutes + " minutes left");
}

(c) Convert the following if statement to a switch statement

    // Find interest rate based on year
    if (numOfYears == 7)
        annualInterestRate = 7.25;
    else if (numOfYears == 15)
        annualInterestRate = 8.50;
    else if (numOfYears == 30)
        annualInterestRate = 9.0;
    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 pa-
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.

    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:

    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 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 \texttt{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 \texttt{x} after the following statements?

```java
float x;
x = 15/4;
```

i. 3.75  
ii. 4.0  
iii. 3.0  
v. 60  

(f) Which of the following expression yields an integer between 0 and 100, inclusive?

i. \((\texttt{int})(\texttt{Math.random()} * 100 + 1)\)
ii. \((\texttt{int})(\texttt{Math.random()} * 101)\)
iii. \((\texttt{int})(\texttt{Math.random()} * 100)\)
iv. \((\texttt{int})(\texttt{Math.random()} * 100) + 1\)
v. \((\texttt{int})(\texttt{Math.random()} * 101) + 1\)

(g) A variable defined inside a method is referred to as __________.

i. a local variable  
ii. a block variable  
iii. a global variable  
v. 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 
v. an array 

(i) What is the result of \(45 / 4\)?

i. 11  
ii. 12
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;
           while (number != 0) {
               number = input.nextInt();
               if (number > max)
                   max = number;
           }
           System.out.println("max is " + max);
           System.out.println("number " + number);
       }
   }
   ```

   (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)
```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 `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 \( \% \) 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

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

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) \( \text{int } i = 0; \)
(b) \( \text{int } i = 1; \)
(c) \( \text{int } i = 3; \)
(d) \( \text{int } i = 4; \)

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;
        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.

```java
public 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.