Midterm Exam #1 - Sample Questions

1. (10 pnts) 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

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

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

   ```java
   // 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");
   ```

2. (10 pnts) Answer the following multiple choice questions (there might be more than one correct answer):

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

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

(d) 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

(e) 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

(f) 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

(g) 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 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.

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

(i) 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

3. (10 pts) 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

4. (10 pts) Write a loop that computes (No need to write a complete program)

   \[
   \frac{100}{1} + \frac{99}{2} + \frac{98}{3} + \ldots + \frac{3}{98} + \frac{2}{99} + \frac{1}{100}
   \]
5. (10 pnts) 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) 

```java
public class Test {
    public static void main(String[] args) {
        int number = 0;
        int[] numbers = new int[1];
        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;
    }
}
```

(c) 

```java
int lower = 3, upper = 7, sum = 0, i;
for (i = lower; i <= upper; i++) {
    sum = sum + i;
    System.out.print( sum + " ");
}
```
6. (10 pnts) Show what is printed by the following program program fragment assuming that it is embedded in a complete and correct program.

7. (10 pnts) Write a method definition for a function called addTax. The method addTax has two formal parameters: taxRate, which is the amount of sales tax expressed as a percentage; and cost, which is the cost of an item before tax. The method returns the value total value of cost with appropriate tax added.

8. (10 pnts) 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) (3 pnts)

```java
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) (4 pnts)

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

(c) (3 pnts)

```java
1 public class Test {
2 // ... some other code here
3 public static method1(int n, m) {
4 n += m;
5 m = method2(n);
6 }
7 public static int method2(int n) {
8 if (n > 0) return 1;
9 else if (n == 0) return 0;
10 else if (n < 0) return -1;
11 }
12 }
```
9. (10 pts) 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;

10. (10 pts) For each statement below decide whether it is true (T) or false (F).

- T  F  The break statement causes all loops to exit.
- T  F  A break statement is required for a switch-case statement in Java.
- T  F  You can define two methods in the same class with the same names and parameter lists.
- T  F  The array size is fixed after it is declared.
- T  F  The memory for the entire array is allocated as soon as the array is declared.

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

12. 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)
```
13. 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.