

Midterm Examination 1

CS170: Introduction to Computer Science

Observe the Emory College Honor Code while taking this test.

Question 1. (30 pts)

1. What is the name of the package in the Java library that is imported automatically by the Java compiler.

`java.lang`

2. What is the name of the phenomenon where you can interpret the same statement in 2 different and correct ways ?

Ambiguity

3. What values will the variable `i` assume in the body of the following loop statement:

```
for ( int i = 4; i < 13; i += 3 )
{
    ...
}
```

Answer: 4 7 10

4. Give 3 types of loop statements in Java.

While-statement, For-statement, Do-statement

5. Give the definition of the “life time of a variable” ?

The duration/range of the execution of a program when a variable exists (memory is reserved for the variable).

6. Give the definition of the “scope of a variable” ?

The location/range in a program where a variable can be accessed/used.

7. What is the range of the scope of a class variable ? (In other words: where in a Java program can you access a class variable)

The *entire* **program**.

8. What is the range of the scope of a parameter variable ? (In other words: where in a Java program can you access a parameter variable)

The *entire* **method**.

9. What parameter passing mechanism is used in the Java programming language ?

pass-by-value

10. What is the other popular parameter passing mechanism that is not available in Java ?

pass-by-reference

Question 2. (10 pts)

You are given the Java program:

```
public class Question2
{
    static int x = 10000;

    public static void main( String[] args )
    {
        {
            {
                System.out.println( "1:  x = " + x );
                String x = "abc";
                System.out.println( "2:  x = " + x );
            }
            System.out.println( "3:  x = " + x );
        }

        for ( int x = 6; x <= 6; x++ )
            System.out.println( "4:  x = " + x );

        System.out.println( "5:  x = " + x );
    }
}
```

For each of the `System.out.println` statement, state whether it will result in a compiler error message. If it does not result in an error message, then give the value that will be printed by the `System.out.println` statement.

- | | | |
|-------------|--------------|-----------|
| 1. No error | If no error: | x = 10000 |
| 2. No error | If no error: | x = abc |
| 3. No error | If no error: | x = 10000 |
| 4. No error | If no error: | x = 6 |
| 5. No error | If no error: | x = 10000 |

Question 3. (10 pts)

You are given the Java program:

```
public class Question3
{
    public static int f( int x, int y )
    {
        x++;
        y--;

        return ( x + y );
    }

    public static void main( String[] args )
    {
        int x, y, z;

        x = 1;
        y = 2;
        z = Question3.f( x, y );

        System.out.println( "x = " + x );
        System.out.println( "y = " + y );
        System.out.println( "z = " + z );
    }
}
```

Questions:

- If the parameters `x` and `y` are passed by **value**, what will be printed by the program:

`x = 1` (original is unchanged, updated a copy)

`y = 2` (original is unchanged, updated a copy)

`z = 3`

- If the parameters `x` and `y` are passed by **reference**, what will be printed by the program:

`x = 2`

`y = 1`

`z = 3`

Question 4 (25 pts)

Define a class method named `minOfFive` inside the class `Question4` below that has 5 double types parameter variables `a`, `b`, `c`, `d` and `e` and returns the *minimum* of the 5 input values.

```
public class Question4
{
    public static double minOfFive( double a, double b, double c,
                                   double d, double e)
    {
        double m;

        m = a;

        if ( b < m )
            m = b;

        if ( c < m )
            m = c;

        if ( d < m )
            m = d;

        if ( e < m )
            m = e;

        return m ;
    }
}
```

Question 5 (25 pts)

An integer number x ($x > 0$) is a prime number if the divisors of x are 1 and x . For example, the number 7 is prime because the divisors of 7 are: 1 and 7. Notice that the number 1 is a divisor of every integer number; and the number x is a trivial divisor of itself (x). In other words:

- an integer number x is a prime number if none of the numbers 2, 3, 4, ..., $x - 1$ is a divisor of x .

Question:

- Write a class method `isPrime(int x)` in the following class `Question5` that returns true when x is a prime number, and returns false otherwise.

```
public class Question5
{
    public static boolean isPrime( int x )
    {
        int f;

        for ( f = 2; f <= x-1; f++ )
            if ( x % f == 0 )
                return( false );    // some number between 2..(x-1) is divisor

        /* -----
           When the for loop completes without executing
           "return(false)"; then none of the number
           2, 3, ..., (x-1) is a divisor
           ----- */
        return(true);
    }
}
```