PRACTICE FOR QUIZ 2
CMPS 12a - Spring 02
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Name:__________________________
Student ID:____________________

This exam is closed book, closed notes, no electronic devices. Show all work.
Partial credit given for partial solutions. Presentation counts! Be legible and
coherent for full credit.

Question 1:_______________(out of 20)
Question 2:_______________(out of 10)
Question 3:_______________(out of 10)
Question 4:_______________(out of 10)
Question 5:_______________(out of 10)
Question 6:_______________(out of 10)
Question 7:_______________(out of 10)
Question 8:_______________(out of 10)
Question 9:_______________(out of 10)
Question 10:______________ (out of 10)

Total:______________________(out of 100)
Name: ________________________________

1. (10 points)
Write a code fragment using functions called isEven, half, and thricePlusOne to do the following: if x is even, set y equals x/2, otherwise return 3\*x + 1. You don’t have to write the functions, just show how you would call them.

**Solution:**

```java
if (isEven(x))
{
    y = half(x);
}
else
{
    return thricePlusOne(x);
}
```
2. (10 points)
What does this program do? **Hint:** The function names are meaningful.

```java
public class PrintBoxes {
    public static void main(String[] argv)
    {
        printBox(3);
        printBox(1);
    }

    public static void printBox(int n)
    {
        for (int i = 1; i <= n; i++)
        {
            printRow(n);
        }
    }

    public static void printRow(int n)
    {
        for (int i = 1; i <= n; i++)
        {
            System.out.print("X");
        }
        System.out.println();
    }
}
```

**Solution:** It prints out a 3 by 3 square box and a 1 by 1 square box of X's, as follows:

```
XXX
XXX
XXX
X
```

**Comment:** Note there was a typo in the original sample quiz where statement `System.out.print("X")` was replaced with `System.out.println("X")`. That version of the code would print out 3 vertical columns of 3 X's each and 1 X, separated by blank lines.
3. (10 points) Identify the compiler error in the following code fragment. Explain the error and how to fix it. You can assume that the int variable `i` has already been declared and initialized correctly.

```java
if (i % 2 == 0)
  {
    String s = "even";
  }
else
  {
    String s = "odd";
  }
System.out.println(i + " is " + s);
```

**Solution:** The problem is that the `println` statement refers to `s` outside the block in which it is declared. To fix it, move the declaration of `s` to the larger block:

```java
String s;
if (i % 2 == 0)
  {
    s = "even";
  }
else
  {
    "odd";
  }
System.out.println(i + " is " + s);
```
4. (10 points)
What does the following program print out?

```java
class TrickyScope {
    public static void main(String[] argv) {
        int i = 10, j;
        for (j = 1; j <= i; j++)
            printJ(i);
    }

    public static void printJ(int j) {
        System.out.println(j);
    }
}
```

**Solution**: It prints a column of 10 10's:
10
10
10
10
10
10
10
10
10
10
5. (10 points)
Consider the following boolean expression.

\[(x \neq 0 \&\& \frac{100}{x} > 5)\]

What would happen to the behavior of this code if the order of the conjunction is reversed as:

\[(\frac{100}{x} > 5 \&\& x \neq 0)\]

**Hint:** Think of the case where \(x\) is 0.

**Solution:** In the original version, there will not be a zero division error when \(x\) is 0, because the conjunction is evaluated from left to right, \(x\neq 0\) is false, and the lazy evaluation means that the rest of the conjunction is not executed. But if the order is reversed, there will be a zero division error when \(x\) is 0.
6. (10 points)

What does the following program print out?

```java
class TrickyParameterPassing
{
    public static void main(String[] argv)
    {
        int i = 2;
        int j = f(g(i) + h(i));
        System.out.println("The answer is " + j);
    }

    public static int f(int x)
    {
        return x*x;
    }

    public static int g(int x)
    {
        return x*h(x);
    }

    public static int h(int x)
    {
        return x + 5;
    }
}
```

**Solution:** This code computes $f(g(2) + h(2))$ which equals $(2^2 + 2 + 5)(2^2 + 2 + 5)(2 + 2 + 5)$, or 441.
Name: 

7. (10 points)
What does the following code fragment print out?

class TrickyFunction
{
    public static void main(String[] argv)
    {
        int a = 5;
        square(a);
        System.out.println("The value of a is " + a);
    }

    public static void square(int a)
    {
        a = a*a;
    }

Solution: It prints out “The value of a is 5.”
Comment: Note that the value of a in the main function is not changed by the call to the square function, because the square function does not return a value, and the scope of the variable in the square function is local within the function.

8. (10 points)
Write a function called isPythagorean which has three int parameters a, b and c and returns a boolean which is true only if the three integers can be the lengths of sides of a right triangle (in other words, either \( a^2 + b^2 = c^2 \) or \( a^2 + c^2 = b^2 \) or \( b^2 + c^2 = a^2 \)).

Solution:

public static boolean isPythagorean(int a, int b, int c)
{
    return (a*a + b*b == c*c || a*a + c*c == b*b || b*b + c*c == a*a)
}
9. (10 points)
What does the following program print out?

```java
class TrickyFunctionCall
{
    public static void main(String[] argv)
    {
        int a = 5;
        triple(a);
        System.out.println("The value of a is " + a);
    }

    public static int triple(int x)
    {
        return 3*x;
    }
}
```

**Solution:** It prints out "The value of a is 5."

**Comment:** Although the triple function does return the value of three times its input parameter, the main function does not assign the result to a, so the value of a in main is not changed.
10. (10 points)
What is the value of quizBoolean after the following code fragment executes?

```java
boolean quizBoolean;
int a = 5, b = 6, c = 20, d = 60;
quizBoolean = ((a > b) || !((c % a != 0) || (d % a == d % b)));
```

**Solution:** The value of quizBoolean will be false. The expression would be true if either the first part or the second part of the disjunction is true. The first part of the disjunction, \(a > b\), is false because 5 is not greater than 6. So we evaluate the expression,

\[!((c \% a != 0) || (d \% a == d \% b))\]

This expression is the negation of

\[((c \% a != 0) || (d \% a == d \% b))\]

so it will be true if that expression is false. We have that \((c \% a != 0)\) is false because 20 modulo 5 is 0, but \((d \%a == d \% b)\) is true because 60 modulo 5 and 60 modulo 6 both equal 0. This makes the disjunction

\[((c \%a != 0) || (d \%a == d \% b))\]

become true, and the negation of it is false. And this makes the whole expression false.