Do not turn the page until instructed to do so.

This booklet contains 10 pages including the cover page.

This is a closed-book exam. All you need is the exam and a writing utensil. (You may use a calculator if you wish.)

You have exactly 55 minutes.

The maximum possible score is 55.

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1. (10 pts.) TRUE/FALSE.

For each of the following, indicate whether the statement is true or false. You do not need to explain your answers.

a. A public instance variable can be accessed and altered by any class, including the class in which it is declared.

b. A private instance variable can not be accessed and altered by any class, including the class in which it is declared.

c. We can make local method variables either public or private, as we choose.

d. If we create a new instance of an object in our code, then we can call any method from that class that we like.

e. You can create a global variable and a local method variable in the same class, with the same name, and with the same type.

f. If the boolean condition for a while loop is false, then the loop will never run.

 g. If a loop does not make progress, then it will run infinitely.

h. An integer counter variable used in a for loop is always local to the loop.

i. Within a class, methods can use input variables with the same names as input variables in other methods.

j. A non-void method must always have a return statement.
2. (10 pts.) SHORT ANSWER.

a. (3 pts.) How many times will the following loops run, assuming they are in a correct program? (This is the same as the number of lines of input each produces.)

(1) int num = 0;
    while ( num < 11 ) {
        System.out.println( num );
        num = num + 1;
    }

Answer: ____________________________________________

(2) for ( int i = 0; i <= 10; i += 2 ) {
        System.out.println( i );
    }

Answer: ____________________________________________

(3) for ( int j = 0; j < 10; j = j + 3 ) {
        System.out.println( j );
    }

Answer: ____________________________________________

b. (3 pts.) List three things that make up a method signature (i.e., the top line of the method, when you are creating it yourself), not including the name of the method.

(1) ____________________________________________

(2) ____________________________________________

(3) ____________________________________________

c. (4 pts.) Suppose we have a class, Driver, and in that class we call a method on a Gadget object:

    Gadget g = new Gadget();
    String s = g.make( 10.5, "Test" );

Without knowing what the make() method does, we do know what its method declaration (i.e., its first line) looks like. Write the method declaration.
3. (10 pts.) CODE EVALUATION.

a. Suppose we run the following method, with input "Hello". Write out what will be printed.

```java
private void method1( String sin ) {
    String sout = new String();
    for ( int i = 0; i < sin.length(); i++ ) {
        sout = sin.charAt( i ) + sout;
        System.out.println( sout );
    }
}
```

b. Write out what will be printed by the following method on inputs 5 and 10, in that order.

```java
private void method2( int num1, int num2 ) {
    for ( int i = 0; i < num1; i++ ) {
        System.out.print( i + " : " );
        int j = i;
        while ( j < num2 ) {
            System.out.print( j + " ");
            j = j + 2;
        }
        System.out.println( "END" );
    }
}
```
4. (10 pts.) CODING NESTED LOOPS

Add a `main()` method to the class below, and add code to it so that when it runs it prints output (using `System.out`) that looks like this:

```
1 2 4 8
2 4 8 16
3 6 12 24
4 8 16 32
5 10 20 40
```

For full points, your code must use a pair of nested loops, each of which is actually used to generate the output. (You may use whatever types of loops you choose.)

```java
public class Main {
    {
    }
```
5. (15 pts.) CODE COMPLETION.

On the next page, complete the given Driver class as follows:

a. Write the method `removeVowels()` so that it works with the code as given:
   i. It will take a `String` as input.
   ii. It will return a `String` as output. The output will be identical to the input, but with any lower-case vowels (a, e, i, o, u) removed.

b. Write the method `longest()` so that it works with the code as given:
   i. This method will take two `String` inputs.
   ii. It will return as output the `String` that is the longest of the two inputs. (If they are of the same length, then it should return the first one input.)

c. Write the method `swapChars()` so that it works with the code as given:
   i. This method should take in two `char` inputs and a single `String` input.
   ii. It should return a `String`. The output should be identical to the input `String`, but with every occurrence of the first `char` replaced with the second `char`.

When complete, the code should produce the following output when run.

```
Starting string = Pork tacos
String without vowels = Prk tcs
Longest string = Pork tacos
Swapped string = Perk taces
```

```java
public class Driver {
    public static void main( String[] args ) {
        Driver d = new Driver();
        String s = "Pork tacos";
        String noVowels = d.removeVowels( s );
        String longest = d.getLongest( s, noVowels );
        String swap = d.swapChars( 'o', 'e', s );
        System.out.println( "Starting string = " + s );
        System.out.println( "String without vowels = " + noVowels );
        System.out.println( "Longest string = " + longest );
        System.out.println( "Swapped string = " + swap );
    }
}
```
// Complete Driver code here.

} // End of Driver class.