Answer all questions in the space provided. Write clearly and legibly, you will not get credit for illegible or incomprehensible answers. This is a closed book exam. However, each student is allowed to bring one page of notes to the exam. Print your name at the top of every page.

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1. Given the variable declarations below, which of the following statements are valid? (Select all that apply.)

```java
int a = 1;
int b = 2;
int c = 7;
```

A. a = b;
B. a = 67;
C. b = 8.7;
D. a + b = 8;
E. a * b = 12;
F. c = a - b;
G. c = a / 2.3;
H. boolean t = a;
I. a /= 4;
J. double d = a;

2. Write the answer in the blank provided.

(a) An array `arr` has 30 elements. What is the index of its last element? (2)

(b) What is the keyword used to make a variable or method belong to a class? (2)

(c) What is the keyword used to make a constant variable? (2)

(d) What is the keyword used to restrict visibility of a member variable to methods within the enclosing class? (2)

(e) What is the keyword used to distinguish a member variable from a parameter or local variable with the same name? (2)
3. Multiple choice questions: Select the single correct answer for each.

(a) If you want to use an existing class from the Java standard libraries, what keyword will you use near the top of your file?
   - A. use
   - B. include
   - C. import
   - D. export
   - E. require

(b) What is the proper way to access the constant PI of the Math class?
   - A. Math.PI()
   - B. Math.PI
   - C. PI
   - D. Math(PI)
   - E. Math[PI]

(c) A recursive method
   - A. is a method containing a loop.
   - B. has no parameters.
   - C. calls itself.
   - D. is part of the java.recursion package.

(d) The name of the special type of method that creates objects of a class is
   - A. instantiator
   - B. initializer
   - C. creator
   - D. constructor
   - E. declarator

(e) Which code would you use to create an array that could hold 25 double values?
   - A. doubles vals = new double(25);
   - B. double vals = new double[25];
   - C. double vals[25];
   - D. double[25] vals;
   - E. double[25] vals = new double();
   - F. double[] vals = new double;
   - G. double[] vals = new double[25];
   - H. double[] vals = new double(25);  
   - I. double[] vals = new [double](25);

(f) What is the value of the following expression? 2 + 4 + "six"+ 8
   - A. "6six8"
   - B. "24six8"
   - C. "six14"
   - D. 20
   - E. This expression would result in a compilation error.
Given the definitions below, evaluate the following boolean expressions to true or false.

```java
boolean kirk = true;
boolean picard = false;
boolean sisco = true;
boolean janeway = false;
```

(a) `kirk && picard`  
(b) `kirk || picard || sisco`  
(c) `!janeway`  
(d) `!kirk || (!picard || sisco || janeway)`  
(e) `!kirk && (!picard || sisco || janeway)`  
(f) `(kirk || janeway) && (picard || janeway)`

(a) ______ (2)  
(b) ______ (2)  
(c) ______ (2)  
(d) ______ (2)  
(e) ______ (2)  
(f) ______ (2)
5. True or false questions
   (a) An improperly indented java file will not compile. (2)
   (b) It is legal to have more than one constructor in a given class. (2)
   (c) The name of a class must start with an uppercase letter. (2)
   (d) A constructor may be given any name, just like other methods. (2)
   (e) All the elements of an array must be the same type. (2)
   (f) An array can be returned by a method. (2)
   (g) In a two-dimensional array, every row must have the same number of columns. (2)
   (h) An object instance can not be passed as a parameter. (2)
   (i) A String is a primitive type in Java. (2)
6. The following Java program compiles and runs. What is its output? (15)

```java
public class MethodTest {
    public static int foo(int a) {
        int b = a % 5;
        int c = b * 4;
        System.out.println("a=
        if(a < c) return b;
        else return c;
    }

    public static void main(String[] args) {
        int a = 6;
        int b = 12;
        int c = 14;
        System.out.println("foo(" + a + ")=
        System.out.println("foo(" + b + ")=
        System.out.println("foo(" + c + ")=" + foo(c));
    }
}
```
7. The following Java program compiles and runs. What is its output?

```java
public class Foo {

    private int x;

    public Foo(int x) {
        this.x = x;
    }

    public void printStuff(int x) {
        System.out.println(this.x);
        System.out.println(x);
    }

    public static void main(String[] args) {

        int x = 6;
        Foo a = new Foo(x);
        x--;
        Foo b = new Foo(x);
        x /= 2;
        Foo c = new Foo(x);

        a.printStuff(1);
        b.printStuff(4);
        c.printStuff(9);
    }
}
```
8. The following Java program compiles and runs. What are the first line, third line, and last line of its output? (I don’t want all the output, just the lines specified.)

```java
public class LoopNest {
    public static void main(String[] args) {

        String[] adj = {"Merry", "Joyful", "Enjoy", "Happy"};
        String[] occasion =
                {"Holidays", "Yule", "Festivus", "Christmas",
                 "Kwanzaa", "Solstice", "Hanukkah", "New Year"};

        for(int a = adj.length-1; a > 0; a--) {
            for(int b = a; b < occasion.length; b+=a) {
                String greeting = adj[a] + " " + occasion[b] + "!";
                System.out.println(greeting);
            }
        }
    }
}
```
9. Write a method that takes an array of strings and a desired length and returns the count of the number of strings in the array with the given length.

\{
"a", "bb", "b", "ccc"
\}, 1 \rightarrow 2
\{
"a", "bb", "b", "ccc"
\}, 3 \rightarrow 1
\{
"a", "bb", "b", "ccc"
\}, 4 \rightarrow 0

```java
public static int wordsCount(String[] words, int len) {
```