Name:_____   NetID:_____

Answer all questions in the space provided. Write clearly and legibly, you will not get credit for illegible or incomprehensible answers. Print your name at the top of every page.

This is a closed book exam. However, each student is allowed to bring one page of notes to the exam. Also, you are permitted the use of a "dumb" calculator to perform basic arithmetic.

Question:	1	2	3	4	5	6	7	8	9	10	Total
Points:	18	4	12	8	6	10	12	10	10	10	100
Score:											

1. Write the answer in the blank provided.

    (a) An array `arr` has 100 elements. What is the index of its last element?   (2)

    (a) _____

    (b) What is the name of the method that is run first when a Java program executes?   (2)

    (b) _____

    (c) What is the keyword used to make a variable or method visible to all classes?   (2)

    (c) _____

    (d) What is the name for the special type of method that creates instances of a class?   (2)

    (d) _____

    (e) What is the keyword used to make a variable that holds a constant value?   (2)

    (e) _____

    (f) What is the keyword used to make a variable or method belong to a *class* rather than an *instance*?   (2)

    (f) _____

    (g) What is the keyword used to distinguish a member variable from a parameter or local variable with the same name?   (2)

    (g) _____

    (h) If you want to use an existing class from the Java standard libraries, what keyword will you use near the top of your file?   (2)

    (h) _____

    (i) What keyword is used to indicate that a method does not return a value?   (2)

    (i) _____

2. There are eight primitive types in Java. List four of them.   (4)

3. Why do the following code snippets not compile? (Explain in one sentence each.)

(a)   (3)

```
public class Test {
    public void method() {

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

        System.out.println(i);
    }
}
```

(b)   (3)

```
int x = 3.14;
```

(c)   (3)

```
String[] names = String[100];
```

(d)   (3)

```
public static String myMethod(int x, int y) {
    if( x > y ) {
        System.out.println("first is larger");
    } else {
        return "second is at least as large";
    }
}
```

4. True or false questions

   (a) An object instance can be returned by a method.   (1)

   (a) _____

   (b) An array can not be passed as a parameter.   (1)

   (b) _____

   (c) An improperly indented java file will not compile.   (1)

   (c) _____

   (d) It is legal to have more than one constructor in a given class.   (1)

   (d) _____

   (e) The name of a variable *must* start with an lowercase letter.   (1)

   (e) _____

   (f) A constructor may be given any name, just like other methods.   (1)

   (f) _____

   (g) All the elements of an array must be the same type.   (1)

   (g) _____

   (h) A method cannot call itself, either directly or indirectly.   (1)

   (h) _____

5. Given the definitions below, evaluate the following boolean expressions to true or false.

```
boolean ginger = true;
boolean cumin = false;
boolean sugar = true;
boolean nutmeg = false;
```

   (a) !sugar   (1)

   (a) _____

   (b) ginger && cumin   (1)

   (b) _____

   (c) ginger || cumin || nutmeg   (1)

   (c) _____

   (d) !ginger || (!cumin && sugar && nutmeg)   (1)

   (d) _____

   (e) !ginger && (!cumin || sugar || nutmeg)   (1)

   (e) _____

   (f) (ginger || nutmeg) && (cumin || nutmeg)   (1)

   (f) _____

6. The following Java program compiles and runs. What is its output?   (10)

```
public class MethodTest {

    public static int foo(int a) {

        int b = a % 10;
        int c = a / 10;

        System.out.println("a=" + a + ", b=" + b + ", c=" + c);

        if(b < c) return b;
        else return c;
    }

    public static void main(String[] args) {
        int a = 12;
        int b = 345;
        int c = 6789;

        System.out.println("foo(" + a + ")=" + foo(a));
        System.out.println("foo(" + b + ")=" + foo(b));
    }

}
```

7. The following Java program compiles and runs. What is its output?　　　　　　　　(12)

```java
public class Foo {

    private int x;

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

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

    public static void main(String[] args) {

        int x = 6;
        Foo a = new Foo(x);
        x--;
        Foo b = new Foo(x);
        x += 4;
        Foo c = new Foo(x);

        a.printStuff(8);
        b.printStuff(7);
        c.printStuff(30);
    }
}
```

8. The following Java program compiles and runs. What are the *first* line, *third* line, and *last* line   (10)
   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[] pastry = {"cake", "pie", "donut", "croissant"};
        String[] item = {"lie", "truth", "treat", "dessert", "carb"};

        for(int a = 0; a < pastry.length; a++) {
            for(int b = a; b < item.length; b++) {
                String message = "The " + pastry[a];
                message += " is a " + item[b] + ".";
                System.out.println(message);
            }
        }
    }
}
```

9. Write a method that takes an array of strings and returns the maximum length of the strings   (10)
in the array, returning -1 if the array is empty.

maxLength(new String[]{"hello", "goodbye"}) → 7
maxLength(new String[]{"cat", "dog", "mouse", "bird"}) → 5
maxLength(new String[]{}) → -1
maxLength(new String[]{""}) → 0

```
    public static int maxLength(String[] strs) {
```

10. Remember the Pig game from earlier this term? (10)

   The game is played with a 6-sided die. Two or more players try to be the first to score 100 points.

   On your turn, roll the die. If you get a 1, your turn is over. Otherwise, your roll is the number of points you've *accumulated*. You can then either stop and *score* the points you've accumulated, or roll again trying to accumulate more points. If you ever roll a 1, your turn ends and you lose all the points you've accumulated (but not those you scored on previous turns).

   At the time, most of you wrote the entire program in `main`. Now that you know more, describe how you would break down the problem into objects, methods, etc. I'm not expecting code here, but I do want you do describe the overall approach you would take.