

Name: _____ UNM Username: _____

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. Each student is allowed to bring one page of notes to the exam and is permitted the use of a “dumb” calculator to perform basic arithmetic.

Question:	1	2	3	4	5	6	7	Total
Points:	16	8	15	14	12	18	17	100
Score:								

1. Write the answer in the blank provided.

(a) What is the value of the following expression? (2)

`(3 < 3 && 5 % 2 != 0) ? "ABCD".charAt(1) : "EFGH".charAt(2)`

(a) _____

(b) Name one of the integer data types in Java. (2)

(b) _____

(c) What is the type of the first parameter of the method that is first run when a Java program executes? (2)

(c) _____

(d) What is the keyword used to make a variable that cannot be reassigned? (2)

(d) _____

(e) What is the keyword used to make a variable or method visible only to the class containing it? (2)

(e) _____

(f) Name a data type that can be used in the expression tested by a switch statement. (2)

(f) _____

(g) Name a method in the String class. (2)

(g) _____

(h) What sort of type should you use when you need to represent a fixed set of constants? (2)

(h) _____

2. I have an array of strings and would like to swap the values stored at indices a and b. Fill in the blanks to complete the implementation of this swap method. (8)

```

public static void swap(_____ strs, int a, int b) {
    _____ temp = strs[a];
    _____
    _____
}

```

3. This question has three related parts. The latter two depend on your answer to the first.
- (a) Write a single Java statement (so, only one line of code) that will declare and initialize an array variable named `letterGrid` that will hold a grid of character values with 10 rows and 15 columns. (5)
- (b) Write a single Java statement that will put an uppercase `A` into the location at the second row and fifth column of the array you created in part (a). (5)
- (c) Write at most three Java statements that will select a random position in the array you created in part (a) and assign its value to a new variable named `randomLetter`. You must use `Math.random()` in your answer. You may not use `java.util.Random` (5)

4. The following Java program compiles and runs. What is its output?

(14)

```
public class Widget {  
  
    private static String str = "A";  
    private int n;  
  
    public Widget(int n, String s) {  
        this.n = n;  
        str = s;  
    }  
  
    public void foo(int n) {  
        System.out.println(this.n);  
        System.out.println(n);  
        this.n -= n;  
    }  
  
    public static void main(String[] args) {  
        System.out.println(str);  
        Widget a = new Widget(30, "BB");  
        a.foo(5);  
        int n = 7;  
        System.out.println(str);  
        Widget b = new Widget(n*2, "CCC");  
        a.foo(n);  
        b.foo(1);  
        a.foo(n+1);  
        b.foo(str.length());  
        System.out.println(str);  
    }  
}
```

5. The following Java program compiles and runs. What is its output?

(12)

Reminder: `System.out.print` will print its argument without going to a new line afterwards.

```
public class ArrayTest {

    public static int[][] buildArray(int n) {
        int[][] result = new int[n][];
        for(int i = 0; i < n; i++) {
            result[i] = new int[n - i];
            for(int j = 0; j < result[i].length; j++) {
                result[i][j] = i + n * j;
            }
        }
        return result;
    }

    public static void printArray(int[][] arr) {
        for(int r = 0; r < arr.length; r++) {
            System.out.print("[ "); // bracket at row start
            for(int c = 0; c < arr[r].length; c++) {
                System.out.print(arr[r][c] + " "); // value and space
            }
            System.out.println("]"); // bracket and newline at row end
        }
    }

    public static void main(String[] args) {
        int[][] nums = buildArray(4);
        printArray(nums);
    }
}
```

6. Consider the following code. Assume that an unmodifiable integer variable named `init` has already been declared and initialized.

```
1   String s = "start";
2   int n = init;
3   do {
4       s += ", " + n + n;
5       n /= 2;
6   } while (n > 2);
7   System.out.println(s + ", end");
```

(a) If `init` had a value of 15, what would this code print? (4)

(b) If `init` had a value of 1, what would this code print? (4)

(c) Rewrite the code from line 2 to 6 to produce the same output using a while loop instead of a do-while loop. Do not declare any additional variables besides the loop variable `n`. (5)

(d) Rewrite the code from line 2 to 6 to produce the same output using a for loop instead of a do-while loop. Do not declare any additional variables besides the loop variable `n`. Declare the loop variable `n` in the loop header, not before it. (5)

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

(17)

```
public class MethodTest {

    public static String foo(String[] b) {
        return foo(b, b.length / 2);
    }

    public static String foo(String[] a, int n) {

        int b = n % a.length;
        int c = a[b].length() % a.length;

        System.out.println("foo: " + n + ", " + b
            + ", " + c + ", " + a[c]);

        a[b] = b < c ? "final" : "exam";

        return a[b];
    }

    public static void main(String[] args) {
        int a = 8;
        String b = "relax";
        String[] c = {"winter", "break", "time", "at", "last"};

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

        for(int i = 0; i < c.length; i++) {
            System.out.println(i + ", " + c[i]);
        }
    }
}
```