

1. Tracing programs (1 point each value):

```
public class Mystery1 {
    public static void mystery1 (double [] d) {
        for(int i=1; i<d.length; i++){
            d[i] = d[i] - d[i-1];
        }
    }
    public static double [] mystery2 (double [] d) {
        double [] ret = new double[d.length];
        for(int i=0; i<ret.length; i++){
            ret[i] = d[i]-1;
            d[i] += 1;
        }
        // POINT 2
        return ret;
    }
    public static void main (String [] args) {
        double [] d1 = {1.0,-1.0,3.0};
        double [] d2 = {5.5,6.5,7.5};
        mystery1(d1);
        // POINT 1
        double [] d3 = mystery2(d2);
        // POINT 3
    }
}
```

1) Draw what d1 looks like at POINT 1.

d1
1.0, -2.0, 5.0,

2) Draw what d, ret, and d2 look like at POINT 2.

ret
4.5, 5.5, 6.5,
d=d2
6.5, 7.5, 8.5,

3) Draw what d2 and d3 look like at POINT 3.

d2
6.5, 7.5, 8.5,
d3
4.5, 5.5, 6.5,

2. For each snippet of Java code on the left, write down the value of the variables after the code is finished executing.

Code	Class definition	Value of variable at end of Code in LEFT COLUMN
<pre>Mystery2 m1 = new Mystery2(); int x = m1.getVal(); Mystery2 m2 = new Mystery2(); x = m2.getVal(); x = m2.getVal();</pre>	<pre>public class Mystery2 { private int a = 0, b = 1; public int getVal() { a = a + b; return a; } }</pre>	<pre>x = 2 m1 = {1,1} m2 = {2,1}</pre>
<pre>Mystery3 m1 = new Mystery3(); String str1 = m1.getStr(1); Mystery3 m2 = new Mystery3(); String str2 = m2.getStr(2);</pre>	<pre>public class Mystery3 { private String s = "ba"; int n = 3; public String getStr (int n){ for(int i=0;i<n;i++){ s = s + n; } return s; } }</pre>	<pre>m1 = {"ba1" 3} str1 = "ba1" m2 = {"ba22" 3} str2 = "ba22"</pre>
<pre>Mystery4 m1 = new Mystery4(2,3); Mystery4 m2 = new Mystery4(3,1); m2.a[1] = 0;</pre>	<pre>public class Mystery4 { public int [] a = null; public Mystery4 (int len, int val){ a = new int[len]; for(int i=0;i<len; i++){ a[i] = val; } } }</pre>	<pre>m1 = {3, 3} m2 = {1, 0, 1}</pre>

3. Below is a partially filled-out Student class, which stores the name, the grades of a student.

```
public class Student{
  private String name;
  private int grade[];
  // No more any other attribute.
  public Student(String n, int[] g){
    name = n;
    grade = new int [g.length];
    for(int i = 0; i<g.length; i++)
      grade[i] = g[i];
  }
  // additional (instance) methods will go here.
}
```

- (1) Implement an accessor **get_average** that can return the average of the grades in the records.
- (2) Implement an accessor **get_name** that can return the name of the calling student.
- (3) Implement the **toString** method that can return the letter grade "A"- "F". The grading is based on the following Numeric-to-letter scale: [90 .. 100] A, [80 .. 90) B, [65 .. 80) C, [60 .. 65) D, and [0

.. 60) F, where the bracket [] indicates an interval including both end points and the parentheses () indicates the interval not including any end point.

- (4) Implement an accessor **compareTo** that accepts a Student object as an argument. It returns an integer with the following value:
- -1 if the average score of this student lower than that of the parameter
 - 0 if the two average scores are the same
 - 1 if the average score of this student higher than that of the parameter
- (5) Write a class called CIS1068 that just has just a main method. The main method should construct two students, "Jack" and "Jill". Jack's grades on three tests for the class are 70, 80, and 90. Jill's grades are 40, 60, 65, and 90. After constructing the objects, the main method should use the above instance methods (2)-(4) to determine who has a better average score and then print out this student's name and letter grade.

```
public class Student{

private String name;

private int grade[];
// No more any other attribute.

public Student(String n, int[] g){
name = n;
grade = new int [g.length];
for(int i = 0; i<g.length; i++)
grade[i] = g[i];
}
// additional (instance) methods will go here.

public double get_average(){
double r = 0;
for(int i = 0; i<grade.length; i++)
r+= grade[i];
return r/grade.length;
}

public String get_name(){
return name;
}

public String toString(){
double r = get_average();
if(r>=90) return "A";
else if (r>=80) return "B";
else if (r>=65) return "C";
else if (r>=60) return "D";
else if (r>=0) return "F";
```

```

else return "N/A";
}

public int compareTo(Student right){
double l = get_average();
double r = right.get_average();
if (l==r) return 0;
else if (l<r) return -1;
else return 1;
}
}

public class CIS1068 {
public static void main(String [] args){
int [] g1 = {70,80,90};
int [] g2 = {40,60,65,90};
Student a = new Student("Jack", g1);
Student b = new Student("Jill", g2);
if(a.compareTo(b)>=0) System.out.println(a.get_name()+", "+a);
if (a.compareTo(b)<=0) System.out.println(b.get_name()+", "+b);
}
}

```