**44-542 Object Oriented Programming**

**Sorting in Java**

1. Define class **Student** with the following private instance variables.

**private String idNum;**

**private String lastName;**

**private String firstName;**

**private double gpa;**

1. Student must implement the **Comparable<Student>** interface
2. Methods and constructors

* A constructor with parameters, listed in the same order as above.
* Getter methods for each of the private instance variables.
* A **toString** method that prints the id number, then last name, the first name, and then gpa. There should be one space between each value output. Between last name and first name there should be a comma immediately following last name and before the intervening space.
* Because **Student** implements the **Comparable** interface, you must also implement the **compareTo** method as defined by the **Comparable** interface. Define this method in such a way that the natural ordering of students will be by id number, in ascending order.

1. Write a class **StudentDriver**
   1. Begin by filling an **ArrayList** with at least 5 students. Add students in random order – not by id number, not by last name, and not by gpa. The original list should not be in order by any of these attributes.
   2. Use an enhanced **for** loop to print the original list.
   3. Call the one-parameter **sort** method of the **Collections** class to sort the list by its natural order (id number) and then print the list again.
   4. Call the two-parameter **sort** method of the **Collections** class, supplying a new **Comparator<Student>** that sorts by gpa. Print the list again.
   5. Call the two-parameter **sort** method of the **Collections** class, supplying a new **Comparator<Student>** that sorts by last name, first name – that is, it sorts by last name, but if the last names are the same, it sorts by first name. Be sure that some students in your list have the same last name when testing this part of your program. Print the list again.

Some sample output of the driver class is shown on the next page. Your output should be similar.

**Sample Output**

**Students in original order:**

**333 Smith, Joe 3.5**

**222 Brown, Betty 3.8**

**444 Anders, Alex 3.92**

**111 Samson, Susie 3.93**

**555 Smith, Andy 2.75**

**440 Smith, Susan 3.0**

**Students in alphabetical order by id number:**

**111 Samson, Susie 3.93**

**222 Brown, Betty 3.8**

**333 Smith, Joe 3.5**

**440 Smith, Susan 3.0**

**444 Anders, Alex 3.92**

**555 Smith, Andy 2.75**

**Students in increasing order by gpa:**

**555 Smith, Andy 2.75**

**440 Smith, Susan 3.0**

**333 Smith, Joe 3.5**

**222 Brown, Betty 3.8**

**444 Anders, Alex 3.92**

**111 Samson, Susie 3.93**

**Students in order by last name, first name:**

**444 Anders, Alex 3.92**

**222 Brown, Betty 3.8**

**111 Samson, Susie 3.93**

**555 Smith, Andy 2.75**

**333 Smith, Joe 3.5**

**440 Smith, Susan 3.0**