Hands #5 - Solving Problems Involving Sorting

Problem Types:

- **Alphabetize groups of letters**
- **Alphabetize groups of words**
- **Using TreeSets to Sort**
- **Using Collections.sort to Sort**
- **Using Arrays. sort to Sort**

Sort Practice Problems

On the following pages, there are 9 sample problems. The dat files and solutions to these problems are provided in a separate folder.

The solutions are based on Java 5.0. I have used meaningful variable names to make the code more readable. Students in contest situations would certainly use shorter variable names and possibly more anonymous variables.

Problem	**Key Concepts**
pr51 - Remove Duplicates and Alphabetize	generic `TreeSet` to alphabetize; enhanced `for` to output
pr51 - Remove Duplicates and Alphabetize each word	generic `TreeSet` to alphabetize; enhanced `for` to output
pr53 - Four Letter Words 1	generic `TreeSet` to alphabetize; enhanced `for` to output
pr54 - Swimming Classes	`ArrayList`; `Collections.sort`; compare Strings with `.equals`
pr55 - Sorted Lists	More than one `ArrayList`; `Collections.sort`;
pr56 - Outside In	parse array of `String`s to `int`s; `Arrays.sort`; output alternating
pr57 - Class List	`lastIndexOf`; `substring`; concatenation
pr58 - Four Letter Words 2	`TreeMap` to sort; `keySet` to iterate through `TreeMap`
pr59 - Matrix Sorter	read row as an array, parse to `int`s, `Arrays.sort` - does not use matrices

pr51 - Remove Duplicates and Alphabetize

Problem: Write a program that removes the duplicate letters in a string and prints the remaining letters in alphabetical order.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains a string of one or more words consisting of only uppercase letters of the alphabet and exactly one space between words.

data file: `pr51`

Output: In alphabetical order, output the unique letters of the string. No spaces will be output.

Assumptions: None

Sample Input:

```
4
PETER PIPER PICKED A PECK OF PICKLED PEPPERS
AUSTIN IS AWESOME IN MAY
TEXAS UIL
JAVA IS MY FAVORITE LANGUAGE
```

Sample Output:

```
ACDEFIKLOPRST
AEIMNOSTUWY
AEILSTUX
AEFGIJLMNORSTUVY
```

pr52 - Remove Duplicates and Alphabetize Each Word

Problem: Write a program that removes the duplicate letters in each word of a string and prints the remaining letters in each word in alphabetical order.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains a string of one or more words consisting of only uppercase letters of the alphabet and exactly one space between words.

data file: `pr52`

Output: In alphabetical order, output the unique letters of each word of the string. Print a space between each "word".

Assumptions: None

Sample Input:

```
4
PETER PIPER PICKED A PECK OF PICKLED PEPPERS
AUSTIN IS AWESOME IN MAY
TEXAS UIL
JAVA IS MY FAVORITE LANGUAGE
```

Sample Output:

```
EPRT EIPR CDEIKP A CEKP FO CDEIKLP EPRS
AINSTU IS AEMOSW IN AMY
AESTX ILU
AJV IS MY AEFIORTV AEGLNU
```

pr53 - Four Letter Words 1

Problem: Write a program that removes all the four letter words from a sentence, outputs the remaining words in order on one line and then outputs all the four letter words in alphabetical order on separate lines.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contain a sentence less that 60 characters long and words separated by a single space.

data file: `pr53`

Output: Output on one line the non-four letter words in the order they appear in the sentence. On the following lines, output all the four letter words removed from the sentence, one per line, in alphabetical order. Print at least one blank line between sets of data.

Assumptions: Each sentence will contain at least one four letter word.

Sample Input:

```
3
FOURTH AND NINE IS TIME TO PUNT
JAVA IS THE ROOT OF ALL THAT IS NOT EVIL
EACH SENTENCE CONTAINS AT LEAST ONE FOUR LETTER WORD
```

Sample Output:

```
FOURTH AND IS TO
NINE
PUNT
TIME

IS THE OF ALL IS NOT
EVIL
JAVA
ROOT
THAT

SENTENCE CONTAINS AT LEAST ONE LETTER
EACH
FOUR
WORD
```

pr54 - Swimming Classes

Problem: The administrator of a summer swimming program has enrolled swimmers for swim classes. As the students are enrolled, the administrator simply listed the instructor followed by the swimmer on a sheet of paper. You need to write a program that will list for each teacher the students in his/her class alphabetically.

Input: The first line of the data set is an integer that represents the number of students enrolled. Each of the remaining lines contains the teacher's name followed by the student's name. All letters are uppercase.

data file: `pr54`

Output: The teacher's name on one line followed by each student in that class listed alphabetically on separate lines. Student's names should be indented 3 spaces.

Assumptions: There must be at least one blank line between classes.

Sample Input:

```
10
MARY ANN
TOM RICK
ANN JOE
TOM DICK
MARY ROBIN
ANN NICK
ANN MARSHALL
TOM ANGELA
MARY BOB
MARY RICHARD
```

Sample Output:

```
ANN
   JOE
   MARSHALL
   NICK

MARY
   ANN
   BOB
   RICHARD
   ROBIN

TOM
   ANGELA
   DICK
   RICK
```

pr55 - Sorted Lists

Problem: Write a program that will read a list of positive integers. The integers in the 1st, 3rd, 5th, ... position are to be printed from low to high and the integers in the 2nd, 4th, 6th, ... position are to be printed from high to low.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains a list of positive integers separate by a single space.

data file: `pr55`

Output: Output the integers in the odd position from low to high followed by an "^" followed by the integers in the even positions from high to low. Separate all integers and the ^ by one space.

Assumptions: Left to right placement of the square is immaterial.

Sample Input:

```
2
1 5 3 77 45 32 6 8 8
5 6 4 7 3 8 2 9 6 5 7 5 4 7
```

Sample Output:

```
1 3 6 8 45 ^ 77 32 8 5
2 3 4 4 5 6 7 ^ 9 8 7 7 6 5 5
```

pr56 - Outside In

Problem: Write a program will sort a list of integers and output them with the smallest first, the next smallest last, the next smallest second, the next smallest next to last, etc.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains integers separated by a single space.

data file: `pr56`

Output: Output the integers as described above and shown below.

Assumptions: None.

Sample Input:

```
3
1 5 4 2 3 7 6 8 9 10
4 2 6 5 4 7 8 9 15 3 14 17 8 1
7 5 6 2 9 4 7 4 5 6 12 15 12 14 13
```

Sample Output:

```
1 3 5 7 9 10 8 6 4 2
1 3 4 6 8 9 15 17 14 8 7 5 4 2
2 4 5 6 7 12 13 15 14 12 9 7 6 5 4
```

pr57 - Class List

Problem: Write a program that will print the names of students with the last name first.

Input: The first line of the data set is an integer that represents the number of lines that follow. Each of the remaining lines contains a person's name in the form of first name, middle name and last name. The middle name is optional and all students will not have a middle name.

data file: `pr57`

Output: Output the names alphabetically by last name in the form

```
lastName, firstName middleName.
```

Assumptions: Each input line will have at least one space.

Sample Input:

```
6
Mary Sue Smith
Larry Don Smith
Richard Ray Roberts
Linda Ann Stephens
Dawn Alexander
Roger Rabbit
Bugs Bunny
```

Sample Output:

```
Alexander, Dawn
Rabbit, Roger
Roberts, Richard Ray
Smith, Larry Don
Smith, Mary Sue
Stephens, Linda Ann
```

pr58 - Four Letter Words 2

Problem: Write a program that will print a list of words sorted based on their 2nd and 4th letters only.

Input: The first line of the data set is an integer that represents the number of words that follow. Each of the remaining lines contains a four letter word.

data file: `pr58`

Output: Output the words in alphabetical order based on the 2nd and 4th letters.

Assumptions: No two words will have the same 2nd and 4th letters.

Sample Input:

```
8
work
lost
love
worm
week
trig
trip
tent
```

Sample Output:

```
week
tent
love
work
worm
lost
trig
trip
```

pr59 - Matrix Sorter

Problem: Write a program that will print the integers in a matrix so the elements in each row are in numerical order from least to greatest.

Input: The first line of the data set is an integer that represents the number of test cases that follow. The first line of each test case will contain two integers representing the number of rows and columns of the matrix in that test case. The rows of the matrix will follow on the next lines, one row per line.

data file: `pr59`

Output: The sorted matrix. Each column should be right justified in 4 characters. Print at least one blank line between test cases.

Assumptions: The integers in each row will be separated by one space.

Sample Input:

```
2
3 5
4 3 5 2 6
8 7 9 6 0
-1 -7 3 8 2
4 6
5 6 4 7 3 8
9 7 6 0 4 1
-5 6 8 3 9 2
-1 6 -3 4 7 -2
```

Sample Output:

```
   2   3   4   5   6
   0   6   7   8   9
  -7  -1   2   3   8

   3   4   5   6   7   8
   0   1   4   6   7   9
  -5   2   3   6   8   9
  -3  -2  -1   4   6   7
```