# 1D and 2D Array

## Lab Programs

1. Search an element in a 1D Array using binary search.
2. Sort the elements of a 1D array using selection sort
3. Add two matrices.
4. Multiply two matrices.
5. Transpose a matrix.

## Homework Programs

1. Generate a table that indicates the rainfall for a city and compares the current year's rainfall for the city with the rainfall from the previous year. Display some summary statistics that will indicate both the annual rainfall for each year and the average monthly rainfall for each year. The input data will consist of 12 pairs of numbers. The first number in each pair will be the current year's rainfall for a month, and the second number will be what fell during the same month the previous year. The first data pair will represent January, the second will be February, and so forth. If you assume the data begin

```
3.2     4     (for January)
2.2     1.6   (for February)
```

the output should resemble the following:

```
                Table of monthly rainfall
                  January    February    March ...
This year            3.2          2.2
Last year            4.0          1.6
Total rainfall this year:    35.7
Total rainfall last year:    42.8
Average monthly rainfall for this year:   3.6
Average monthly rainfall for last year:   4.0
```

2.

The results from the mayor's race have been reported by each precinct as follows:

| Precinct | Candidate A | Candidate B | Candidate C | Candidate D |
|---|---|---|---|---|
| 1 | 192 | 48 | 206 | 37 |
| 2 | 147 | 90 | 312 | 21 |
| 3 | 186 | 12 | 121 | 38 |
| 4 | 114 | 21 | 408 | 39 |
| 5 | 267 | 13 | 382 | 29 |

Write a program to do the following:

a. Display the table with appropriate labels for the rows and columns.
b. Compute and display the total number of votes received by each candidate and the percentage of the total votes cast.
c. If any one candidate received over 50 percent of the votes, the program should display a message declaring that candidate the winner.
d. If no candidate received 50 percent of the votes, the program should display a message declaring a runoff between the two candidates receiving the highest number of votes; the two candidates should be identified by their letter names.
e. Run the program once with the data shown and once with candidate C receiving only 108 votes in Precinct 4.

3. Use matrix subtraction to calculate how much longer was the life expectancy of black and white women than men of the same races in each decade from year 1950 to 2000. Calculate the matrix difference that will subtract the two 6-by-2 matrices, producing a third 6-by-2 matrix. Display all three matrices. Your program should calculate the matrix difference by subtracting each element of the second matrix from the corresponding element of the first.

United States Life Expectancy at Birth by Sex and Race

| Female | | | Male | | |
|---|---|---|---|---|---|
| **Year** | **Black** | **White** | **Year** | **Black** | **White** |
| **1950** | 62.9 | 72.2 | **1950** | 59.1 | 66.5 |
| **1960** | 66.3 | 74.1 | **1960** | 61.1 | 67.4 |
| **1970** | 68.3 | 75.6 | **1970** | 60.0 | 68.0 |
| **1980** | 72.5 | 78.1 | **1980** | 63.8 | 70.7 |
| **1990** | 73.6 | 79.4 | **1990** | 64.5 | 72.7 |
| **2000** | 75.2 | 80.1 | **2000** | 68.3 | 74.9 |

*Source:* National Center for Health Statistics