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The University of Saskatchewan

Saskatoon, Canada

Department of Computer Science

CMPT 214– Programming Principles and Practice

Assignment 4

Date Due: October 19, 2020

Total Marks: 18

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Submission Instructions

- Assignments must be submitted using Canvas.

- Programs must be written in C conforming to the C11 standard.

- Always include the following identification in your solutions: your name, NSID, student ID, instructor's name, course name, and course section number.

- No late assignments will be accepted. See the course syllabus for the full late assignment policy for this class.

- **VERY IMPORTANT**: Canvas is very fragile when it comes to submitting multiple files. We insist that you package all of the files for all questions for the entire assignment into a **ZIP** archive file. This can be done with a feature built into the Windows explorer (Windows), or with the **zip terminal command** (LINUX and Mac). We **cannot accept** any other archive formats. This means no tar, no gzip, no 7zip. Non-zip archives will not be graded. We will not grade assignments if these submission instructions are not followed.

- Instructions on "how to create zip archives" can be found here `https://canvas.usask.ca/courses/9771/pages/how-to-zip-slash-compress-your-files`

Question 1 (6 points):

Purpose: To practice creating and accessing of arrays.

Canadian Agriculture and Food statistics collects data directly from individuals and businesses, and when possible, uses existing data from government and private sector organizations. According to Agriculture and Food statistics of Canada, there is a fluctuation in the price of food items in 2018 and 2020. The statistics of the food items can be found in the table below. The data in this table is also provided in a tabular file called `food.txt` (more details below).

Items	Quantity	Price in 2018	Price in 2020
Round steak	1 kg	17.38	18.50
Chicken	1 kg	7.21	7.50
Apples	1 kg	4.25	4.03
Carrots	1 kg	2.3	2.27
Onions	1 kg	2.2	1.94
Eggs	1 dz	3.60	3.23
Butter	454 g	5.17	4.85
Bananas	1 kg	1.55	1.58
Oranges	1 kg	3.58	3.48
Mushrooms	1 kg	9.03	8.74

Input File Format

The format of the data file `food.txt` is as follows.

- The first line is a column header row containing column titles. Each column title is a string of less than 1000 characters containing no spaces.

- Each subsequent line contains four data items per line separated by spaces. In order, they are:
    - The name of the food item as a string containing no spaces with a length of less than 1000 characters.
    - The quantity that this food item is sold in as a string with length at most 1000 characters.
    - The price of the food item in 2018 as a floating point number.
    - The price of the food item in 2020 as a floating point number.

Your Tasks

(a) Read the food.txt and create two arrays, one for 2018 food prices and the other for 2020 price list. All of the prices from 2018 (third column in the file) should be stored in one array. The food prices from 2020 (fourth column in the file) should be stored in the other array of the same length as the first. The data in the first and second columns must be read from the file in order to access the third and fourth columns but do not need to be permanently stored. The titles in the column headers in the first line of the file may be ignored. You may assume that there are exactly 10 food items in the data file, in other words, there will be exactly 10 lines after the header line.

(b) From the data in your arrays, find the total cost of the ten items in 2018 and the total cost of the ten items in 2020.

(c) Calculate the difference in the total costs in 2018 and 2020 (calculated in part (c)).

(d) Print out the total cost in 2018, 2020 and the difference in the total costs.

Question 2 (6 points):

Purpose: To practice passing array to functions.

In this question we will consider the given life expectancy values for different provinces in Canada. To work with this problem, we'll use the the float array given below:

```
float LifeEx[COUNT] = {75.981, 82.675, 68.745, 99.425, 88.442};
```

Your Tasks

Note: the functions described in parts (a) through (c) should take the array as a parameter. Do not make the array provided above a global variable. Its definition should be placed in main().

(a) Write a function that calculates and prints the average of the array items.

(b) Write a function that calculates and prints the smallest and highest life expectancy value.

(c) Write a function to sorts and prints the array in a **descending** order (largest to smallest). You may use any sorting algorithm you wish, but we recommend Insertion Sort for this task.

(d) Call the functions you wrote in parts (a) thorugh (c) in main().

Sample Output

```
Average of the life expectancy values: ????
Lowest life expectancy value is: ????
Highest life expectancy value is: ????
The list of sorted life expectancy values: ????
```

where ???? is your answers for the respective summary question.

Question 3 (6 points):

Purpose: To practice structures and returning a structure from a function.

In this question we will help Steven determine the best-selling smoothie from the last weekend so he can advertise it on his display board. He has recorded his sales data from the last weekend in a file called `sales.txt`.

Input File Format

The format of `sales.txt` is as follows:

- The first line is a column header row containing column titles. Each column title is a string of less than 100 characters containing no spaces.

- Each subsequent line contains four data items per line, separated by spaces.. In order they are:

  - The name of the smoothie flavour as a string containing no spaces, with a length of less than 100 characters.
  - The number of smoothies of this flavour sold as an integer.
  - The price charged for one smoothie of this flavour as a floating point number.
  - The total sales of this flavour (product of second and third column values) as a floating point number.

Your Tasks

(a) Create a structure type for smoothies with members for storing the smoothie's name, number sold, selling price, and total sales (same data as in one line of the input file).

(b) Write a function called `bestSeller` that takes one parameter, the name/location of the input data file of the described format (above) that contains the sales data. Read the data in the file, and determine which smoothie had the greatest total sales. You can ignore the header row, like in Question 1. Return the information from the data file for that smoothie as a structure of the type you defined in part (a).

(c) Call the function you wrote in part (b) from `main()` and display the data about the returned smoothie as in the sample output.

Sample Output

```
Displaying the best seller for the last weekend:
Name: Fieldberry
Price: 4.250000
Number sold: 102
Total sales: 433.500000
```

What to Hand In

Hand in a `.zip` **file archive** which contains the following files:

asn4q1.c: Your completed solution for question 1.

asn4q2.c: Your completed solution for question 2.

asn4q3.c: Your completed solution for question 3.

    VERY IMPORTANT: You **must** hand in a ZIP archive containing all of the above files. You may not use any other type of archive (this means no gzip, no 7zip, etc.), and you may not submit the files individually. We regret this necessary inconvenience but failure to follow these instructions may result in your assignment not being graded. We simply do not have the resources to handle special cases when we have so many students in the class. Instructions on "how to create zip archives" ca be found here `https://canvas.usask.ca/courses/9771/pages/how-to-zip-slash-compress-your-files`.
    We will not grade assignments if these submission instructions are not followed.

Grading Rubric

The grading rubric can be found on Canvas.