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PG2 – LAB: HISTOGRAM

CONTENTS

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PART A – READ METHODS, MENU LOOP

For Part A, you will create the basic application for Lab 1.

- You will create a menu loop in Main.
- You will create 3 methods to make it easier to get user input.

Part A-1: Console Application

SETUP

Lab Overview Video

Part A-1 Overview

A **C# .NET Core console application** has been provided for you in your **GitHub repo**. **Use the provided solution.**

Input Class

A static class called Input has been provided. **Put the Read methods (ReadInteger, ReadString, and ReadChoice) inside of the Input class.**

GRADING: 5 POINTS

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Part A-2: ReadInteger

Lecture Videos

Method Basics Examples 02
Method Basics Challenge 02
Converting Strings
Converting Strings Example
Converting Strings Challenge

Lab Overview Video

Part A-2 Overview

Create a method called **ReadInteger** that will ask the user to input a number. The method should show the prompt parameter, read the user's input, and return the integer**.** Console.ReadLine will give you a string so you will need to convert the string to an integer. **DO NOT THROW AN UNHANDLED EXCEPTION.** If the user does NOT enter an integer OR the integer is not within the min-max range, show an error message to them, show the prompt again and ask for the user's input. You'll need a **loop** for this. **Do not return until the user enters a valid integer**.

NAME	RETURNS	PARAMETERS	COMMENTS
ReadInteger	int	string prompt int min int max	Show the prompt, read input, return integer

EXAMPLE USAGE

These are examples of how you could call the method once you've written the code for it. NOTE: they are just examples. It is not to be used exactly as is for the lab.

```
int year = Input.ReadInteger("Year: ", 1908, 2021);
int passengers = Input.ReadInteger("Number of passengers: ", 1, 10);
```

EXAMPLE OUTPUT

Year: **steve**
That is not an integer. Please try again.
Year: **2019**

GRADING: 10 POINTS

COMMON MISTAKES:

- -2: Calling int.Parse after already calling int.TryParse. If you call int.TryParse and it returns true, then the string is converted and the number is stored in the out parameter.
- -2: Calling the ReadInteger method recursively. A simple loop is better in this scenario so do not use recursion.
- -2: Not checking the number against the min and max parameters. ReadInteger should not return until the user enters a number AND the number falls within the min-max range.

- -5: using int.Parse without a try-catch. ReadInteger should not throw an unhandled exception. Catch the exception using a try-catch and show a message to the user. Continue looping until the input is valid.

Part A-3: ReadString

Lecture Videos

Parameters By Reference
Parameters By Reference Example
Parameters By Reference Challenge

Lab Overview Video

Part A-3 Overview

Create a method called **ReadString** that will ask the user for a string. Instead of returning the value like in ReadInteger, you should use **pass by reference** to get the string back to the caller. The method should show a prompt, read the user's input, store the input in the ref parameter. If the user does NOT enter a string, show an error message to them, show the prompt again and ask for the user's input. You'll need a loop for this. **Do not return until the user enters something.** You should use the IsNullOrEmpty or the IsNullOrWhiteSpace methods of the string class to check if the string is empty.

NAME	RETURNS	PARAMETERS	COMMENTS
ReadString	void	string prompt ref string value	Show the prompt, read input, store in ref parameter

EXAMPLE USAGE

These are examples of how you could call the method once you've written the code for it.

```
string make = string.Empty;
Input.ReadString("Make: ", ref make);

string model = string.Empty;
Input.ReadString("Model: ", ref model);
```

EXAMPLE OUTPUT

Make: **Ford**

GRADING: 10 POINTS

COMMON MISTAKES:

- -1: converting the string input to a number as part of validation. The only validation you need to check is whether the input is empty or not.
- -2: returning without checking if the input is empty. ReadString should not return if the user's input is empty. You should use the IsNullOrEmpty or the IsNullOrWhiteSpace methods of the string class to check.

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Part A-4: ReadChoice

Lecture Videos

Out Parameters
Out Parameters Example
Out Parameters Challenge

Lab Overview Video

Part A-4 Overview

Create a method called **ReadChoice** that will ask the user to select from a list of options, like a menu. Instead of returning like ReadInteger or passing back the value like ReadString, you should return the selection through an **out parameter**. The method should show a list of options to the user, show a prompt, get the user's selection, and return the selection through an **out parameter**.

You'll need to pass the list of options as a **string array**. Something like string[] {"1. Add Car", "2. Show Cars", "3. Exit" }. The method should loop over the array and show each option on a new line. Then it should show the prompt and read the user's input**. You should use your ReadInteger method you created earlier.**

NAME	RETURNS	PARAMETERS	COMMENTS
ReadChoice	void	string prompt string[] options out int selection	Reuse the ReadInteger method to get the user's selection

EXAMPLE USAGE

These are examples of how you could call the method once you've written the code for it.

```
int menuChoice = 0;
string[] mainMenu = new string[] { "1. Add Car", "2. Show Cars", "3. Exit" };
Input.ReadChoice("Choice? ", mainMenu, out menuChoice);
```

EXAMPLE OUTPUT

1. Add Car
2. Show Cars
3. Exit

Choice? **Steve**
That is not a number. Please try again.
Choice? **2**

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GRADING: 10 POINTS

COMMON MISTAKES:

- -3: duplicating the ReadInteger logic. ReadChoice should call ReadInteger instead of duplicating the code.
- -2: hardcoding the range passed to ReadInteger. You should use the options.Length for the max value passed to ReadInteger.
- -2: creating the array of options inside the method. ReadChoice should just print the array.

Part A-5: Menu loop

Lecture Videos

Input Challenge
Converting Strings Challenge

Lab Overview Video

Part A-5 Overview

You will need to create a loop in **Main** that handles the menu options for lab 1. This should be a simple **while** loop that loops while the menu selection is NOT exit. ***Inside*** the while loop, you should 1) call **ReadChoice** to show the menu and get the user's menu selection. 2) use a **switch** statement that has logic for each menu option.

The Menu to show:

1: The Speech
2: List of Words
3: Show Histogram
4: Search for Word
5: Remove Word
6: Exit

NOTE: for Part A, you will only need code to handle the exit option.

You should have a menu loop that shows the menu and let's the user select a menu option.

GRADING: 5 POINTS

COMMON MISTAKES:

- -2: Exit does not exit.

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PART B – THE LIST

Part B-1: The Speech

Lecture Videos

Method Basics Examples 02
Method Basics Challenge 02

Lab Overview Video

Part B-1 Overview

NOTE: find the data to use for this project in the **speechString.txt** file for the lab. The file is located in the Lab1 folder in your repo.

Create a method called **GetSpeech**. **Copy the text from the file to the method.** It should simply return the string.

Call the GetSpeech method from Main. Do this BEFORE the menu loop starts.

NAME	RETURNS	PARAMETERS	COMMENTS
GetSpeech	String	(none)	Returns the string that is supplied in the speechString.txt file.

Add code to the first menu option to show the speech. First, clear the screen then print the speech. Wait for user to press a key before clearing the screen and showing the menu again.

GRADING: 5 POINTS

COMMON MISTAKES:

- -2: trying to read the file instead of copy and pasting the text into the method.
- -2: not showing the speech
- -1: not clearing the screen before or after printing the speech.
- -1: not waiting for the user to press a key before showing the menu

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Part B-2: List of Words

Lecture Videos

Splitting Strings Channel
List Basics
List Basics Example
List Basics Challenge
List Looping
List Looping Example
List Looping Challenge

Lab Overview Video

Part B-2 Overview

Create a method called **Splitter** that you can use to get the list of words from the speech. In the method, **Split the string** into an **array of words** that appear in the string using the array of delimiters that is passed in. Make sure you remove the empty entries when splitting.

Now convert array of words to a list of strings and return the list.

Before the menu loop in Main, call Splitter to get your list of words from the speech.

Add code to the second menu option to show the list of words. First, clear the screen then print each word of the list on a separate line. Wait for user to press a key before clearing the screen and showing the menu again.

NAME	RETURNS	PARAMETERS	COMMENTS
Splitter	List<string>	String to split Char[] of delimiters	Using the character array of delimiters, split the string parameter, convert the string array to a list, then return the list. Make sure you remove the empty entries when splitting.

EXAMPLE USAGE

These are examples of how you could call the method once you've written the code for it.

```
char[] delimiters = new char[] { '^', '$' };
string stringToSplit = "Batman^The Bat^Robin&The Boy Wonder";
List<string> heroes = Splitter(stringToSplit, delimiters);
```

GRADING: 10 POINTS

COMMON MISTAKES:

- -2: not splitting on the correct delimiters. To get the words, you need all punctuation and the escape sequences (\n, \t, \r) in your list of delimiters.
- -3: not converting the string array to a List. The Split method returns an array of strings. Convert that to a List<string>.
- -2: not using StringSplitOptions.RemoveEmptyEntries
- -2: not showing the list of words
- -1: not clearing the screen before or after printing the list of words.
- -1: not waiting for the user to press a key before showing the menu

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PART C – THE DICTIONARY

Part C-1: Word counts

Lecture Videos

List Looping
List Looping Example
List Looping Challenge
Dictionary Creating Adding
Dictionary Examples
Dictionary Basics Challenge
Dictionary Checking Keys
Dictionary Checking Keys Example
Dictionary Updating Values
Dictionary Updating Values Example
Dictionary Keys Values Challenge

Lab Overview Video

Part C-1 Overview

Create a method called SpeechCounts. Now that you have the **list of words**, you need to calculate how many times each word appears in the list of words. In themethod, create a **Dictionary** to store those counts. The key of the dictionary will be the words and the value will be the counts. Loop over the **List of words** and ***put*** or ***update*** the word in the dictionary.

Call SpeechCounts BEFORE the menu loop. Store the dictionary in a variable to use for the menu options.

NOTES:

- Make it **case-insensitive** meaning that if the word is upper-case and lower-case in the data, only 1 will appear in the dictionary. For example, 'The' and 'the' are the same word so only one should be in the dictionary. **HINT: look at the different constructors for Dictionary to make this easier**.
- You need to check if the word is in the dictionary to decide if it should be **added** or if it should be **updated**. Use **ContainsKey** or **TryGetValue**.

NAME	RETURNS	PARAMETERS	COMMENTS
SpeechCounts	Dictionary	List<string> words	Using the list of words pulled from the speech, create a dictionary and calculate the counts for each word. Return the dictionary.

GRADING: 10 POINTS

COMMON MISTAKES:

- -5: not calculating the word counts correctly. Loop over the list of words from the speech. Check if the word is in the dictionary and update the value if it is or add it if it is not.
- -5: using a list to store unique words. The keys in the dictionary are unique so no other list is needed outside of the list of words for the speech.

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Part C-2: Show Histogram

Lecture Videos

Dictionary Looping
Dictionary Looping Example
Dictionary Looping Challenge
Output
Output Example
Output Challenge 1
Output Challenge 2
Output Challenge 3
Output Challenge 4
Output Challenge 5

Lab Overview Video

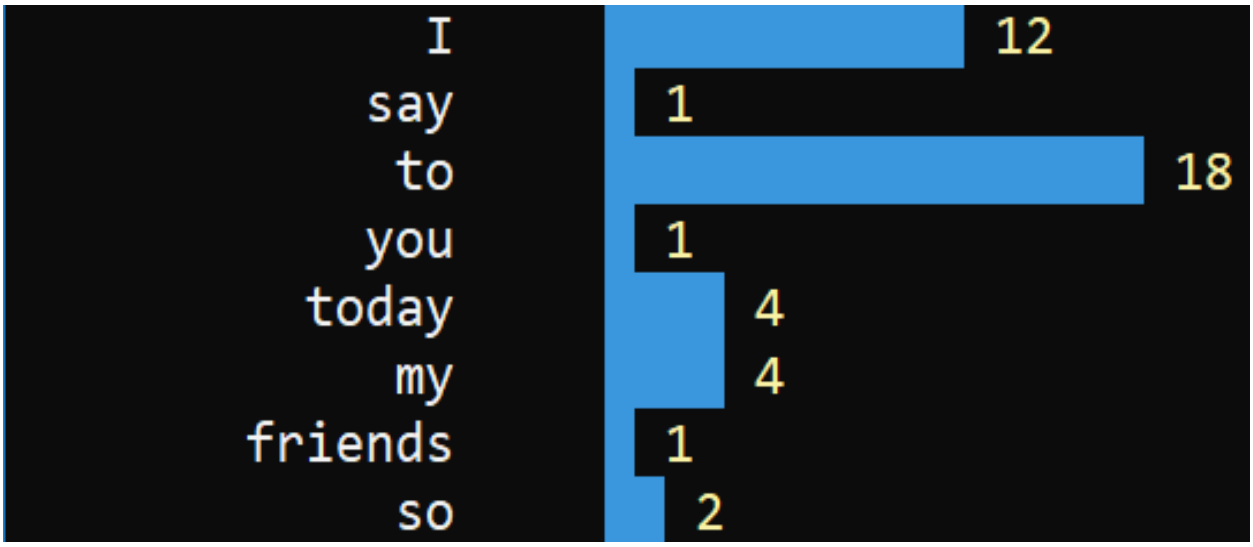
Part C-2 Overview

Now you have the information you need to add logic to the menu for the **"Show Histogram"** menu option. For each word in the dictionary, print the **word**, the **count** and a **bar** representing the count as a horizontal bar chart (see screenshot). **Format your chart** to make it look nice! Use Console.CursorLeft to align the bars.

** **Create a method called PrintKeyValueBar** that will be called inside the loop. The method will print a word, the bar, and count. It is only meant to print 1 row of the histogram (EX: printing just the "say" word and its bar and count of 1). **Pass the word and count as parameters to the method.**

NOTE: you should also call this method in the search feature too (part C-3).

EXAMPLE OUTPUT:



GRADING: 10 POINTS

COMMON MISTAKES:

- -5: not showing the bar for the chart.
- -2: chart is not formatted well.
- -2: not making a method to print 1 row of the histogram (a word, bar, and count).

Part C-3: Search for Word

Lecture Videos

Dictionary Checking Keys
Dictionary Checking Keys Example

Lab Overview Video

Part C-3 Overview

Now you have the information you need to add logic to the menu for the "Search for Word" option. **Ask the user for a word to search for** ("What word do you want to find? "). **Use ReadString to get the word from the user!**

If the word is in the Dictionary, print the **word**, **bar,** and **count**. **NOTE: call the method you created in part C-2.**

GRADING: 10 POINTS

COMMON MISTAKES:

- -2: using a loop to find the search word in the dictionary. Using a loop to find a key in a dictionary defeats the purpose of using a dictionary. Use one of the build-in methods (ContainsKey or TryGetValue) instead.
- -2: trying to access a key's value without first checking if the key exists.
- -2: the bar is missing from the output.
- -1: not using ReadString to get the search word from the user
- -2: not calling the method you created in part C-2.

Part C-4: Sentences for Word

Lab Overview Video

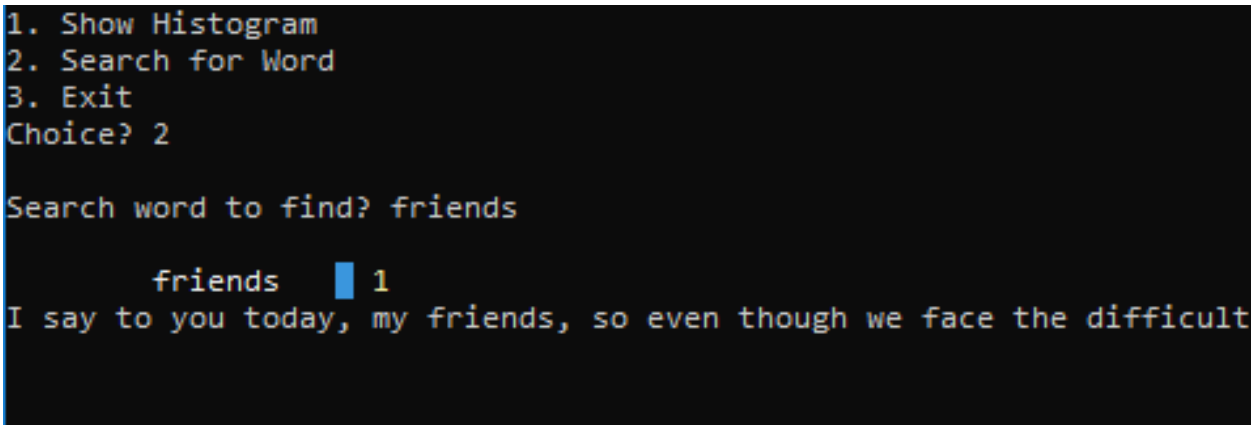
Part C-4 Overview

ADD CODE TO PART C-3

Show the sentences that the word appears in. HINT: you can split the original speech text on different delimiters to get the sentences. Call the Splitter method you created earlier to get the list of sentences.

If the word is NOT in the dictionary, print "<word> is not found.". (replace <word> with what the user entered)

EXAMPLE OUTPUT:



GRADING: 10 POINTS

COMMON MISTAKES:

- -3: using .Contains to find the search word in a sentence string. Contains will give you false positives (Example: trying to find "any" using Contains will match with "anywhere").
- -2: not showing all the sentences for the word

Part C-5: Remove Word

Lecture Videos

Dictionary Removing
Dictionary Removing Example
Dictionary Removing Challenge

Lab Overview Video

Part C-5 Overview

Ask the user for a word to remove. **Use ReadString to get the word to remove**.

Remove the word from the dictionary. If the word is not in the dictionary, show "<word> is not found". (replace <word> with what the user entered). **Do not use ContainsKey or TryGetValue.**

GRADING: 5 POINTS

COMMON MISTAKES:

- -1: not using ReadString to get the search word from the user
- -2: using ContainsKey or TryGetValue before calling Remove
- -2: looping over the dictionary to find the key to remove

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RUBRIC

Part A

FEATURE	VALUE
Part A-1: Console Application	5
Part A-2: ReadInteger	10
Part A-3: ReadString	10
Part A-4: ReadChoice	10
Part A-5: Menu Loop	5
TOTAL	40

Part B

FEATURE	VALUE
Part B-1: The Speech	5
Part B-2: List of Words	10
TOTAL	15

Part C

FEATURE	VALUE
Part C-1: Word Counts	10
Part C-2: Show Histogram	10
Part C-3: Search for word	10
Part C-4: Sentences	10
Part C-5: Remove Word	5
TOTAL	45

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PROGRAMMER'S CHALLENGE

As with every programmer's challenge, remember the following…

1. Do the rubric first. Make sure you have something to turn in for the assignment.
2. When attempting the challenge, don't break your other code.
3. You have other assignments so don't sacrifice them to work on the challenges.

List Challenge

It would be nice to see the histogram data displayed in a sorted way. Two ways that would be interesting:

- Sort the word data alphabetically by word
- Sort the word data by the count

When selecting "Show Histogram", ask the user which to sort on then show the sorted word data chart.

The challenge is to sort the list of words by either the word or the count. Sorting by the words in a list should be easy. How would you sort by count? Those are stored in the dictionary.