

PG2 – LAB: HISTOGRAM

CONTENTS

| | |
|---------------------------------------|----|
| Part A – Read methods, menu loop..... | 1 |
| Part A-1: Console Application..... | 2 |
| Input Class | 2 |
| Part A-2: ReadInteger | 2 |
| Part A-3: ReadString | 3 |
| Part A-4: ReadChoice..... | 4 |
| Part A-5: Menu loop | 5 |
| Part B – The List | 6 |
| Part B-1: The Speech | 6 |
| Part B-2: List of Words | 6 |
| Part C – The Dictionary | 7 |
| Part C-1: Word counts | 7 |
| Part C-2: Show Histogram | 8 |
| Part C-3: Search for Word | 8 |
| Part C-4: Sentences for Word..... | 9 |
| Part C-5: Remove Word..... | 10 |
| Rubric..... | 10 |
| Part A..... | 10 |
| Part B..... | 10 |
| Part C..... | 10 |
| Programmer’s Challenge | 11 |
| List Challenge | 11 |

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

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

Part A-2: ReadInteger

Create a method called **ReadInteger** that will ask the user to input a number. The method should show a prompt, read the user's input (Console.ReadLine maybe?), 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.

```
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

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.

Part A-4: ReadChoice

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**

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

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...
 - Call **ReadChoice** to show the menu and get the user's menu selection
 - use a **switch** statement that has logic for each menu option.
 - 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.

PART B – THE LIST

Part B-1: The Speech

NOTE: find the data to use for this project in the **speechString.txt** file for the lab.

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

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

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

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

Part B-2: List of Words

Split the string into an **array of words** that appear in the string. You need to figure out what the possible delimiter(s) are to give you all the words (look at all the characters in the string that separate the words).

Now convert array of words to a list of strings. This should happen **BEFORE** the menu loop.

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.

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

PART C – THE DICTIONARY

Part C-1: Word counts

THE DICTIONARY

Now that you have the **list of words**, you need to calculate how many times each word appears in the list of words. 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.

Do this **BEFORE** the menu loop.

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**.

GRADING: 10 POINTS

COMMON MISTAKES:

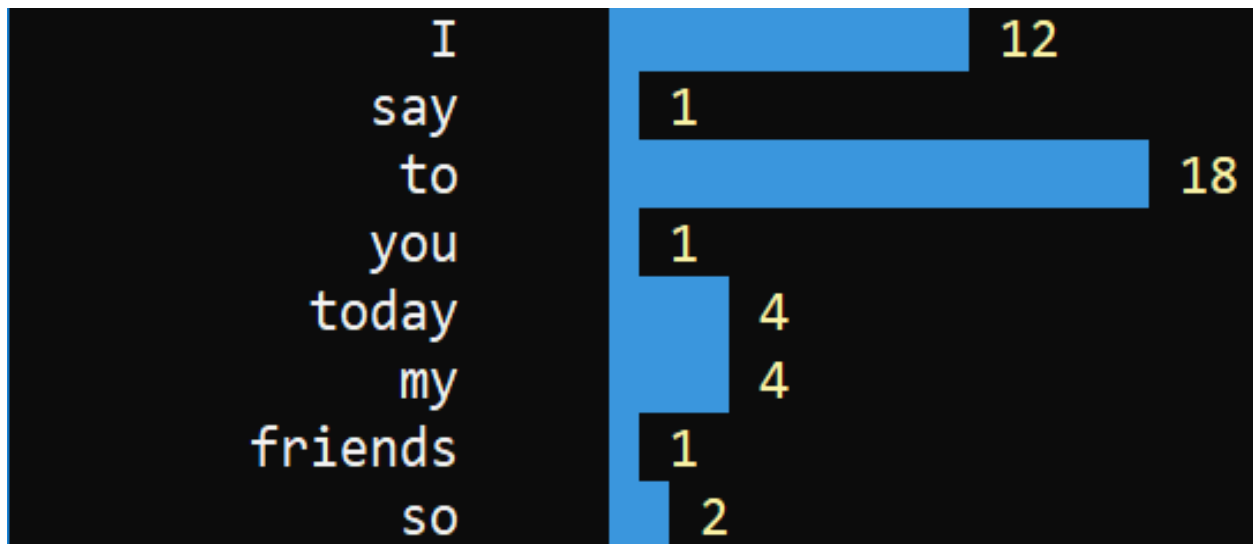
- -5: not calculating the word counts correctly. Loop over the list of words from the speech. Check if the word is in the dictionary and update the value if it is or add it if it is not.

- -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.

Part C-2: Show Histogram

Now you have the information you need to add logic to the menu for the “Show Histogram” 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.

EXAMPLE OUTPUT:



GRADING: 10 POINTS

COMMON MISTAKES:

- -5: not showing the bar for the chart.
- -2: chart is not formatted well.

Part C-3: Search for Word

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**.

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

Part C-4: Sentences for Word

ADD 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.

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

EXAMPLE OUTPUT:

```
1. Show Histogram
2. Search for Word
3. Exit
Choice? 2

Search word to find? friends

    friends 1
I say to you today, my friends, so even though we face the difficult
```

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

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

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 |

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.