CS201 – Spring 2022-2023 - Sabancı University

Homework #2: Phone Bill

Due April 5, Wednesday, 23:00 (Sharp Deadline)

Introduction

The aim of this homework is to practice on parametric functions, returning functions, reference parameters and if-else statements. The use of if-else statements is necessary in this problem; however, the use of functions is for good (modular) programming design. That means, it is possible to accomplish this homework without using functions, but it is a must to use them. The details about the use of functions in this homework are given later.

Your homework will be automatically graded using SUCourse, so it is very important to satisfy the exact same outputs given in the example test cases of SUCourse. Please submit your assignment by writing your main source (cpp) file content into the Answer field. You can utilize the **Check** button under the code editor at SUCourse to check whether your implementation is working in the expected way. After you check your solution code, you will see your grade with the example test cases used; however your homework will then be graded with **different** test cases.

To submit your homework, you must hit the **"Finish attempt…"** and **"Submit all and finish"** buttons. **Just a reminder of a character ↩ which refers to a newline in your expected output.**

Description

In this homework, you will write a C++ program that will calculate the total cost for the local phone bill and international phone bill of a single user. The number of minutes they talked, the number of SMS's they sent and their internet usage as MB will be your inputs. Additionally, your program will also ask the users how many additional packages they bought for calls, SMS and/or internet. These inputs are for a **single** phone bill.

Please note that there are **two** phone bills, therefore you should handle each phone bill separately. This means, you should get the inputs for one bill first, and display its results. After that, you should do the same for the other phone bill.

In this scenario, for the local phone usage, the users have a base package (shown in Table 1), and they can buy additional packages for calls, SMS and/or internet (detailed in Table 2). Please note that additional packages are only for one kind of usage. Users can buy separate packages for calls, SMS and/or internet. It is also possible for users to buy more than one type of additional packages (e.g. packages for both calls and SMS), and more than one package for any one kind of package (e.g. three packages for internet). If they exceed their base packages and did not buy any additional packages; or they exceed the additional packages as well, the cost of their usage will be calculated using the standard rates given in Table 3. For example, if a user spent 1050 minutes for calls, and bought two additional

packages for calls; they exceed their package by 1050 – 250– (250 * 2) = 300 minutes. The cost of excess minutes' will be calculated using the standard rate of 2 TL per minute (2 TL * 300 = 600 TL).

For international phone usage, the users have a global package (shown in Table 4), and they can buy additional packages for calls, SMS and/or internet (detailed in Table 5). Please note that additional packages are only for one kind of usage. Users can buy separate packages for calls, SMS and/or internet. It is also possible for users to buy more than one type of additional packages (e.g. packages for both calls and SMS), and more than one package for any one kind of package (e.g. three packages for internet). If they exceed their global packages and did not buy any additional packages; or they exceed the additional packages as well, the cost of their usage will be calculated using the standard rates given in Table 6. For example, if a user spent 500 minutes for calls, and bought two additional packages for calls; they exceed their package by 500 – 100 – (50 * 2) = 300 minutes. The cost of excess minutes' will be calculated using the standard rate of 15 TL per minute (15 TL * 300 = 4500TL).

Local Phone Usage

Base Package	**120 TL**
Calls	250 minutes
SMS	1000 SMS
Internet	5 GB

Table 1

Additional Packages (30 TL for each)	
Calls	250 minutes (30 TL)
SMS	250 SMS (30 TL)
Internet	1 GB (30 TL)

Table 2

Standard Rates	
Calls	2 TL per minute
SMS	1 TL per SMS
Internet	2 TL per 100 KB

Table 3

International Phone Usage

Global Package	**300 TL**
Calls	100 minutes
SMS	200 SMS
Internet	2 GB

Table 4

Additional Packages (100 TL for each)	
Calls	50 minutes (100 TL)
SMS	100 SMS (100 TL)
Internet	1 GB (100 TL)

Table 5

Standard Rates	
Calls	15 TL per minute
SMS	3 TL per SMS
Internet	5 TL per 100 KB

Table 6

VERY IMPORTANT!

Your programs will be compiled, executed and evaluated automatically; therefore, you should definitely follow the rules for prompts, inputs and outputs. See **Sample Runs** section for some examples.

- **Order of inputs and outputs** must be in the abovementioned format.
- **Prompts before inputs and outputs** must be **exactly the same** with examples.

Following these rules is crucial for grading, otherwise our software will not be able to process your outputs and you will lose some grades in the best scenario.

Input Checks and Program Flow

Firstly, your program will ask for the number of minutes spent for local calls. At this point, you should make an input check to make sure the number of minutes is equal to or greater than zero. If this input check fails, then you should display an appropriate message and end the flow of the program. If the input is entered correctly, then your program will ask for the number of local SMS's, and make another input check to see if that is equal to or greater than zero. Again, if this input check fails, you should display a message and end the flow of the program. If the input is correct, then your program will ask for the local internet usage in MB's and make an input check to see if it is equal to or greater than zero. If this check fails, you will display a message and end the flow of the program. Otherwise, you will continue.

If all previous inputs are entered correctly, then your program will ask a single question for the user to enter how many local additional packages they bought for calls, SMS and/or internet. You will need to make input checks for these inputs to make sure that they are equal to or greater than zero. If any of the input checks fail. you should display a message and end the flow of the program. If all previous inputs are entered correctly, the local phone bill is calculated and displayed for the user.

After the local phone bill is calculated and displayed for the user, your program should start taking inputs to calculate the international phone bill. Firstly, your program will ask for the number of minutes spent for international calls. At this point, you should make an input check to make sure the number of minutes is equal to or greater than zero. If this input check fails, then you should display an appropriate

message and end the flow of the program. If the input is entered correctly, then your program will ask for the number of international SMS's, and make another input check to see if that is equal to or greater than zero. Again, if this input check fails, you should display a message and end the flow of the program. If the input is correct, then your program will ask for the international internet usage in MB's and make an input check to see if it is equal to or greater than zero. If this check fails, you will display a message and end the flow of the program. Otherwise, you will continue.

If all previous inputs are entered correctly, then your program will ask a single question for the user to enter how many international additional packages they bought for calls, SMS and/or internet. You will need to make input checks for these inputs to make sure that they are equal to or greater than zero. If any of the input checks fail, you should display a message and end the flow of the program.

You may also assume that the users will not buy additional packages if they do not exceed their base package.

Please do not forget to refer to the given tables above (Table 2, 3) to see the prices of additional packages and standard rates for outside of package uses of services. Please note that you should make conversions between GB, MB and KB when necessary.

After the calculations, your program will display the total cost and display a special message according to the total cost of the bill. You may see the cases and their respective messages in Table 7.

Cases	Messages
If the total cost is equal to the package price (Base or International)	You did not exceed your package.
If the total cost is greater than package price and smaller than (2 * package price)	You exceeded your package.
If the total cost is equal to or greater than (2 * package price)	You exceeded your package too much. We suggest you change your package.

Table 7

Please remember that there are different phone bills, therefore you should handle each case separately. This means, you should get the inputs for one phone bill first, and display its results. After that, you should do the same for the other phone bill. You may (and you should) check the "Sample Runs" below.

IMPORTANT!

If your code does not compile, you will get **zero**. Please be careful about this and double check your code before submission.

Use of Functions (EXTREMELY IMPORTANT!)

You have to follow the specifications below for function declaration and callings. The grading criteria will include proper use of these parametric functions. Do NOT use any global variables (variables defined outside the functions) to avoid parameter use. Unnecessary code duplication will cause grade reduction as well.

In this homework you are expected to (actually you have to) use some function(s). The guidance about using functions in this homework is below.

A total of four user-defined functions (other than main) must be implemented. One of these functions is a void function and three of them are non-void functions. You have to implement and use these four functions. If you don't, your grade will be lowered because of the missing functions. On top of these functions, you may use other functions if you want.

The program flow will be as follows:

1. **main function:** In the main function, you will call ***getInputs*** to take inputs from the user as explained above. Then, you should proceed to call ***costCalculate*** with the parameters mentioned below to calculate the total cost. Lastly, you should call ***displayResults*** to print out the result. The same steps will be repeated for the other phone bill.

2. **bool getInputs(…):** This function will be called from main with seven parameters, and it will be used to prompt for the inputs and to get them from the user. Please remember that you should get the first three inputs one by one and make an input check for each input before asking for another input. Therefore, your program will call ***inputCheck*** to make input checks for each input separately whenever necessary. The function should **return** the appropriate boolean (bool) value depending on whether there are errors or not.
   The **7 parameters** are as follows:
   1) Type of phone usage (string)
   2) Number of Minutes user has used
   3) Number of SMSs user has used
   4) Number of MBs user has used
   5) Number of additional call packages the user has bought
   6) Number of additional SMS packages the user has bought
   7) Number of additional Internet packages the user has bought

   ****The last six parameters are all integers**

   The inputs for function1 will be variables defined in the main function. They will be used in other functions too so make sure that you use the right function calling mechanisms.

3. **bool inputCheck(…):** Gets an integer value and the type of service in question as parameters. It then checks if the given integer value is equal to or greater than zero. It will **return** the appropriate boolean (bool) value.

4. **double costCalculate(…):** Takes **17** inputs as parameters and calculates the total cost of all services. (Please refer to Tables 1, 2 and 3 to calculate the total cost.) After the calculations, it will **return** the total cost calculated

   The **17 parameters** are as follows:
   1) Number of Minutes user has used
   2) Number of SMSs user has used
   3) Number of MBs user has used
   4) Number of additional call packages the user has bought
   5) Number of additional SMS packages the user has bought
   6) Number of additional Internet packages the user has bought
   7) Price of a single package
   8) Number of minutes provided by the package
   9) Number of SMSs provided by the package
   10) Number of MBs provided by the package
   11) Price of a single additional package
   12) Number of minutes provided by the additional package
   13) Number of SMSs provided by the additional package
   14) Number of MBs provided by the additional package
   15) Standard rate for calls
   16) Standard rate for SMSs
   17) Standard rate for internet

   ****<u>The 17 parameters are all integers</u>**

5. **void displayResults(…):** Takes the package price, type of phone usage (string) and the total cost as parameters, and displays the total cost and the appropriate special message for that total cost as given in Table 7.

No abrupt program termination please!

You may want to stop the execution of the program at a specific place (before the end) in the program. Although there are ways of doing this in C++, it is not a good programming practice to abruptly stop the execution in the middle of the program. Therefore, your program flow should continue until the end of the main function and finish there.

Sample Runs

Below, we provide some sample runs of the program that you will develop. The italic and bold phrases are inputs taken from the user. You should follow the input order in these examples and the prompts your program will display must be **exactly the same** as in the following examples.

Sample Run 1

```
Please enter how many minutes you used this month in Turkey: 200
Please enter how many SMSs you sent this month in Turkey: 900
Please enter how many MBs you used this month in Turkey: 4000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 0 0 0
Total cost of your phone usage in Turkey is 120 TL. You did not
exceed your package.
Please enter how many minutes you used this month Internationally: 99
Please enter how many SMSs you sent this month Internationally: 99
Please enter how many MBs you used this month Internationally: 800
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 0 0 0
Total cost of your phone usage Internationally is 300 TL. You did not
exceed your package.
```

Sample Run 2

```
Please enter how many minutes you used this month in Turkey: 250
Please enter how many SMSs you sent this month in Turkey: 1300
Please enter how many MBs you used this month in Turkey: 5000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 0 1 0
Total cost of your phone usage in Turkey is 200 TL. You exceeded your
package.
Please enter how many minutes you used this month Internationally:
200
Please enter how many SMSs you sent this month Internationally: 100
Please enter how many MBs you used this month Internationally: 1000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 2 0 0
Total cost of your phone usage Internationally is 500 TL. You
exceeded your package.
```

Sample Run 3

```
Please enter how many minutes you used this month in Turkey: 300
Please enter how many SMSs you sent this month in Turkey: 1200
Please enter how many MBs you used this month in Turkey: 5000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 1 0 0
Total cost of your phone usage in Turkey is 350 TL. You exceeded your
package too much. We suggest you to change your package.
```

Please enter how many minutes you used this month Internationally: **300**
Please enter how many SMSs you sent this month Internationally: **10**
Please enter how many MBs you used this month Internationally: **1000**
Please specify how many additional packages you bought for calls, SMS and internet in this order: **2 0 0**
Total cost of your phone usage Internationally is 2000 TL. You exceeded your package too much. We suggest you to change your package.

Sample Run 4

Please enter how many minutes you used this month in Turkey: **500**
Please enter how many SMSs you sent this month in Turkey: **1250**
Please enter how many MBs you used this month in Turkey: **6144**
Please specify how many additional packages you bought for calls, SMS and internet in this order: **1 1 1**
Total cost of your phone usage in Turkey is 210 TL. You exceeded your package.
Please enter how many minutes you used this month Internationally: **200**
Please enter how many SMSs you sent this month Internationally: **300**
Please enter how many MBs you used this month Internationally: **3072**
Please specify how many additional packages you bought for calls, SMS and internet in this order: **2 1 1**
Total cost of your phone usage Internationally is 700 TL. You exceeded your package too much. We suggest you to change your package.

Sample Run 5

Please enter how many minutes you used this month in Turkey: **250**
Please enter how many SMSs you sent this month in Turkey: **1000**
Please enter how many MBs you used this month in Turkey: **5120**
Please specify how many additional packages you bought for calls, SMS and internet in this order: **0 0 0**
Total cost of your phone usage in Turkey is 120 TL. You did not exceed your package.
Please enter how many minutes you used this month Internationally: **150**
Please enter how many SMSs you sent this month Internationally: **300**
Please enter how many MBs you used this month Internationally: **2148**
Please specify how many additional packages you bought for calls, SMS and internet in this order: **1 1 0**

```
Total cost of your phone usage Internationally is 5620 TL. You
exceeded your package too much. We suggest you to change your
package.
```

Sample Run 6

```
Please enter how many minutes you used this month in Turkey: 200
Please enter how many SMSs you sent this month in Turkey: 500
Please enter how many MBs you used this month in Turkey: 2000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: -1 0 -1
Number of additional minutes packages cannot be smaller than 0.
```

Sample Run 7

```
Please enter how many minutes you used this month in Turkey: 200
Please enter how many SMSs you sent this month in Turkey: -1
Number of SMSs cannot be smaller than 0.
```

Sample Run 8

```
Please enter how many minutes you used this month in Turkey: 200
Please enter how many SMSs you sent this month in Turkey: 100
Please enter how many MBs you used this month in Turkey: 1000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 0 0 0
Total cost of your phone usage in Turkey is 120 TL. You did not
exceed your package.
Please enter how many minutes you used this month Internationally: 50
Please enter how many SMSs you sent this month Internationally: 50
Please enter how many MBs you used this month Internationally: 1000
Please specify how many additional packages you bought for calls, SMS
and internet in this order: 0 0 -1
Number of additional internet packages cannot be smaller than 0.
```

General Rules and Guidelines about Homework

The following rules and guidelines will be applicable to all homework unless otherwise noted.

How to get help?

You may ask questions to TAs (Teaching Assistants) or LAs (Learning Assistants) of CS201. Office hours of TAs/LAs are at the SUCourse.

What and Where to Submit

You can prepare (or at least test) your program using MS Visual Studio 2019 C++ (Windows users) or using XCode (macOS users).

- Your code will be automatically graded using SUCourse. Therefore, it is essential that you ensure your output matches the exact same outputs given in the example test cases provided by SUCourse.
- After writing your code, use the "Check" button located under the code editor in SUCourse to see your grade based on the example test cases used. This grade will give you an idea of how well your code is performing.
- Note that the example test cases used for checking your code are not the same as the ones used for grading your homework. Your final grade will be based on different test cases. Therefore, it is important that you carefully follow the instructions and ensure that your code is working correctly to achieve the best possible grade on your homework assignment.
- To submit your homework, click on the "Finish attempt..." button and then the "Submit all and finish" button. If you wish to submit again before the due date, you can press the "Re-attempt quiz" button.
- Submit your work **through SUCourse only**! You will receive no credits if you submit by any other means (email, paper, etc.).

Grading, Review and Objections

Be careful about the automatic grading: Your programs will be graded using an automated system. Therefore, you should follow the guidelines on the input and output order. Moreover, It is important to use the exact same text as provided in the example test case outputs from SUCourse. Otherwise, the automated grading process will fail for your homework, and you may get a zero, or in the best scenario, you will lose points.

Grading:

- There is NO late submission. You need to submit your homework before the deadline. Please be careful that SUCourse time and your computer time may have 1-2 minute differences. You need to take this time difference into consideration.
- Successful submission is one of the requirements of the homework. If, for some reason, you cannot successfully submit your homework and we cannot grade it, your grade will be 0.

- If your code does not work because of a syntax error, then we cannot grade it; and thus, your grade will be 0.
- Please submit your **own** work only. It is really easy to find "similar" programs!
- Plagiarism will not be tolerated. Please check our plagiarism policy given in the Syllabus.

Plagiarism will not be tolerated!

Grade announcements: Grades will be posted in SUCourse, and you will get an Announcement at the same time. You will find the grading policy and test cases in that announcement.

Grade objections: It is your right to object to your grade if you think there is a problem, but before making an objection please try the steps below and if you still think there is a problem, contact the TA that graded your homework from the email address provided in the comment section of your announced homework grade or attend the specified objection hour in your grade announcement.

- Check the comment section in the homework tab to see the problem with your homework.
- Check the test cases in the announcement and try them with your code.
- Compare your results with the given results in the announcement.

Good Luck!
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