

# CS 1014: PROJECT 2

## Due February 19, 1998

### TELEPHONE BILLS

#### OBJECTIVE

This project will give you the opportunity to write your first Fortran program with variable declarations, file I/O, and arithmetic processing statements. You must do the work for this project alone and must not receive any aid from any one except the course GTA or the instructor.

#### PROBLEM STATEMENT

In this assignment you are required to write a Fortran program to compute telephone bills for a local telephone company.

- **Local calls:** Each customer pays a basic charge of \$8.95 per month and pays extra \$0.08 for each local call.
- **Long distance calls within the same calling area (same area code):** The local company also charges each customer for making long distance calls within the same calling area. For such long distance calls, the customer pays \$0.12 per minute.
- **Long distance calls outside the calling area (different area code):** Long distance calls outside the calling area require the customer to dial an area code different from his or her own area code. For such calls, a long distance carrier bills the customer through the same local company. The rate for long distance calls is \$0.15 per minute.
- **Tax:** Consider 7.00% tax on the total amount which includes the basic charge, the charge for local calls, the charge for long distance calls within the same calling area, and the charge for long distance calls outside the calling area.

For example, suppose some customer made 100 local calls, spent 10 minutes in some long distance calls within the area, and spent 50 minutes in some long distance calls outside the area in one month. Then,

$$\begin{aligned}\text{Charge for all local calls} &= \text{Number of local calls} * 0.08 \\ &= 100 * 0.08 \\ &= 8.00\end{aligned}$$

$$\begin{aligned}\text{Charge for all long distance calls within the same calling area} &= \text{Number of minutes} * 0.12 \\ &= 10 * 0.12 \\ &= 1.20\end{aligned}$$

$$\begin{aligned}\text{Charge for all long distance calls outside the calling area} &= \text{Number of minutes} * 0.15 \\ &= 50 * 0.15 \\ &= 7.50\end{aligned}$$

$$\begin{aligned}
\text{Total amount} &= \text{Basic charge} \\
&+ \text{Charge for all local calls} \\
&+ \text{Charge for all long distance calls within the same calling area} \\
&+ \text{Charge for all long distance calls outside the calling area} \\
&= 8.95 + 8.00 + 1.20 + 7.50 \\
&= 25.65
\end{aligned}$$

$$\begin{aligned}
\text{Tax} &= \text{Total amount} * \text{Tax rate} \\
&= 25.65 * 0.07 \\
&= 1.7955
\end{aligned}$$

$$\begin{aligned}
\text{Total Bill} &= \text{Total amount} + \text{Tax} \\
&= 25.65 + 1.7955 \\
&= 27.4455
\end{aligned}$$

Therefore, the total bill should be \$27.45.

Your program should implement the above processing requirements for billing all customers served by the local company. To develop your own program for billing, you may use the example program EX7.F90, handed out and discussed in the class as a model and modify accordingly to fit the requirements for this assignment.

## INPUT

Your program should read data from an input file "charge.dat". Each line of data of the file contains the customer number, the number of local calls, the number of minutes for long distance calls within the calling area, and the number of minutes for the long distance calls outside the calling area. Each data item in a line is separated by spaces from others. You may create the file with the following sample data to test your program:

6734	56	50	80
4567	45	45	57
3432	75	35	69
4753	80	85	100
6723	38	20	180

Use free-format (unformatted) READ statement to read data from the input file as shown in the model program (EX7.F90). Your program should terminate when it is done processing all data sets from the file (you should not assume any fixed number of data sets or lines of data in the input file).

## OUTPUT

The program should create an output file "bill.out" containing the customer number, the basic charge, the charge for local calls, the charge for long distance calls within the same calling area, the charge for long distance calls outside the calling area, the tax, and the total bill for all customers. Notice that the customer number has to be written as an integer with ten positions and all others with at least ten positions and two decimals. With the sample input, the output file should look like as follows:

6734	8.95	4.48	6.00	12.00	2.20	33.63
4567	8.95	3.60	5.40	8.55	1.86	28.35
3432	8.95	6.00	4.20	10.35	2.07	31.57
4753	8.95	6.40	10.20	15.00	2.84	43.39
6723	8.95	3.04	2.40	27.00	2.90	44.29

## DOCUMENTATION

Do not forget to document your program. Some of your programs will be randomly selected from the archive (maintained on the grader server) later on for manual grading. Points will be deducted if your program is not well documented, well structured, and readable. You can use the program handed out for the first project as a model for documentation. Do not forget to include your name in the program documentation.

## SUBMISSION

Make sure your program compiles, links, and runs without errors before electronic submission. Notice that the program will not receive any input from the keyboard and also will not give you any output on the screen. The output will be saved in the file "bill.out." You have to check that file for correctness. Once you are confident that your program is giving correct output, submit your program file (the file with extension f90) to the grader server electronically. Do not submit the input or the output file or the executable file. You will be able to make four submissions only. You will be able to receive extra 5 points maximum if you submit the program early. Remember the late penalty is 20% for each day late.