

CS120 - Computer Science I

Lab #6

Spring 2014

The purpose of this lab is to use functions to break up a larger C++ program into smaller sections, and also to experience the use of *input redirection*. We will take our existing work from Assignment #2 and improve it through the use of functions.

Avista Utilities provides electricity to this area. They use rather complicated formulas to determine the charges for their services. They also use different rate schedules for residential, commercial and industrial customers. Each schedule consists of one or more of the following charges:

- A basic charge - a charge that is levied whether the customer uses any power or not.
- An energy charge - the actual cost of the energy used. Energy is measured in kilowatt-hours (kWh), and the cost of the energy used is determined by multiplying the kWh by the cost per kWh. On the schedules, the amount per kWh varies, depending upon the total amount of energy used.
- A demand charge - a cost associated with the maximum peak rate of energy use, measured in kW. This charge is either a fixed amount or is determined by multiplying the kW rate by the demand charge per kW.
- A voltage discount - Some customers receive a discount on the demand portion of their bill, determined by multiplying the discount rate by the demand amount.

Not every type of customer pays every type of charge. The type of customer is determined by a *schedule* number. The list on the next page summarizes each type of customer and the charges that are pertinent to that customer.

For this assignment, you will write a program that will read from *standard input* (`stdin`) a 6 digit customer number, a schedule number (one of 1, 11, 12, 21, 25), and the relevant information for a customer's bill.

All customers will have an energy use (kWh) - this is the only information required for schedule 1 customers. Other customers will have a demand amount (kW), and schedule 21 and 25 customers will need to have an indication (Y - for yes, N - for no) whether they should receive a voltage discount. Your program should then output the customer number, all the parameters that were input, and the computed electricity bill.

This input is provided for you in the form of a file containing data for several customers. To send it to your program, we will use *input redirection*. As the name implies, this causes the input to come from a file, rather than the keyboard. To do this, you can use the following command:

```
./a.out < SampleInputFile
```

The `<` indicates the redirection, with the file name being used for input rather than the keyboard. When the shell executes this command, it connects standard input to this file. You can

use `cin` within your program exactly as before, except now the program will get its input from the file, rather than from the keyboard.

For the purposes of this lab, the calculations must not take place in `main`. Instead, you should perform the calculations for each schedule in a function, and return the resulting charge back to the main program.

Your book covers functions in chapter 3, starting at 3.2.1.

You can assume that the input in the file contains correct data. Its format is columnar and tab-delimited, and the column names shown here will not be in the file:

CustomerNumber	ScheduleNumber	EnergyUse	DemandAmount	Discount
123456	1	800		
234567	11	4000	45	
345678	21	300000	75	Y
000000				

Note that the last line in the data file contains a customer number of 0. This value should be used to terminate your program.

Test your program with the provided `SampleInputFile`, and verify that the results are correct. Once you have tested your program, submit the source code via `cscheckin`, and turn in a hardcopy of your code to your instructor.

This program is due Friday, February 28, before midnight.

The current rate schedule is shown below. The data is the same as Assignment 2.

Schedule 1 - Residential	Rate
Basic charge	\$ 5.25000
Energy charge - first 600 kWh (per kWh)	0.07903
Energy charge - over 600 kWh (per kWh)	0.08853
Demand charge	None
Schedule 11 - Small commercial	Rate
Basic charge	\$10.00000
Energy charge - first 3650 kWh (per kWh)	0.09662
Energy charge - over 3650 kWh (per kWh)	0.07206
Demand charge - up to 20 kW	0.00000
Demand charge - more than 20 kW (per kW above 20kW)	5.25000
Voltage discount	None
Schedule 12 - Large commercial - same as Schedule 11	
Schedule 21 - Industrial	Rate
Basic charge	\$ None
Energy charge - first 250000 kWh (per kWh)	0.06263
Energy charge - over 250000 kWh (per kWh)	0.05339
Demand charge - up to 50 kW (fixed charge)	350.00000
Demand charge - over 50 kW (per kW above 50kW)	4.75000
Voltage discount (if eligible - per kW of demand)	0.20000
Schedule 25 - Large Industrial	Rate
Basic charge	\$ None
Energy charge - first 500000 kWh (per kWh)	0.05111
Energy charge - over 500000 kWh (per kWh)	0.04313
Demand charge - first 3000 kW (fixed charge)	12500.00
Demand charge - over 3000 kW (per kW above 3000 kW)	4.5000
Voltage discount (if eligible - per kW of demand)	0.20000