Student Name: **Weight:** **20%**

Student ID: **Marks:** **/100**

Assignment: Programming Basics

Type: Individual Assignment

Needed Modules: 1 and 2 ONLY

- Students should **ONLY USE** programming constructs covered in modules 1 and 2.
- **Submission will not be accepted when using programming concepts that are not covered in modules 1 and 2**
- **Late submission will not be accepted**

Scenario

A new Canadian energy provider, Responsible Energy Company (REC), plans to offer competitive utility services to residential customers. REC has engaged your company to write a program to calculate customer total monthly utility bills.

Equipment and Materials

For this assignment, you will need:

- Python IDE

Instructions

This assignment consists of three sections, all completed outside of class time. See Brightspace for exact due date.

1. Working individually, review the Scenario and the Processing Details sections of this document.
2. Draft a flowchart to represent the process/algorithm of calculating a customer's monthly utility bill.
3. Write a program that meets the requirements described in the scenario above, and calculates a customer's total monthly utility bill in **CDN$**.

   Your program should ask the user to enter the following information:

   - Account number
   - Month
   - Type of electricity plan (EFR or EVR)

- Amount of electricity used (in kWh)
- Type of natural gas plan (GFR or GVR)
- Amount of natural gas used (in GJ)
- Province

4. When your program is complete, use the data listed in each of the following three tests below to see if your program works correctly.

   Note: Check your program against the marking criteria for the submission.

5. Your program's output **MUST EXACTLY MATCH** the tests that follow on pages 4 and 5.
6. Submit the following to Brightspace:
   - The code of the program that you implemented (.py file)
   - A copy of the output from your three test runs (.txt file)
   - The flow chart in PDF format.

Processing Details

- Every REC customer pays a fixed monthly fee of $127.86.
- In addition to the monthly fee, customers are charged according to their actual consumption and the type of plan in which they're enrolled. To keep administration costs down, REC requires that customers receive both electricity and natural gas through REC.

  Note: Electricity and gas prices are in cents. To convert to Canadian dollars (CDN$), multiply by 0.01.
- For electricity, customers choose one of these two options:
  - **Fixed rate (EFR):** the price of one kWh is 8.86 ¢/kWh for the first 1000 kWh, guaranteed for 4 years. After the first 1000 kWh, the price of one kWh is 9.97 ¢/kWh
  - **Floating rate (EVR):** the rate varies monthly based on the market conditions and weather. This rate is determined at the end of each month and applies only to that month's consumption. This month, the price is 9.66 ¢/kWh.
- For natural gas, customers choose one of these two options:
  - **Fixed rate (GFR):** the price of one kWh is 4.83 ¢/ GJ for the first 950 GJ which is guaranteed for 4 years. After 950 GJ, the price of one kWh is 6.24 ¢/ GJ
  - **Floating rate (GVR):** the rate varies monthly based on the market conditions and weather. This rate is determined at the end of each month and applicable only to that month's consumption. This month, the price is 4.17 ¢/GJ
- Every natural gas customer is charged a fixed monthly transaction fee of $1.40 to help cover the cost of REC's industry-leading blended natural gas supply network.
- The company is required to apply a specific sales tax rate depending on the province that the customer lives in (see table below).

Province	Tax rate
Alberta (AB), British Columbia (BC), Manitoba (MB), Northwest Territories (NT), Nunavut (NU), Quebec (QC), Saskatchewan (SK) and Yukon (YT)	5%
Ontario (ON)	13%
New Brunswick (NB), Newfoundland and Labrador (NL), Nova Scotia (NS) and Prince Edward Island (PE)	15%

Bill Calculator Tests

Input values are shown in **bold underline**.

Test 1

```
Welcome to Responsible Energy bill calculator!

Enter the account number: 123456
Enter the month number, i.e. for January, enter 1: 2
Enter the electricity plan type (EFR or EVR): EFR
Enter amount of electricity used in month 2 (in kWh): 500
Enter the gas plan type (GFR or GVR): GFR
Enter amount of gas used in month 2 (in GJ): 700
Enter the province abbreviation (2 letters): AB
Thank you!
Monthly Utility Charge: $207.37
Provincial Sales Tax: $10.37
Total Amount Due Now: $217.74
```

Test 2

```
Welcome to Responsible Energy bill calculator!

Enter the account number: 456789
Enter the month number, i.e. for January, enter 1: 4
Enter the electricity plan type (EFR or EVR): EVR
Enter amount of electricity used in month 4 (in kWh): 700
Enter the gas plan type (GFR or GVR): GVR
Enter amount of gas used in month 4 (in GJ): 650
Enter the province abbreviation (2 letters): NS
Thank you!
Monthly Utility Charge: $223.99
Provincial Sales Tax: $33.60
Total Amount Due Now: $257.58
```

Test 3

Welcome to Responsible Energy bill calculator!

Enter the account number: **147852**
Enter the month number, i.e. for January, enter 1: **11**
Enter the electricity plan type (EFR or EVR): **EFR**
Enter amount of electricity used in month 11 (in kWh): **1100**
Enter the gas plan type (GFR or GVR): **GVR**

Enter amount of gas used in month 11 (in GJ): **1320**
Enter the province abbreviation (2 letters): **ON**
Thank you!
Monthly Utility Charge: $282.87
Provincial Sales Tax: $36.77
Total Amount Due Now: $319.65

Marking Criteria

	Needs Improvement (0–50%)	Good (51–75%)	Excellent (76–100%)	Marks
Flow chart	• Largely incomplete • Poor structure	• Good overall design, but not complete or there are steps missing	• Excellent design which can be followed to write a functional code • No missing steps or branches	**/20**
Working code	• The project doesn't run in all scenarios • Input requests work but don't match the scenario • Syntax of if/else statements has mistakes • Output works but doesn't match the scenario	• The project runs in all scenarios • Input requests work but don't match the scenario • Correct use of if/else statements • Output works but doesn't match the scenario	• The project runs in all scenarios • Input requests match the scenario exactly • Correct use of if/else statements • Output matches the scenario	**/40**

Style	• Indentation – not consistent
	• Readability – poor variable names
	• Documentation
	  ○ No comments are included at the top.
	  ○ No comments indicating major code sections or what they do
		• Indentation – some parts are consistent and some are not
		• Readability – some variable names are not ideal
		• Documentation
		  ○ Comments at the top are missing or incomplete.
		  ○ Comments indicating major code sections and what they do are incomplete
			• Indentation – consistent
			• Readability – good variable names
			• Documentation
			  ○ Comments at the top are complete and include name, date, program description including details on inputs, processing and outputs (4–5 sentences minimum).
			  ○ Comments indicate major code sections and what they do
				/20

Testing	• Sample output doesn't match the provided test plan • Output is not formatted according to the specification (test plan)	• Parts of the sample output don't exactly match the provided test plan • Output formatted according to the specification (test plan)	• Sample output exactly matches the provided test plan • Output formatted according to the specification (test plan)	**/20**
			Total	**/100**