PROG 8010 Assignment 6

You are only required to complete the programming problem that has been assigned to your group. However, you are encouraged to work through as many programming problems as possible.

Each group is to submit one solution to eConestoga. Someone from your group will be selected at random to present their solution to the class. Your mark on the assignment will depend on a combination of the quality, functionality, and adhesion to coding standards of your code. If you are absent without excuse, your mark for the presentation portion of the assignment (20%) is zero.

Group 1/12 Problem – Kinetic Energy

In physics, an object that is in motion is said to have kinetic energy. The following formula can be used to determine a moving object's kinetic energy:

$$KE = \frac{1}{2} mv^2$$

In the formula, KE is the kinetic energy, m is the object's mass in kilograms, and v is the object's velocity in meters per second. Create an application that allows the user to enter an object's mass and velocity and then displays the object's kinetic energy. The application should have a function named *CalcKineticEnergy* that accepts an object's mass (in kilograms) and velocity (in meters per second) as arguments. The function should return the amount of kinetic energy that the object has.

Group 2/7 Problem – Joe's Automotive

Joe's Automotive performs the following routine maintenance services:

- Oil change - $26
- Lube job - $18
- Radiator flush - $30
- Transmission flush - $80
- Inspection - $15
- Muffler replacement - $100
- Tire rotation - $20

Joe also performs other nonroutine services and charges for parts and labor ($20 per hour). Create an application that displays the total for a customer's visit to Joe's.

The application should have the following value-returning methods:

- OilLubeCharges – Returns the total charges for an oil change and/or a lube job, if any.
- FlushCharges – Returns the total charges for a radiator flush and/or a transmission flush, if any.
- MiscCharges – Returns the total charges for an inspection, muffler replacement, and/or a tire replacement, if any.
- OtherCharges – Returns the total charges for other services (parts and labor, if any)
- TaxCharges – Returns the amount of sales tax, if any. Sales tax is 6% and is charged only on parts.
- TotalCharges – Returns the total charges.

The application should have the following void methods called when the user clicks the Clear button:

- ClearOilLube – clears the UI for selecting oil change and lube job.
- ClearFlushes – clears the UI for selecting radiator and transmission flush.
- ClearMisc – clears the UI for inspection, muffler replacement, and tire rotation.
- ClearOther – clears the UI collecting user data for parts and labor
- ClearTaxAndTotal – clears the tax and total area of the form.

Group 3/8 Problem – Hospital Charges

Create an application that calculates the total cost of a hospital stay. The daily base charge is $350. The hospital also charges for medication, surgical fees, lab fees, and physical rehab. The application should accept the following input:

- The number or days spent in the hospital
- The amount of medication charges
- The amount of surgical charges
- The amount of lab fees
- The amount of physical rehabilitation charges

Create and use the following value-returning methods in the application:

- CalcStayCharges – calculates and returns the base charges for the hospital stay. This is computed as $350 times the number of days in the hospital.
- CalcMiscCharges – calculates and returns the total of the medication, surgical, lab, and physical rehabilitation charges
- CalcTotalCharges – calculates and returns the total charges.

Group 4/9 Problem – Present Value

Suppose you want to deposit a certain amount of money into a savings account and then leave it alone to draw interest for the next 10 years. At the end of 10 years, you would like to have $10,000 in the account. How much do you need to deposit today to make that happen? You can use the following formula, which is known as the present-value formula, to find out:

$$P=F/(1+r)^n$$

The terms of the formula are as follows:

- P is the present value, or the amount you need to deposit today
- F is the future value that you want in the account (In this case, F = $10,000)
- r is the annual interest rate
- n is the number of years that you plan on letting the money sit in the account

Write a method named CalcPresentValue that performs this calculation. The method should accept the future value, the annual interest rate, and the number of years as arguments. It should return the present value, which is the amount that you need to deposit today. Demonstrate the method in an application that lets the user experiment with different values for the formula’s terms. A slider control might be an interesting way of seeing the data change.

Group 5/10 Problem – Prime Numbers

A prime number is a number that can be evenly divided by only itself and 1. For example, the number 5 is a prime number because it can be evenly divided by only 1 and 5. The number 6, however, is not prime because it can be evenly divided by 1, 2, 3, and 6. Write a Boolean function named *IsPrime* that takes an integer as an argument and returns true if the argument is a prime number and false otherwise. Use this function to display all the prime numbers from 1 to 100 in a list box. The program should have a loop that calls the *IsPrime* function.

Remember that the % operator divides one number by another and returns the remainder of the division. In an expression such as num1 % num2, the % operator returns 0 if num1 is evenly divisible by num2.

Group 6/11 Problem – Rock, Paper, Scissors Game

Create an application that lets the user play the game of Rock, Paper, Scissors against the computer. The program should work as follows:

1. When the program begins, a random number is the range of 1 through 3 is generated. If the number is 1, then the computer has chosen rock. If the number is 2, then the computer has chosen paper. If the number is 3, then the computer has chosen scissors. (Do not display the computer's choice yet.)
2. The user selects his or her choice of rock, paper, or scissors. To get this input you can use Button controls, or clickable Button/Image controls displaying some of the artwork that you will find in the supporting materials folder.
3. The computer's choice is displayed.
4. A winner is selected according to the following rules:
    a. If one player chooses rock and the other player chooses scissors, the rock wins.
    b. If one player chooses scissors and the other player chooses paper, then scissors wins.
    c. If one player chooses paper and the other player chooses rock, then paper wins.
    d. If both players make the same choice, the game must be played again to determine the winner.

Be sure to modularize the program into methods that perform each major task.