CS 110 - Programming I

Homework 1

General Instructions

- Every problem needs to be solved in a separate .cpp file
- The name of the cpp file needs to be the number of the problem. For example, the file for the solution to problem 2 should be named 2.cpp
- The first two lines of every one of your solutions should be a comment with your full name and your email address, for example:

```
// Pablo Gallastegui
// pablo.gallastegui@brescia.edu
```

- All the solutions need to be compressed (zipped up) in a single file named as the left half (before the @ symbol) of your email address, for example:

```
pablo.gallastegui.zip
```

- The compressed folder has to be submitted using moodle, before the due date and time.
- After every homework is due, a few students may randomly be selected to explain the way they solved one of the problems.

Recommendations

- You can resubmit the assignment multiple times, so I would recommend submitting early and often. Better to have most of your assignment turned in in case of a technology failure than none at all.
- Due date and time is on a Sunday right before midnight. Although I try to do my best, the chances of getting any questions answered right before the due date and time can be small. Try to solve the homework with plenty of times to ask questions in the forum or, preferably, during class.

- You will always get a better credit for a wrong answer that is yours, than for a right answer that is someone else's. Make sure you add comments explaining your reasoning in code to get partial grade even when the problem does not return the correct result.
- Make sure that your output looks exactly like the output required. While we will have plenty of flexibility during the labs to experiment and explain the route we took, I may not be able to understand the reasoning behind changing the output in a homework, and that could result in lost points.
- Feel free to help each other, but do not copy from each other.
- Test your programs with many different inputs, make sure they return the correct result.

Problems

1. (10 points) Write a program that inputs three integers from the keyboard and prints the sum, average, product, smallest and largest of these numbers. The screen dialog should appear as follows:

    ```
    Input three different integers: 13 27 14
    Sum is 54
    Average is 18
    Product is 4914
    Smallest is 13
    Largest is 27
    ```

2. (10 points) Write a program that reads in the radius of a circle as an integer and prints the circle's diameter, circumference and area. Use the constant value 3.14159 for π. Do all calculations in output statements. The screen dialog should appear as follows:

    ```
    Input the radius of a circle: 20
    Diameter is 40
    Circumference is 125.66
    Area is 1256.64
    ```

3. (10 points) Write a program that reads an integer and determines and prints whether it's odd or even. The screen dialog should appear as follows:

    ```
    Input a number: 3
    3 is odd
    ```

    or:

    ```
    Input a number: 1024
    1024 is even
    ```

4. (10 points) Write a program that inputs a five-digit integer, separates the integer into its digits and prints them separated by three spaces each. The screen dialog should appear

as follows:

```
Input a 5-digit number: 54354
5    4    3    5    4
```

5. (20 points) Drivers are concerned with the mileage obtained by their automobiles. One driver has kept track of several trips by recording miles driven and gallons used for each trip. Develop a C++ program that uses a while statement to input the miles driven and gallons used for each trip. The program should calculate and display the miles per gallon obtained for each trip and print the combined miles per gallon obtained for all tankfuls up to this point. The screen dialog should appear as follows:

```
Enter miles driven (-1 to quit): 287 Enter gallons used: 13
MPG this trip: 22.076923
Total MPG: 22.076923
Enter miles driven (-1 to quit): 200 Enter gallons used: 10
MPG this trip: 20.000000
Total MPG: 21.173913
Enter the miles driven (-1 to quit): 120 Enter gallons
   used: 5
MPG this trip: 24.000000
Total MPG: 21.678571
Enter the miles used (-1 to quit): -1
```

6. (10 points) Create an application that calculates your daily driving cost, so that you can estimate how much money could be saved by carpooling, which also has other advantages such as reducing carbon emissions and reducing traffic congestion. The application should input the following information and display the user's cost per day of driving to work:
   a. Total miles driven per day.
   b. Cost per gallon of gasoline.
   c. Average miles per gallon.
   d. Parking fees per day.
   e. Tolls per day.

   The screen dialog should appear as follows:

```
Input total miles driven per day: 20
Input cost per gallon of gasoline in dollars: 2.2
Input average miles per gallon: 20
Input parking fees per day in dollars: 7.5
Input tolls per day: 10
Total cost: $19.7
```

7. (30 points) Develop a C++ program that will determine whether a department-store customer has exceeded the credit limit on a charge account. For each customer, the following facts are available:

   a. Account number (an integer)
   b. Balance at the beginning of the month
   c. Total of all items charged by this customer this month
   d. Total of all credits applied to this customer's account this month
   e. Allowed credit limit

The program should use a while statement to input each of these facts, calculate the new balance (= beginning balance + charges – credits) and determine whether the new balance exceeds the customer's credit limit. For those customers whose credit limit is exceeded, the program should dis- play the customer's account number, credit limit, new balance and the message "Credit Limit Exceeded."

```
Enter account number (or -1 to quit): 100 Enter beginning
   balance: 5394.78
Enter total charges: 1000.00
Enter total credits: 500.00
Enter credit limit: 5500.00 New balance is 5894.78 Account:
   100
Credit limit: 5500.00 Balance: 5894.78 Credit Limit
   Exceeded.
Enter Account Number (or -1 to quit): 200 Enter beginning
   balance: 1000.00
Enter total charges: 123.45
Enter total credits: 321.00
Enter credit limit: 1500.00 New balance is 802.45
Enter Account Number (or -1 to quit): -1
```