Cairo University
Faculty of Computers & Artificial Intelligence
Structured Programming (2019/2020)

Assignment 1

Delivery Notes:

- This is a group assignment of 2 members (at most) and the members should be from the same group/lab.
- Both students should work and fully understand everything in the code.
- Due date is on May 4th until 11:55 pm
- No late submission is allowed.
- Submission will be on blackboard
- No submission through e-mails.
- For each task you will develop a .cpp file that should include a block comment containing students' IDs and names these files should be named task1.cpp, task2.cpp & task3.cpp, then put these 3 files in a folder named GroupNum_firstStudentID_SecondStudentID and compress them to a .zip file with the same folder name. The compressed file would be the file to be delivered.
- The allowed values for group numbers in the zip file name is **S1 till S44**, and for the **old ByLaw G1 till G4**. Please check your group number using the student names list uploaded on blackboard because writing it wrong will not allow your TA to receive your assignment and you might lose its grade.
- **Failing to abide by the naming conventions of the file, would result in a ZERO for both team members.**
- **Do not send your code** to anyone**,** so that no other student would take your files and submit it under their names.
- **In case of Cheating you will get a negative grade whether you give the code to someone, take the code from someone/internet, or even send it to someone for any reason.**
- You have to write clean code and follow a good coding style including choosing meaningful variable names.

Problem-1: Science: wind-chill temperature (20 points)

How cold is it outside? The temperature alone is not enough to provide the answer. Other factors including wind speed, relative humidity, and sunshine play important roles in determining coldness outside. In 2001, the National Weather Service (NWS) implemented the new wind-chill temperature to measure the coldness using temperature and wind speed. The formula is:

$$T_{Wind\text{-}chill} = 13.12 + 0.6215\,\mathbf{T} - 11.37\,\mathbf{V}^{0.16} + 0.3965\mathrm{T}\,\mathbf{V}^{0.16}$$

where T is the outside temperature measured in degrees Celsius and V is the speed measured in kilometers per hour. $T_{Wind\text{-}chill}$ is the wind-chill temperature. The formula cannot be used for wind speeds below 4 kph or temperatures below –50°C or above 5°C.

Write a program that prompts the user to enter a temperature between **–50°C** and **5°C** and a wind speed greater than or equal to **4** and displays the wind-chill temperature. Your output should be displayed as a float with exactly 2 digits after the decimal point.

Use **pow(a, b)** to compute $V^{0.16}$. Here is a sample run:

```
Please enter the temperature in degrees Celsius: -14.8
Please enter the wind speed in kilometers per hour: 9

The wind chill temperature is: -20.58
```

Problem-2: Point and a circle (20 points)

Write a program that prompts the user to enter a point (**x, y**) and checks whether the point is: 1-on the outer edge of the circle, 2- outside the circle, 3- inside the circle centered at ($\mathbf{x_{center}}$, $\mathbf{y_{center}}$) with radius **r**.
A point is on the outer edge of the circle if the distance between (x, y) and ($\mathbf{x_{center}}$, $\mathbf{y_{center}}$) is equal to the radius r. Note that double and float comparisons can be tricky, so allow for an error margin of 0.01, such that when the difference between distance and the radius is less than 0.01, they are considered equal.

A point is outside of the circle if the distance separating it from the center is greater than the radius.

A point is inside of the circle if the distance separating it from the center is less than the radius.

Example Runs:

```
Enter coordinates of the center of the circle: 3 4
Enter the radius of the circle: 5
Enter coordinates of the point: 6 8

On the circle
```

```
Enter coordinates of the center of the circle: 5 1
Enter the radius of the circle: 4
Enter coordinates of the point: 10 3

Outside the circle
```

```
Enter coordinates of the center of the circle: 4 8
Enter the radius of the circle: 10
Enter coordinates of the point: 1 2

Inside the circle
```

```
Enter coordinates of the center of the circle: 5 7
Enter the radius of the circle: 2.23
Enter coordinates of the point: 3 8

On the circle
```

Problem-3: Call ME! (50 points)

Write a program that calculates the charges for telephone calls based: the time of the call, the duration of the call, and the selected plan of the user. The program should ask the user to enter the following:

- Selected plan (A or B)
- Start time of the call entered in hours minutes seconds in a 24-hour format. For example, entering **14:23:11** means 2 pm at minute 23, at 11 seconds.
- End time of the call entered in hours minutes seconds.
- Date of the call entered in Name-of-the-day day-of-the-month month. For example, entering Thurs 22 4 means Thursday 22nd April. Days of the week should be {Sat, Sun, Mon, Tues, Wed, Thurs, Fri}

Based on the entered information, the program should calculate the duration of the call in minutes, and display:

- The entered call information (Start time, end time, date, and duration of the call in minutes)
- The user's plan displayed in a tabular format, where all the rates would be displayed in right alignment.
- The calculated rate of the call.

The cost of the call is determined according to the following Plans:

Plan A: Premium

a. Any call started between 7:00 am and 5:00 pm, Sunday to Thursday, is billed at a rate of L.E. 0.60 per minute if the call lasts less than 15 minutes, otherwise the rate would be L.E. 0.80.

b. Any call starting before 7:00 am or after 5:00 pm, Sunday through Thursday, is charged at a rate of L.E. 0.45 per minute.

c. Any call started on a Friday or Saturday is charged at a rate of L.E. 0.25 per minute.

Plan B: Platinum

a. Any call started between 7:00 am and 5:00 pm, Sunday to Wednesday, is billed at a rate of L.E. 0.60 per minute if the call lasts less than 30 minutes, otherwise the rate would be L.E. 0.80.

b. Any call starting before 7:00 am or after 5:00 pm, Sunday through Wednesday, is charged at a rate of L.E. 0.45 per minute.

c. Any call started on a Thursday, Friday or Saturday is charged at a rate of L.E. 0.25 per minute.

The program should not allow entering negative times, or times that are greater than 23:59:59. Invalid day names should be rejected as well. Furthermore, only the given plans are available for choice.

Grading (100 points):

1. **Problem-1 [20 points]** [Input validation (2), calculating wind chill correctly (16), output display (2)]
2. **Problem-2 [20 points]** [Inside the circle (5), Outside the circle (5), On the circle (8), Input validation (2), validation (3 points)]
3. **Problem-3 [50 points]** [Call info (10 points), User's Plan (10), Call rate (20), validation (10 points)]
4. Comments and Programming style **[5 points]**
5. Meaningful variables names **[5 points]**