National University of Computer & Emerging Sciences, Karachi
Fall-2022 School of Computing
Lab – Mid Examination, Fall 2022
21st Oct, 2022, 1:45 pm – 3:45 pm
Paper A

Course Code: CL1002	Course Name: Programming Fundamentals Lab
Instructors: Mr. Taha Ahmed, Ms. Ayesha Ali, Mr. Shaheer Ahmad Khan, Mr. Hamza Ahmed	
Student Roll No:	Section:

Instructions:
READ carefully the following instructions before attempting the paper.

- Except your Roll No and Section, **DO NOT WRITE** anything on this paper.
- The Final Exam consists of **3 questions on 2 pages**. Make sure that you have all of these and that they are all legible.
- Read all questions and their instructions thoroughly before you begin. It is always worth your time to plan ahead!
- Points will be awarded based on your explicit answers. Partial credit will be given where possible, so show all of your work.
- In case of any ambiguity, you may make assumptions but your assumption must not contradict any statement in the question paper.
- **DON'T** share your program, if your code is matched to any member of your class, both will get **straight F** in the course without asking who shared or who magically copied.
- Name the .c file for each question according to Roll_No e.g. k221234_Q1.c, k221234_Q2.c etc.
- You must comment your student ID on top of each file. (Line#1 of your code).
- Submission on **Google Classroom**.

Time: 120 Minutes **Max Points:** 60 Points

Task 1: **[20 mins, 10 points]**

Barcodes are the mark which identify a product as unique. The barcode is 5 digits long. A company has mixed up stock which is required to be sorted out into 3 categories:

- Category 1 - If the first 2 digits are both divisible by 2 or 4.
- Category 2 - If not category 1, and the last digit is divisible by 3 and the 2nd last digit is odd.
- Category 3 - If it doesn't meet the above conditions.

Write a C program which will read the barcode and print on the screen the appropriate category.

Example Input:
Barcode: 46751
Example Output:
Category 1

Task 2: **[35 mins, 20 points]**

You have been tasked with creating a parking management system for a shopping center. The cars queueing for parking will be of 3 types: large, medium and small. The possible parking spaces for a car will also be of these 3 types.
This means:

- A large parking space has space for a large, medium, or small car.
- A medium parking space has space for a medium, or small car.
- A small parking space has space for only a small car.

Initially, you will take as input the total number of large, medium and small parking spaces in the parking lot. Then, your program will simulate the process of parking management for N cars. You are also supposed to monitor the **feedback score** from each customer using the parking system.

For each car, you will ask the user which type of car it is: large, medium or small. Then, your program should check whether the car can be parked using the available parking spaces or not.

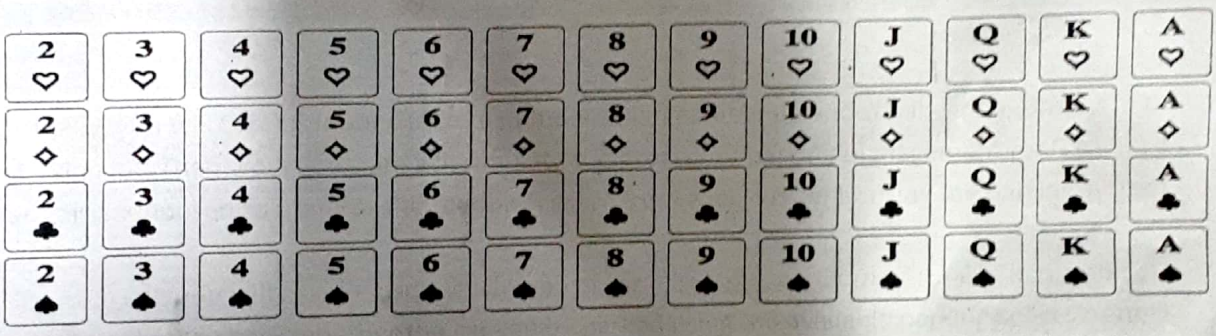
If it is not possible, then your feedback score must be reduced by 50 points. Otherwise, the feedback score will be incremented based on the following criteria:

- If the car received a parking space of its size (e.g. large car in large space) then +5 points.
- If the car received a parking space larger than its size (e.g. medium car in large space) then +10 points.

Your program must end after simulating all N cars and then print the final feedback score, as well as the total occupied parking spaces of each type (large, medium, small).

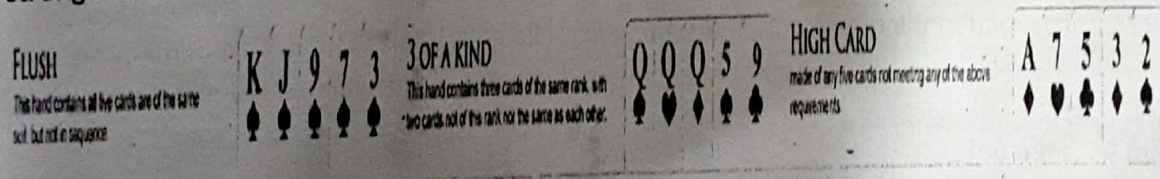
Task 3: **[60 mins, 30 points]**

Alice and Bob want to play a poker game, where both players will receive 5 cards and the strongest set of 5 cards will win. The image below shows the full set of the possible 52 playing cards.



Each card has 2 features: rank & suit. The rank can be represented by a number (2-14). 2-10 as normal and 11,12,13,14 will represent J,Q,K,A respectively. The suit can be represented by a character. 'h' for hearts, 'd' for diamonds, 'c' for clubs and 's' for spades.

The player with the strongest hand will win the game. Following is the criteria to select the strongest hand along with an example of each type:



The above hand types are ranked in the following order:

1. **"Flush".** This hand contains 5 cards with the same **suit**. (e.g. all hearts).
2. **"3 of a Kind".** This hand contains 3 cards with the same **rank**. (e.g. 7,7,7).
3. **"High Card".** If the above requirements are not satisfied, it is simply a "High Card".

This means, **"Flush"** is the **strongest** compared to the other 2 hands.

During each iteration of the game loop, you must take as input the 5 cards of Alice, and 5 cards of Bob. Then, your program will compare which of the 2 players has a stronger hand according to the

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Paper B

Course Code: CL1002	**Course Name:** Programming Fundamentals Lab
Instructors: Mr. Taha Ahmed, Ms. Ayesha Ali, Mr. Shaheer Ahmad Khan, Mr. Hamza Ahmed	
Student Roll No: 22[redacted]	**Section:** K

Instructions:
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- You must comment your student ID on top of each file. (Line#1 of your code).
- Submission on **Google Classroom**.

Time: 120 Minutes **Max Points:** 60 Points

Task 1: **[20 mins, 10 points]**

A company provides salary to its employees based on the hours they have worked. Then, it decides to give bonuses to all its employees on Eid. A 5% bonus on salary is given to the male workers and a 10% bonus on salary to the female workers.

Write a program which takes as input the hours worked and hourly rate to first calculate the salary of the employee. Then, take as input the gender (M for male and F for female) of the employee. If the salary of the employee is less than Rs. 10,000 then the employee gets an extra 2% bonus on salary. Finally, print on the screen the final salary after bonus.

Task 2: **[35 mins, 20 points]**

Ali has started a burger shop, with one of his key principles being that no ingredients should go to waste. The ingredients he uses are tomato slices and cheese slices.

The following 2 items are on menu:

1. **Jumbo Burger:** 4 tomato slices, 1 cheese slice.
2. **Small Burger:** 2 tomato slices, 1 cheese slice.

Write a C program to help Ali simulate his daily business, by taking as input the initial number of tomato slices and cheese slices. Then, your program should check whether it is possible to use all the ingredients exactly without wasting anything. If it is possible, your program should print the number of Jumbo Burgers and Small Burgers that must be cooked to satisfy the criteria. Otherwise, print "Not possible".

Example Input_1:
tomatoSlices = 16, cheeseSlices = 7

Example Output_1:

No ingredients wasted. Jumbo Burgers = 1, Small Burgers = 6

Explanation_1:

To make one jumbo burger and 6 small burgers we need 4*1 + 2*6 = 16 tomatoes and 1 + 6 = 7 cheese. There will be no remaining ingredients.

Example Input_2: tomatoSlices = 4, cheeseSlices = 17

Example Output_2: Not possible

Explanation_2:

Making 1 jumbo burger there will be 16 cheese remaining and making 2 small burgers there will be 15 cheese remaining. Either way, ingredients will be wasted.

[60 mins, 30 points]

Task 3:

Alice and Bob want to play a poker game, where both players will receive 5 cards and the strongest set of 5 cards will win. The image below shows the full set of the possible 52 playing cards.

Each card has 2 features: rank & suit. The rank can be represented by a number (2-14). 2-10 as normal and 11,12,13,14 will represent J,Q,K,A respectively. The suit can be represented by a character. 'h' for hearts, 'd' for diamonds, 'c' for clubs and 's' for spades.

The player with the strongest hand will win the game. Following is the criteria to select the strongest hand along with an example of each type:

The above hand types are ranked in the following order:

1. **"4 of a Kind".** This hand contains 4 cards with the same **rank**. (e.g. 7,7,7,7).
2. **"2 Pair".** This hand contains 2 cards with the same **rank**, and another 2 cards also with the same **rank**. (e.g 2,2,4,4).
3. **"High Card".** If the above requirements are not satisfied, it is simply a "High Card".

This means, **"4 of a Kind"** is the **strongest** compared to the other 2 hands.

During each iteration of the game loop, you must take as input the 5 cards of Alice, and 5 cards of Bob. Then, your program will compare which of the 2 players has a stronger hand according to the above conditions. The result can either be "Alice wins", "Bob wins", or "Draw". After each round, you must ask the user to input whether the game should continue or stop.

When the user wishes for the game to stop, you must print on the screen the total number of wins for Alice, wins for Bob, and draws.