



United International University
Department of Computer Science and Engineering
CSE 1112 Structured Programming Language Laboratory
Assignment 2

1. Write a program that will take a student's name (in a string) and five exam marks (in a float array) as input in main function. Then define two functions with the following tasks:
 - a. Detect the last name of the student(last word of the string) and print it.
 - b. Find the average exam marks and return the value to main.

Sample Input:

Enter student name : Ruhan Khan
Enter five exam marks : 15.5 16.5 14 20 19

Sample output:

The Last name is : Khan
Average marks is : 17.0

2. Declare a structure date with year, month and day (all integer) as its attributes. Take five dates as input (These inputs should be taken from an input file).
 - Print the stored data as output.
 - Print the dates that fall on a leap year in the format dd/mm/yyyy.

All outputs should be shown in the console.

3.

Write a program that checks whether a number is a “Mersenne prime” or not. A Mersenne prime is a number that has the following properties:

- a. The number is prime
- b. The number is one less than a power of two

For example, the number 31 is a Mersenne prime, because it is a prime number, and it is one less than 32, which is a power of two. However, the number 15 is not a Mersenne prime, because even though it is one less than 16 (which is a power of two), it is not a prime number.

Your job is to write a program that takes an integer as input and then prints ‘Yes’ if it is a Mersenne prime and ‘No’ if it is not.

For that purpose, you have to write the following functions

- a. `int is_prime(int x)`: This function returns 1 (or nonzero/true value) if the integer `x` is prime and 0 otherwise
- b. `int power_of_2(int x)`: This function takes an integer as input and checks if it is a power of two or not. If `x` is a power of two, this function returns 1 (or nonzero/true value) and 0 otherwise. **You must write this function using recursion.**
- c. `int is_mersenne(int x)`: This function takes an integer as input and returns 1 (or nonzero/true value) if it is a Mersenne prime and 0 otherwise. **You should make function calls to functions (a) and (b) in this function.**

See the following sample input and output for clarification:

Sample Input	Sample Output
100	No
31	Yes
15	No
71	No
131071	Yes

4.

Ash Ketchum from Pallet Town is an avid collector of Pokemon Cards. But now he is becoming old and has got a job, so he wants to sell all of his Pokemon cards to others so that they can have the joy of Pokemon. But first, Ash wants to find out how much money he will make by selling the cards in his collection.

Your job is to write a program to help Ash calculate the price of all of his cards.

In your program, each Pokemon card should be represented by a structure, containing the following member variables:

```
struct card {  
    char name[60];    // name of the Pokemon card  
    int stage;        // stage of the Pokemon, can take  
                        // values 0, 1 or 2  
    int HP;           // HP (hit points) of that Pokemon  
};
```

The price of each card is calculated in the following method:

- The base price of each card is 50 Tk (If the card has no other extra features, the card can be sold for 50 Tk)
- The price of the card increases by the number of hit points it has. That is, if the HP of a card is 140, the price of that card will increase by 140 Tk. If its HP is 80, the price of that card will increase by 80 Tk instead.
- If the stage of the card is equal to 1, its price increases by 30 Tk. If its stage is equal to 2, its price increases by 70 Tk instead. (If its stage is equal to 0, no price increase happens due to stage)
- If the name of the Pokemon card ends with the letter 'X' (the capital letter only), the price of the card increases by 200 Tk

Your program should take information about all the cards in Ash's collection as input, and then print the total price obtainable by selling all of Ash's cards.

The first line of input contains an integer N , indicating the number of cards in Ash's collection. The next lines contain information about the individual Pokemon cards. Each group of three lines contains the name, stage, and HP of that individual Pokemon card respectively. You can be sure that the name of a card is a single word.

Your program should have the following properties:

- Your program should represent all of the cards in Ash's collection using an array of structures of type `struct card`
- You need to make the following function and call it in your program to calculate the result -**

```
int ends_with(char *input, char letter): returns 1 (or  
nonzero/true value) if the string input ends with the character  
letter
```

You may add additional functions if required for the implementation of the program.

See the following sample input output for clarification.

Pictures of the Pokemon cards in Ash's Collection are given after that as well for reference.

Sample Input	Sample Output	Explanation				
4 Charizard 2 120 Pikachu 0 40 ShayminEX 0 110 Lucario 1 90	870	<div>The four Pokemon Cards are</div> <table><tr><td>Name: Charizard Stage: 2 HP: 120</td></tr><tr><td>Name: Pikachu Stage: 0 HP: 40</td></tr><tr><td>Name: ShayminEX Stage: 0 HP: 110</td></tr><tr><td>Name: Lucario Stage: 1 HP: 70</td></tr></table> <div>The price of the first card = 50 (base price) + 120 (HP) + 80 (for stage 2) = 250</div> <div>The price of the second card = 50 (base price) + 40 (HP) = 90</div> <div>The price of the third card = 50 (base price) + 110 (HP) + 200 (for ending in 'X') = 360</div> <div>The price of the fourth card = 50 (base price) + 90 (HP) + 30 (for stage 1) = 170</div> <div>∴ Total price of all the cards = 250 + 90 + 360 + 170 = 870</div>	Name: Charizard Stage: 2 HP: 120	Name: Pikachu Stage: 0 HP: 40	Name: ShayminEX Stage: 0 HP: 110	Name: Lucario Stage: 1 HP: 70
Name: Charizard Stage: 2 HP: 120						
Name: Pikachu Stage: 0 HP: 40						
Name: ShayminEX Stage: 0 HP: 110						
Name: Lucario Stage: 1 HP: 70						

Pictures of the four Pokemon cards (Note that 'basic' Pokemon are Pokemon with stage 0):



5.

HIGHEST CGPA

Declare a structure of students with three variables (name, id, and cgpa). Now take the input of two students and print the information of that student who has the higher cgpa.

Sample Input	Sample Output
3 Shakib Al Hasan 101 3.5 Tamim Iqbal 102 2.7 Akib Zaman 203 3.1	Shakib Al Hasan 101 3.5

6.

THE MAGICIAN MODRIC

Base 6 Conversion: 5	Prime Checker: 5	Use of Recursion and Call by Reference: 3	Perfect Output: 2

Magician Modric is visiting the town again. This time he has told all of his followers to guess a number and He has decided to give them a Mega reward based on any of the following constraints:

1. If the Number is converted into a base of 6 and the sum of the digits of that converted number is divisible by 5.
2. If the count of Prime Numbers is between 0 to the sum of the first and last digit of the given number is more than 4.

Write a Program to assist Modric automating this Process by creating the following functions:

- **int convBase (int num):** This must be a recursive function to find out the conversion into Base 6.
- **int primeChecker (int* a, int* b):** Count the Prime numbers between two range and return the value.

You may write more functions if required apart from these two.

Input: Take a Number from the user

Output: Print YES if He/She will receive the Mega Modric Reward. Else Print NO

Ser	Input	Output	Explanation
1	103	NO	<p>Condition 1 Check:</p> <ul style="list-style-type: none"> • 103 to Base (6) = 251 • Sum of the Digits = $2+5+1 = 8$ • 8 is not Divisible by 5 <p>Decision: False</p> <p>Condition 2 Check:</p> <ul style="list-style-type: none"> • First Digit = 1 • Last Digit = 3 • Sum = $1+3 = 4$ • Prime Numbers between 0 to 4: 2,3. So Only 2 numbers • 2 is not more than 4 <p>Decision: False</p> <p>Both False Thus Print NO</p>
2	35	YES	<p>Condition 1 Check:</p> <ul style="list-style-type: none"> • 21 to Base (6) = 55 • Sum of the Digits = $5+5 = 10$ • 10 is Divisible by 5 <p>Decision: True</p> <p>Condition 2 Check:</p> <ul style="list-style-type: none"> • First Digit = 3 • Last Digit = 5 • Sum = $3+5 = 8$ • Prime Numbers between 0 to 4: 2,3,5,7. So 4 numbers • 4 is not more than 4 <p>Decision: False</p> <p>At least one of the conditions is TRUE Thus Print YES</p>

7. Eleven is overwhelmed by the recent outbreak of Demogorgon unleashed by Vecna. Every Demogorgon is marked with a specific number. Write a Program that will detect all Demogorgon Numbers in between TWO Ranges given by Eleven.

Demogorgon numbers are those numbers that have the following CONDITIONS:

[**CONDITION 1**] Sum of ODD digits is less than the Sum of EVEN digits in that number.

[**CONDITION 2**] It is a Prime number

Write following functions to solve this problem:

```
int DemogorgonNumber (int a): if DEMOGORGON returns 1 else returns -1
int checkerFunc1 (int a): if CONDITION No. 1 is true returns 1 else returns -1
int primeChecker (int a): if CONDITION No. 2 is true returns 1 else returns -1
```

Sample Input	Sample Output
130 430	163 181 223 241 263 281 283 383 401 421
1005 1250	1061 1063 1163 1181

8. WAP that takes n as input and print up to nth Fibonacci number with following special character after each of the number. **[YOU MUST USE A RECURSIVE FUNCTION]**
- If Even Then \$
 - If Odd Then #
 - If 0 Then &

Note that after the last number there will not be any special character

Sample Input	Sample Output
5	0 & 1 # 1 # 2 \$ 3
7	0 & 1 # 1 # 2 \$ 3 # 5 # 8

9. Ms. Isabella wants to find out her best 3 loyal customers. She has the following data of the customer:
- Customer ID
 - Name
 - Birthday: dd/mm/yyyy
 - House: Gryffindor, Slytherin
 - Purchase Cost of Last 3 Months

For Example, 11034, Christopher Nolan, 11/06/1945, Gryffindor, [40, 56, 67]

Loyal Customer will be awarded to the person with the highest average purchase value from each House with the following additional criteria:

- If House is Gryffindor, he/she must contain “**est**” in his name.
- If House is Slytherin, he/she must contain “**rus**” in her name.

Write a Program to assist Ms. Isabella. Your Program must contain a structure that will be able to contain the data of a customer. If There is No Loyal Customer from a House Print Nil. Else Print the Customer Name, Birthday, and Average Purchase.

NOTE THAT - You must write a function named **int substringChecker (char *mainString, char *searchString)** and utilize that while searching a certain sub-string in another string. **[The Function must be called by Reference only]**

Input	Output	Explanation
<p>Num of Customer: 3</p> <p>Customer 1: Name: Harry Potter Birthday: 11/01/1985 House: Gryffindor Purchase: 22 45 65</p> <p>Customer 2: Name: Albus Severus Potter Birthday: 11/04/1987 House: Slytherin Purchase: 22 45 65</p> <p>Customer 3: Name: Hermione Grenzer Birthday: 11/04/1985 House: Gryffindor Purchase: 21 42 65</p> <p>Customer 4: Name: Severus Snape Birthday: 23/04/1967 House: Slytherin Purchase: 34 41 95</p> <p>Customer 5: Name: Draco Malfoy Birthday: 11/04/1985 House: Slytherin Purchase: 100 41 45</p>	<p>List of Loyal Customers:</p> <p>Gryffindor: Nil</p> <p>Slytherin: Severus Snape 23/04/1967 56.67</p>	<p>Both the Gryffindor Customers Violate the constraint that he/she must contain “est” in his name. Thus NIL.</p> <p>In Slytherin, the average purchase value is as follows:</p> <p>Draco Malfoy 62 Severus Snape 56.67 Albus Severus Potter 44</p> <p>Though Draco has the highest average, he doesn’t have “rus” in his name.</p> <p>Thus, the Loyal customer from Slytherin is Severus Snape.</p>

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10. Write a program that will take five emails (in a string) as input in main function. Then define two functions with the following tasks:
- Detect if the email is for student or teacher (“@bscse” is for students and “@cse” is for teachers) and print it.
 - Find the number of teachers in another function.

Sample Input	Sample Output
abc@bscse.uiu.ac.bd ab@cse.uiu.ac.bd a@cse.uiu.ac.bd acc@bscse.uiu.ac.bd abcd@bscse.uiu.ac.bd	Student Teacher Teacher Student Student 2