

Programming Assignment 4

Instructions: Solve the following problems in C. Some example input and output cases are given for better understanding. Your program is expected to provide correct output on **any valid input**. Ensure that your input and output formats exactly match the examples. The words 'SAMPLE INPUT: ' and 'SAMPLE OUTPUT: ' in the examples are **NOT** part of the input and output.

Problem Set 1

Instructor: Om Prakash Patel

Timeslots for resolving doubts:

- Tuesday: 4:30 PM -5:00 PM

- Thursday: 2:30 PM -3:00 PM

Venue: First floor faculty office

1. Write a C program that accepts integers from the keyboard until we enter a zero or a negative number. The program will output the number of positive values entered, the minimum value, the maximum value and the average of all the numbers (accurate to four decimal places).

SAMPLE INPUT: 6 3 2 -4

SAMPLE OUTPUT: 3, 2, 6, 3.6667

SAMPLE INPUT: 12 2 0

SAMPLE OUTPUT: 2, 2, 12, 7.0000

SAMPLE INPUT: 0

SAMPLE OUTPUT: Enter at least one positive value

2. Write a C program that asks the user to enter a positive integer n less than 10. If the user enters an invalid input, the code repeats the command of asking the user for a positive integer less than 10 until the input is correct. It then prints out the sum of the first n terms of the series $1^4+2^4+4^4+7^4+11^4+ \dots$

SAMPLE TEST CASE 1:

Enter a number:0

Invalid input, enter again:4

The sum is 2674

SAMPLE TEST CASE 2:

Enter a number:11

Invalid input, enter again:5

The sum is 17315

SAMPLE TEST CASE 3:

Enter a number:3

The sum is 273

3. Write a program to print all prime numbers till a given number N.

SAMPLE INPUT: 5

SAMPLE OUTPUT: 2, 3, 5

SAMPLE INPUT: 10

SAMPLE OUTPUT: 2, 3, 5, 7

4. Write a program to count the number of Armstrong Numbers in the given query range. An Armstrong number is an integer such that the sum of the cubes of its digits is equal to the number itself. For example, 371 is an Armstrong number since $3^3 + 7^3 + 1^3 = 371$.

SAMPLE INPUT: 1 3

SAMPLE OUTPUT: 1

SAMPLE INPUT: 5 10

SAMPLE OUTPUT: 0

Explanation: The 1st test case has only one armstrong number in the range $[1, 3] = \{1\}$. The 2nd test case has no armstrong numbers in its range $[5, 10] = \{\}$.

5. Write a program that accepts a positive integer and prints the number of 1s in its binary representation.

SAMPLE INPUT: 5

SAMPLE OUTPUT: 2

SAMPLE INPUT: -2

SAMPLE OUTPUT: INVALID INPUT

Problem Set 2

Instructor: Sunny Rai

Timeslots for resolving doubts:

- Monday: 4:30-5PM

- Thursday: 3:30-4PM

Venue: Second floor faculty office

1. Write a C program that takes two positive integers x and y as input and calculates the sum of integers between x and y (both included) which are divisible by 7 but not divisible by 63.

SAMPLE INPUT: 9 300

SAMPLE OUTPUT: 5684

SAMPLE INPUT: 100 1

SAMPLE OUTPUT: 672

SAMPLE INPUT: 11 13

SAMPLE OUTPUT: 0

SAMPLE INPUT: -11 13

SAMPLE OUTPUT: Both the numbers must be positive

2. Given a positive integer, output all the divisors of that number including '1' and the number itself.

SAMPLE INPUT: 8

SAMPLE OUTPUT: 1 2 4 8

SAMPLE INPUT: -4

SAMPLE OUTPUT: OUT OF RANGE

SAMPLE INPUT: 12

SAMPLE OUTPUT: 1 2 3 4 6 12

3. Write a program to check if a given number is Palindrome OR not.

SAMPLE INPUT: 23

SAMPLE OUTPUT: NO

SAMPLE INPUT: 313

SAMPLE OUTPUT: YES

4. It is given that $x_1 + x_2 + x_3 + x_4 = N$ where $2 < N < 11$ and each x_i is a natural number. Write a program to print all solutions followed by the number of solutions.

SAMPLE INPUT: 4

SAMPLE OUTPUT:

1 1 1 1

1

SAMPLE INPUT: 5

SAMPLE OUTPUT:

1 1 1 2

1 1 2 1

1 2 1 1

2 1 1 1

4

SAMPLE INPUT: 1

SAMPLE OUTPUT: INVALID

5. Write a program that accepts a positive real quantity (of double datatype) and calculate its positive square root (accurate to six decimal places) using bisection method (look online for more details) until the margin of error (between the input number, and the square of this square root) is less than or equal to 0.0001.

SAMPLE INPUT: 5

SAMPLE OUTPUT: 2.236053

SAMPLE INPUT: 6.9834

SAMPLE OUTPUT: 2.642630

Problem Set 3

Instructor: Rajesh Tavva

Timeslots for resolving doubts:

- Monday: 4:30-5PM

- Thursday: 4:30-5PM

Venue: Library (faculty reading section)

1. A perfect number is a positive number in which the sum of all its positive divisors excluding that number is equal to that number. Write a C program that accepts a positive integer from the keyboard and checks whether the entered number is a perfect number or not.

SAMPLE INPUT: -2

SAMPLE OUTPUT: Input must be positive

SAMPLE INPUT: 8128

SAMPLE OUTPUT: PERFECT

SAMPLE INPUT: 64

SAMPLE OUTPUT: NOT PERFECT

2. Write a C program without using if-else construct that does the following. It accepts a sequence of positive integers between 1 and 9 both inclusive from the keyboard. The program will stop accepting input once an integer outside the range is entered. The program will finish by printing the total number of multiples of 3 and the total number of even integers entered.

SAMPLE INPUT: 0

SAMPLE OUTPUT: 0, 0

SAMPLE INPUT: 2 4 6 9 3 1 2 0

SAMPLE OUTPUT: 3, 4

3. Write a program to print Mersenne Prime Numbers till a given number N. A Mersenne Prime Number is a **prime** number of the form $M_n = 2^n - 1$.

SAMPLE INPUT: 20

SAMPLE OUTPUT: 3, 7

SAMPLE INPUT: 50

SAMPLE OUTPUT: 3, 7, 31

SAMPLE INPUT: 2

SAMPLE OUTPUT: NO MERSENNE PRIME

4. Write a program to find the Nth Fibonacci number modulo $(10^5 + 7)$. The recurrence relation for a fibonacci number is $F(n) = F(n-1) + F(n-2)$ with $F(1) = 1$ and $F(2) = 1$ (Google if you do not understand). Constraints: $1 \leq N \leq 90$

SAMPLE INPUT: 100

SAMPLE OUTPUT: OUT OF RANGE

SAMPLE INPUT: 30

SAMPLE OUTPUT: 31984

5. Children are taught to add multi-digit numbers from right to left, one digit at a time. Many find the carry operation, where a 1 is carried from one digit position to the next, to be a significant challenge. Given two integers, your job is to count the number of carry operations needed for adding these two numbers so that educators may assess their difficulty. The maximum number of digits in each number is 5.

SAMPLE INPUT: 123, 456

SAMPLE OUTPUT: 0

SAMPLE INPUT: 555, 2756

SAMPLE OUTPUT: 3