**ITERATIVE STATEMENTS IN C**

**EXERCISES**

**Task 01:**

Read a positive integer value, and compute the following sequence: If the number is even,

halve it; if it's odd, multiply by 3 and add 1. Repeat this process until the value is 1, printing out

each value. Finally print out how many of these operations you performed.



**Task-02**

You joined ACM society at your university and you assigned with a task for simulating the ticket procedure for 500 participants. you are asked to write a program for the mentioned task with following operations:

1. Purchase a ticket. The ticket price is PKR 100 for sophomores and 50 for juniors. You also offer 20% discounts who buy more than 3 tickets.

2. Displaying the number of seats available free and the total amount of sold tickets.

3. Termination of the program when user enters a certain input. When the program terminates also print the total tickets sold and total income generated by all sales.

Note: Use while loop and switch statement

**Task 03:**

Your teacher wants to test your mental math abilities, and asks you a question. He wants you to answer how many perfect squares there exist within a certain range of numbers. When the range is very large, you realize this problem is difficult to solve in your mind without using code.

Take as input the range (lower limit, upper limit) into your program and compute how many perfect squares there exist within that range. Output should print on the screen each perfect square that exists within the range, and at the end the total amount of perfect squares in the range.

**Example:** lower limit = 12, upper limit = 50.

In this range, the following perfect squares exist: 16,25,36,49. Total perfect squares = 4.

**Task 04:**

A palindrome number is defined as one which is the same forwards and backwards. For example, 121 is a palindrome. Reading from the left or the right, the number is the same – 121. Another example of a palindrome is 22.

In contrast, 354 is **not** a palindrome since it reads 354 from the left (forward), and 453 from the right (backwards).

Your task is to take any number as input from the user (in integer form) and check whether it is a palindrome or not, showing the result on the screen.

**Task 05:**

A real estate office handles, say, 50 apartment units. When the rent is, say, $600 per month, all

the units are occupied. However, for each, say, $40 increase in rent, one unit becomes vacant.

Moreover, each occupied unit requires an average of $27 per month for maintenance.

How many units should be rented to maximize the profit?

Write a program that prompts the user to enter:

a. The rent to occupy all the units.

b. The increase in rent that results in a vacant unit.

c. Amount to maintain a rented unit.

The program then outputs the number of units to be rented to maximize the profit.

**Task 06:**

Perfect numbers are defined as a number whose sum of divisors (other than the number itself) is equal to the number itself

**For example, if A = 6:**

The divisors of 6: 1, 2, 3. Sum = 6. Therefore 6 is a perfect number

**For example, if A = 28:**

The divisors of 28: 1, 2, 4, 7, 14. Sum = 28. Therefore 28 is a perfect number.

Now, you are tasked with coding a program to check whether 2 numbers are mutually perfect. This means that given 2 numbers A and B, they are mutually perfect if the sum of divisors of A (other than A itself) is equal to B, and the sum of divisors of B (other than B itself) is equal to A.

For example, if A = 220, B = 284:

**The divisors of A are: 1, 2, 4, 5, 10, 11, 20, 22, 44, 55, 110. Sum = 284.**

So the sum of divisors of A is equal to B.

**The divisors of B are: 1, 2, 4, 71, 142. Sum = 220.**

So the sum of divisors of B is equal to A.

Hence, A and B are mutually perfect

**Task 07:**

You are building a software program for a restaurant to keep track of its daily food waste. Write a program that inputs the food waste for each meal of the day (breakfast, lunch, and dinner) and then calculates and displays the total food waste for the day.

Input: 3 inputs representing the food waste for each meal of the day (breakfast, lunch, and dinner).

Output: The program should print the total food waste for the day. Example:

Input:

Enter the food waste for breakfast: 10 Enter the food waste for lunch: 15 Enter the food waste for dinner: 20

Output:

Total food waste for the day: 45

**Task 08:**

You are a software engineer at a financial company and you need to write a program in C to calculate the compound interest on an investment over several years. The program should ask the user for the initial investment amount, the interest rate, and the number of years for which the investment should grow. The program should then calculate and print out the total amount of the investment at the end of each year.

Input: The user inputs the initial investment amount (0 <= initial investment <= 10000), the interest rate (0 <= interest rate <= 1), and the number of years for which the investment should grow (1 <= number of years <= 30).

Output: The program should print the total amount of the investment at the end of each year. Example:

Input:

Enter the initial investment amount: 1000 Enter the interest rate: 0.05

Enter the number of years: 5

Output

Year 1: 1050.00

Year 2: 1102.50

Year 3: 1157.63

Year 4: 1215.51

Year 5: 1276.28

Explanation:

In the example, the user has invested $1000 with an interest rate of 5% for 5 years. The program calculates the total amount of the investment at the end of each year using the formula amount = initial investment \* (1 + interest rate)^year.

**Task 09:**

You are a software engineer at a weather station and you need to write a program in C to analyze the temperature data for a week. Your program should calculate the average temperature for each day, the highest temperature for the week, and the lowest temperature for the week.

Input: The user inputs the temperature readings for each day of the week (in degrees Fahrenheit). The temperature readings for each day are between -100 and 200 degrees Fahrenheit.

Output: The program should print the average temperature for each day of the week, the highest temperature for the week, and the lowest temperature for the week.

Example:

Input:

Enter the temperature for Monday: 75 Enter the temperature for Tuesday: 80 Enter the temperature for Wednesday: 70 Enter the temperature for Thursday: 85 Enter the temperature for Friday: 75 Enter the temperature for Saturday: 90 Enter the temperature for Sunday: 80

Output:

The average temperature for the week is: 78.5714 The highest temperature for the week is: 90

The lowest temperature for the week is: 70

**Task 10:**

You are given a number n and you need to calculate the factorial of n. A factorial is the product of an integer and all the integers below it; e.g., factorial four ( 4! ) is equal to 4 \* 3 \* 2 \* 1 = 24.

Input: The user inputs a positive integer n (1 <= n <= 12). Output: The program should print the factorial of n.

Example:

Input:

Enter a positive integer: 4

Output:

The factorial of 4 is 24

**Task 11:**

You have been hired by a company that specializes in creating fun and interactive games. Your task is to write a program for a matchstick game between the computer and a user. The rules of the game are as follows:

* There are 21 matchsticks placed in a pile.
* The computer asks the player to pick 1, 2, 3, or 4 matchsticks from the pile.
* After the player makes their pick, the computer makes its pick.
* The player who is forced to pick up the last matchstick loses the game.
* The program should ensure that the computer always wins the game by making the correct move in each turn.

Input: The user inputs the number of matchsticks they want to pick from the pile (1 <= number of matchsticks <= 4).

Output: The program should print the number of matchsticks left in the pile after each turn and who made the last pick.

**Task 12:**

You are a teacher in a school and you have to grade the exams of your students. You need to write a program in C to calculate the average grade of the students based on their marks in 5 different subjects. The program should ask the user to input the marks for each student and then calculate the average grade for each student. Finally, the program should print out the average grade for each student.

Input: The user inputs the marks for each subject for each student (0 <= marks <= 100). The number of students can be between 1 and 50.

Output: The program should print the average grade for each student. Example:

How many students would you like to grade? 2

Enter marks for student 1 in 5 subjects: 60 70 80 90 100

Enter marks for student 2 in 5 subjects: 80 90 70 60 50

Output:

The average grade for student 1 is 80.0 The average grade for student 2