Programming with Python - Open Elective

Feb 7, 2025

Revision: variable, input(), print(), datatype: int, float, bool, str
arithmetic, relational and logical operator, operator associativity, operator precedence (arithmetic > relational > logical)

Exercise 1: Leap Year:
leap year (divisible by 4, but not by 100 unless also divisible by 400).
Example:
2024, 2028 (Divisible by 4, but not by 100)
1900 - Not a leap year (Divisible by 4, also by 100 but not by 400)
2000 - Leap Year (Divisible by 4, divisible by 100 as well as by 400)

Write a program (if-else) that checks whether a given year is a leap year using

a. multiple conditional statements
b. Use single conditional statement

Exercise 2: Tax Calculator:

Write a Python program (if-else) that asks the user to enter their annual income and then determines their total tax amount based on the following tax brackets:

- Income ≤ Rs 10000 → 0% tax
- Income Rs 10,001 - Rs 30,000 → 10% tax
- Income Rs 30,001 - Rs 70,000 → 20% tax
- Income Rs 70,001+ → 30% tax

Loops: Repetitive execution of a statement or sequence of statements. **Iteration** is the execution of a such sequence of statements in the loop.

For loop

General form or `for` loop

```
for variable in sequence:
    Statements
```

A very useful built-in function used during `for` loop is **`range`**.

range: generates a sequence of integers

```
range(n)
range(start, end)
range(start, end, increment)
```

range(5) : 0, 1, 2, 3, 4
range(2, 7) : 2, 3, 4, 5, 6
range(2, 17, 3) : 2, 5, 8, 11, 14
range(6, 2, -1) : 6, 5, 4, 3

Exercises

1. Write a Python program that calculates the factorial of a number using a for loop. (Pay attention to the significance of accumulating multiplication in a variable initialized to 1)

   Example: $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

2. Write a Python program that:
   - Asks the user how many years of GDP data they want to analyze.
   - Uses a for loop to take GDP growth rate input for each year.
   - Uses if-else conditions to classify each year's economic condition as:
     - "Economic Growth" if GDP growth rate is greater than 2%.

- "Economic Stagnation" if GDP growth rate is between 0% and 2% (inclusive).
- "Economic Recession" if GDP growth rate is negative.
- Prints the classification for each year based on the given GDP growth rate.

3. Given a DNA sequence ("ATGCCGTAAACG"), write a program to count and print the number of occurrences of each nucleotide (A, T, G, C) using a for loop.
4. Ask the user to enter a range of numbers (start and end). Print all odd numbers between the range.

5. Bacterial Growth Simulation: A bacterial colony doubles in number every hour. Write a program that:
- Asks the user for the initial number of bacteria and the number of hours to simulate.
- Uses a for loop to calculate the population at each hour.

6. Write a program to find the sum of first n numbers. (Pay attention to the significance of collecting sum in a variable initialized to 0).

7. Write a program to find the factorial of number n. (Pay attention to the significance of accumulating multiplication in a variable initialized to 1).

8. Input a number from the user. Find sum of digits.

9. Input a number from the user. Reverse the digits of the number using for loop

10. Write a program and compute the sum of even digits and sum of odd digits.
11. Write a program to count the number of odd and even digits in a number.