Tutorial 05

Guided Programming Workshops

Workshop 01: Loop with Break and Continue

Problem: Write a program to find and print the first 10 prime numbers greater than 100.

Detailed Steps:

1. Initialize a variable **count** to 0 to keep track of the number of prime numbers found.
2. Start a loop that iterates from 101 onwards.
3. Inside the loop, use another loop to check if the current number is prime.
4. If the number is prime, print it and increment **count**.
5. If **count** reaches 10, break out of the loop.

Workshop 02: Loop with Complex Logic

Problem: Create a program that generates the Fibonacci sequence up to the largest Fibonacci number less than 1000.

Detailed Steps:

1. Initialize variables **a** and **b** to 0 and 1 respectively to represent the first two terms of the sequence.
2. Start a loop that iterates until **b** reaches 1000.
3. Inside the loop, print the value of **a**.
4. Update **a** and **b** to generate the next term of the sequence.

Workshop 03: Loop with Nested Conditions

Problem: Write a program to find and print all twin prime pairs less than 1000, where twin primes are prime numbers that differ by 2.

Detailed Steps:

1. Start a loop that iterates from 3 to 1000.
2. Inside the loop, check if the current number and the next number are prime.
3. If both numbers are prime and their difference is 2, print them as a twin prime pair.

Workshop 04: Loop with Variable Manipulation

Problem: Develop a program that calculates and prints the sum of digits of factorial of a given number.

Detailed Steps:

1. Prompt the user to enter a number.
2. Initialize a variable **factorial** to 1.
3. Start a loop that iterates from 1 to the entered number.
4. Inside the loop, multiply **factorial** by the current loop index.
5. Convert the factorial to a string and iterate over its digits, summing them.
6. Print the sum of digits of the factorial.

Unguided Programming Workshops

Workshop 05: Nested Loop with Complex Logic

Problem: Write a program to generate a magic square of size 5x5.

Detailed Steps:

1. Create a 5x5 grid filled with zeros.
2. Place the number 1 in the middle of the top row.
3. Start a loop that iterates from 2 to 25.
4. Inside the loop, calculate the next position by moving diagonally up and to the right from the current position.
5. If the calculated position is out of bounds or already filled, move vertically down one position from the current position.
6. Place the next number in the calculated position.
7. Repeat steps 3-6 until all positions in the grid are filled.

Workshop 06: Loop with Advanced Selection Statements

Problem: Develop a program that simulates the Collatz conjecture for a given starting number.

Detailed Steps:

1. Prompt the user to enter a starting number.
2. Start a loop that iterates until the number becomes 1.
3. Inside the loop, check if the current number is even or odd.
4. If the number is even, divide it by 2.
5. If the number is odd, multiply it by 3 and add 1.
6. Print each number in the sequence.
7. Repeat steps 2-6 until the number becomes 1.

Workshop 07: Loop with Advanced Variable Manipulation

Problem: Write a program to find and print all palindromic prime numbers less than 1000.

Detailed Steps:

1. Start a loop that iterates from 2 to 1000.
2. Inside the loop, check if the current number is prime.
3. If the number is prime, check if it is palindromic (reads the same forwards and backwards).
4. If the number is palindromic, print it.

Workshop 08: Loop with Advanced Data Manipulation

Problem: Develop a program that generates and prints all permutations of the letters "ABC".

Detailed Steps:

1. Initialize a list with the letters "A", "B", and "C".
2. Start three nested loops to generate permutations.
3. Inside the loops, swap elements in the list to generate different permutations.
4. Print each permutation.