Programs for Series Sum and Fibonacci Numbers

Program 1: Sum of First n Values of the Series $i + \frac{i^2}{i!} + \frac{i^3}{i!} + \ldots$

Algorithm

1. Start.
2. Input i (base value) and n (number of terms).
3. Initialize `series_sum` to 0.
4. For k from 1 to n:
   - Compute the term $\frac{i^k}{k!}$.
   - Add the term to `series_sum`.
5. Display `series_sum`.
6. End.

Python Program

Listing 1: Program for Series Sum

```
# Program to compute the sum of the first n values of the
series i + i^2/i! + i^3/i! + ...

import math

# Input: Get the value of 'i' and 'n'
i = float(input("Enter the value of i: "))
n = int(input("Enter the number of terms (n): "))

# Initialize sum
series_sum = 0

# Calculate the series sum
for term in range(1, n + 1):
    series_sum += (i ** term) / math.factorial(term)

# Output the result
```

```
print("The sum of the first ",n," terms of the
series is: ",series_sum)
```

Example Output

```
Enter the value of i: 2
Enter the number of terms (n): 5
The sum of the first 5 terms of the series is: 9.333333333333334
```

Program 2: Sum of First n Fibonacci Numbers

Algorithm

1. Start.
2. Input n (number of Fibonacci terms).
3. Initialize:
   - `fib1` $= 0$
   - `fib2` $= 1$
   - `fib_sum` $= 0$
   - `fibonacci_sequence` as an empty list.
4. For k from 1 to n:
   - Add `fib1` to `fibonacci_sequence`.
   - Add `fib1` to `fib_sum`.
   - Update `fib1` and `fib2` as:
     - `fib1` $=$ `fib2`
     - `fib2` $=$ `fib1` $+$ `fib2`
5. Display the Fibonacci sequence and the sum.
6. End.

Python Program

Listing 2: Program for Fibonacci Numbers

```
# Program to compute the sum of first n Fibonacci numbers
and display the sequence

# Input: Get the number of terms
n = int(input("Enter the number of Fibonacci terms (n): "))

# Initialize Fibonacci sequence
fib1, fib2 = 0, 1
fib_sum = 0
fibonacci_sequence = []

# Calculate the sum of the Fibonacci sequence
for _ in range(n):
    fibonacci_sequence.append(fib1)
    fib_sum += fib1
    fib1, fib2 = fib2, fib1 + fib2

# Display the Fibonacci sequence
print("The first ",n," Fibonacci numbers are: "
```

```
,fibonacci_sequence)

# Output the sum
print("The sum of the first ",n,"Fibonacci numbers is: ",fib_sum)
```

Example Output

```
Enter the number of Fibonacci terms (n): 7
The first 7 Fibonacci numbers are: [0, 1, 1, 2, 3, 5, 8]
The sum of the first 7 Fibonacci numbers is: 20
```