Batch:A3 **Experiment Number: 2**

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Aim of the Experiment: Implementation of Fenwick Tree operations

Program/ Steps:

```
def solve():
    n, k = map(int, input().split())

    full_sequence_length = 2 * (n - 1)
    cycles = (k - 1) // full_sequence_length
    position = k - cycles * full_sequence_length

    if position <= n:
        return position
    else:
        return 2 * n - position


t = int(input())
for _ in range(t):
    print(solve())
```

Output/Result:

```
D:\PyCharm\MyProjects\contest995\.venv\Scripts\python.exe
Test Case 1: Basic Operations

Initial Array: [2, 1, 4, 6, -1, 5, -32, 0, 1]
Query(0, 3): 13 - Sum of first 4 elements
Query(2, 5): 14 - Sum of elements from index 2 to 5
Query(0, 8): -14 - Sum of all elements

Test Case 2: Update Operations
Updated index 4 from -1 to 10
New Array: [2, 1, 4, 6, 10, 5, -32, 0, 1]
Query(0, 8): -3

Process finished with exit code 0
```

Post Lab Question-Answers:

None.

Outcomes:

Understand the fundamental concepts for managing the data using different data structures such as lists, queues, trees etc.

Conclusion (based on the Results and outcomes achieved):

Successfully demonstrated Fenwick Tree with a program in Python.

References:

1. https://www.hackerearth.com/practice/data-structures/advanced-data-ructures/segment-trees/tutorial/
2. https://cp-algorithms.com/data_structures/segment_tree.html