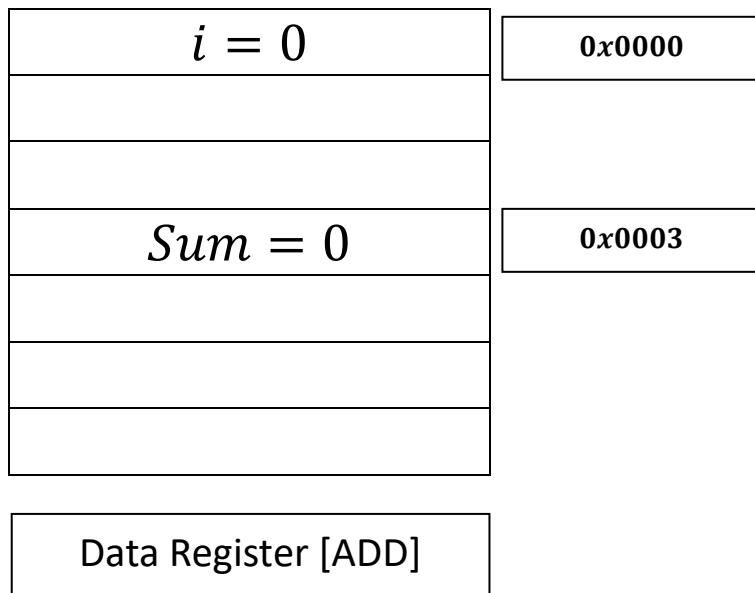


Stack Operation Vs Loop Operation in Memory.

```
int sum = 0;  
for(int i = 0; i < n; i + +){  
    sum = sum + i;  
}
```



- *i and sum are local variables.*
- *They are created once inside the function's stack frame[say inside main function's stack frame].*
- *Their memory location remains the same throughout the loop.*
- *Only their values change during each iteration.*
- *The statement sum = sum + i executes n times.*

→ ***Read value of i***

→ ***Read value of sum***

→ ***Compute Result***

 → ***ADD i, 1 [Sent to Instruction Register]***

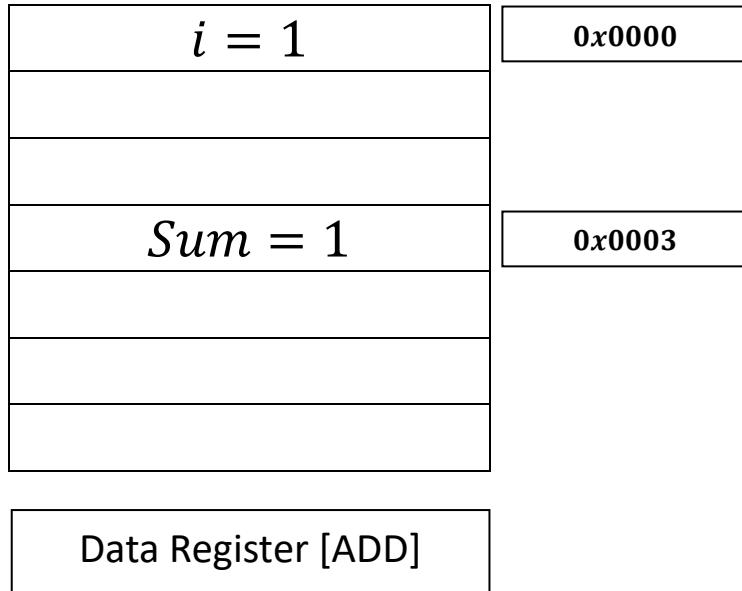
 → ***ADD SUM, i [Sent to Instruction Register]***

[Note: This is simpler version]

→ ***We get i = 1 and Sum = 1 , therefore :***

 → ***Write i = 1 to the reserved memory for i.***

 → ***Write Sum = 1 to the reserved memory for Sum.***



It replaces the values but no push and pop , hence during for loop memory is used again and again `n` times.

Hence the process will continue up to n times at same location. We can state that the statement or operation $sum = sum + i$ runs up to $i = n$ i.e., n times .

Generating Time Complexity : $O(n)$.

Where as in Push and Pop operation:

Stack Push Operation [Time Complexity]

[Single Element Pushed]	→ $O(1)$
.....	
[Single Element Pushed]	→ $O(1)$

i.e., Push will be inserted at each Top of the stack.

i.e., At each location the Push operation will be performed at $O(1)$ complexity.

Also, if we see there is lower bound (1) and upper bound (n i.e. size of the stack = n):

$$1 \leq f(n) \leq n$$

Here if we do average if it runs up to n times:

$$\frac{1 + 1 + 1 + 1 \dots + n \text{ times}}{n} = \frac{n}{n} = 1 = O(1).$$

Stack Pop Operation [Time Complexity]

[Single Element Popped]	→ $O(1)$
.....	
[Single Element Popped]	→ $O(1)$

i.e., Pop of element will be done at each Top (First Element) of the stack.

i.e., At each location the Pop operation will be performed at $O(1)$ complexity.

Also, if we see there is lower bound (1) and upper bound (n i.e. size of the stack = n):

$$1 \leq f(n) \leq n$$

Here if we do average if it runs up to n times:

$$\frac{1 + 1 + 1 + 1 \dots + n \text{ times}}{n} = \frac{n}{n} = 1 = O(1).$$
