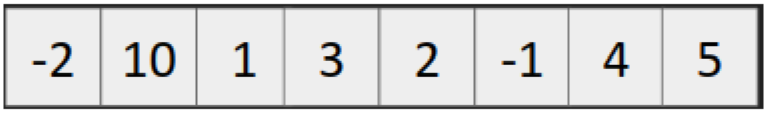
Sliding Window Technique

<u>Problem</u>

You are given an array a[] with n elements. Your task is to calculate the minimum sum of k consecutive elements.

<u>Example</u>



-2	10	1	3	2	-1	4	5

K = 3

Sums possible of 3 consecutive elements: 9, 14, 6, **4**, 5, 8.
Minimum of them = 4 (answer).

<u>Brute force approach</u>

1. Iterate from *i=0* to *i=n-k-1* in the outer loop.
2. Starting from *j=i*, compute the sum of k elements and maintain the minimum.

Time complexity: O(n*k)

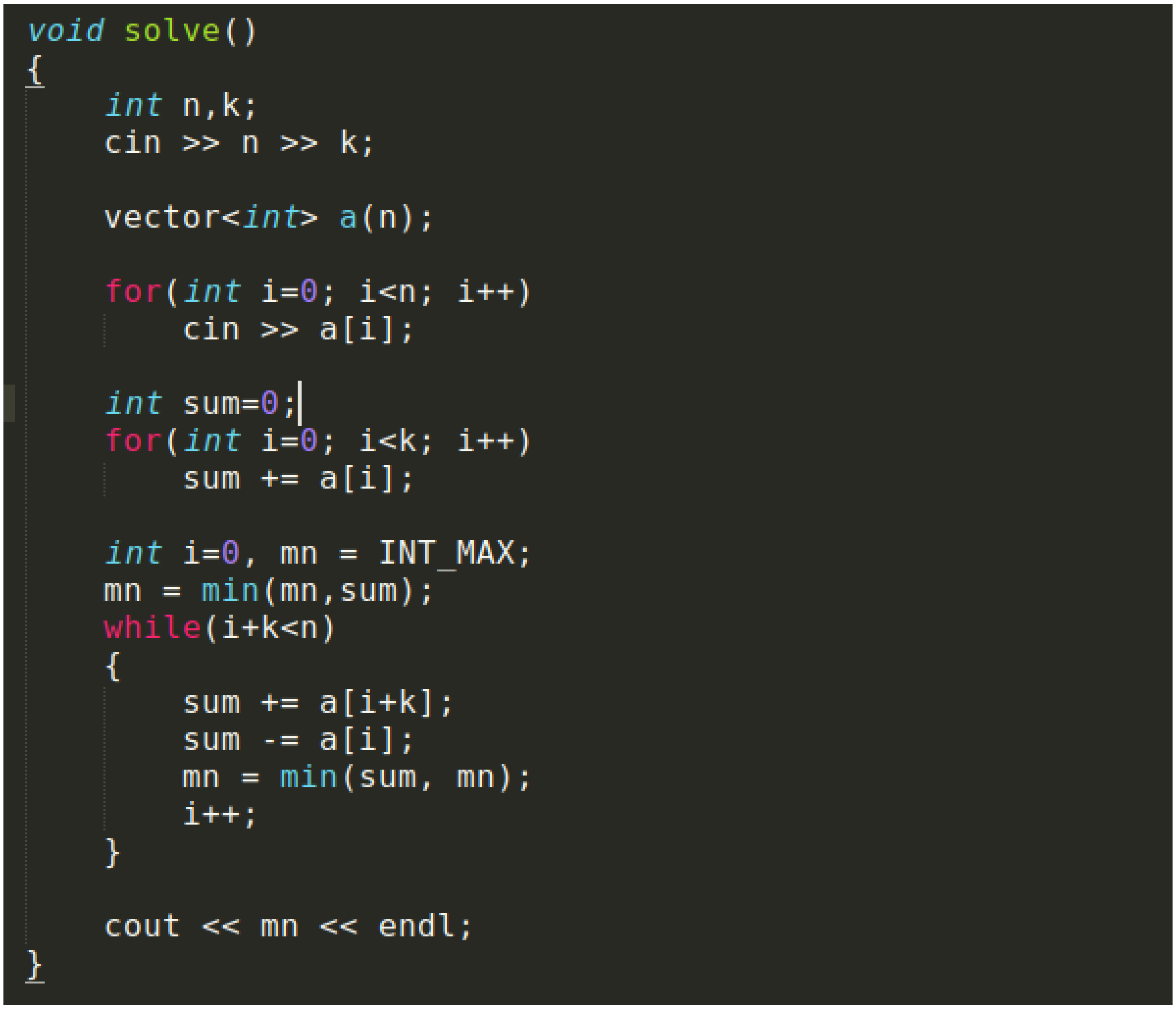
<u>Optimal Approach (Sliding Window Technique)</u>

1. Compute sum of first k elements by iterating from *i=0* to *i=k-1* and store it in the variable *sum.*
2. While increasing *i*, subtract a[i-1] and add a[i+k-1] in the previous sum, which will become the current sum. This step is known as moving window forward.
3. Keep a variable *mn*, which stores the minimum of the sum. Operation used is

mn = min(mn, sum)

Time Complexity: O(n)

Code



```
void solve()
{
    int n,k;
    cin >> n >> k;

    vector<int> a(n);

    for(int i=0; i<n; i++)
        cin >> a[i];

    int sum=0;
    for(int i=0; i<k; i++)
        sum += a[i];

    int i=0, mn = INT_MAX;
    mn = min(mn,sum);
    while(i+k<n)
    {
        sum += a[i+k];
        sum -= a[i];
        mn = min(sum, mn);
        i++;
    }

    cout << mn << endl;
}
```