Program to find an element in array such that sum of left array is equal to sum of right array

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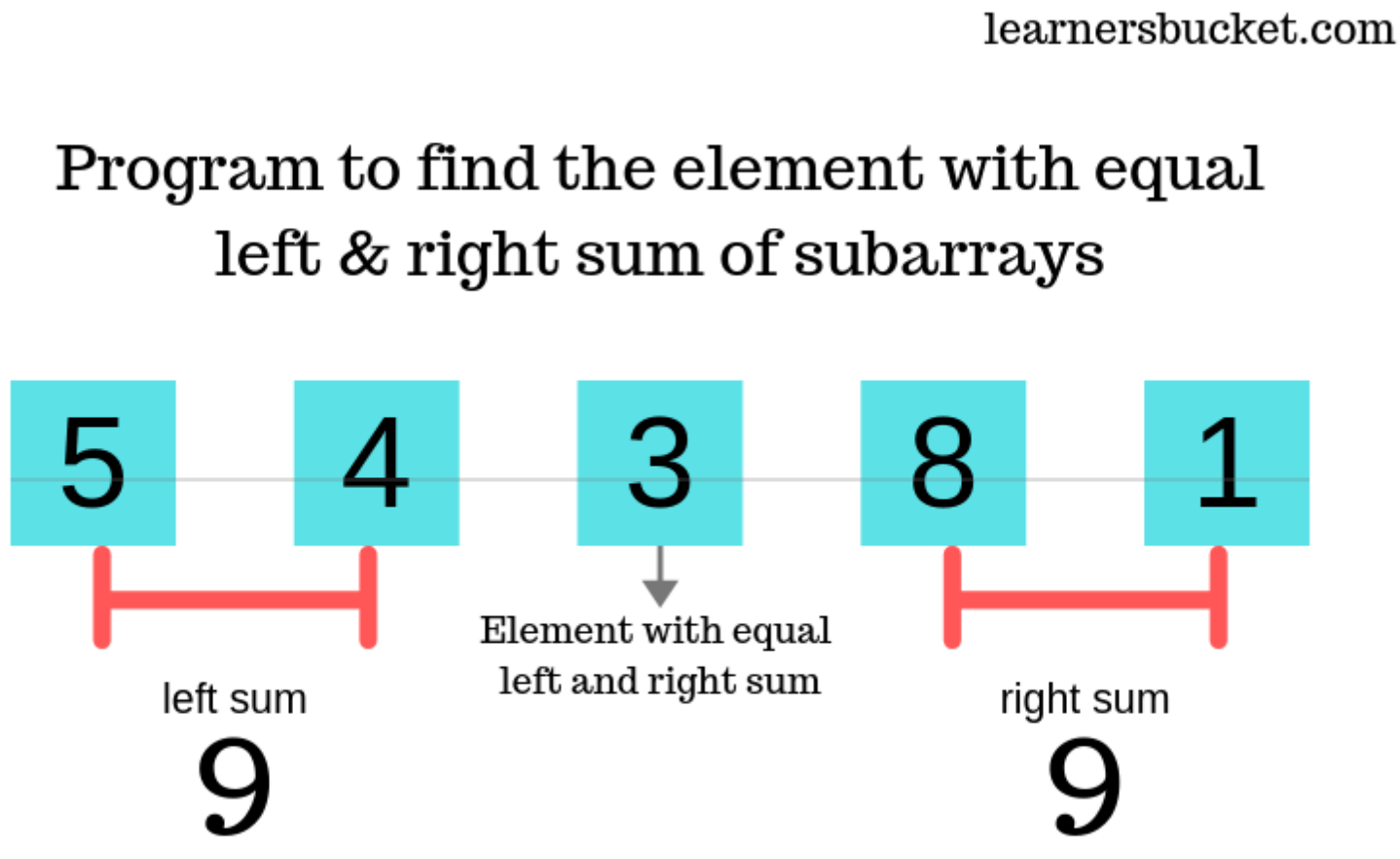
An algorithm to find the element in array such that the sum of its left elements is equal to the sum of its right elements in javascript.

Example

```
Input:
[2, 1, 9 ,3]
[1, 2, 3]

Output:
9
-1
```

Element on the left (`2+1`) subarray and right (`3`) subarray of `9` are equal.



We are going to see three different solution for this problem.

Method 1: Brute Force approach.

Implementation

- We are going to use two nested loops.
- In the outer loop start from the second element in the array.
- Then calculate its left and right sum and check them if they are equal or not.

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```
let solution1 = (arr, n = arr.length) => {
  //Return if there is only one element in the array
  if(arr.length === 1){
    return arr[0];
  }

  for(let i = 1; i < n; i++){
    //Calculate the left sum for the current element
    let leftSum = 0;
    for(let j = i-1; j >= 0; j--){
      leftSum += arr[j];
    }

    //Calculate the right sum for the current element
    let rightSum = 0;
    for(let k = i+1; k < n; k++){
      rightSum += arr[k];
    }

    //If equal then return the elm
    if(leftSum === rightSum){
      return arr[i];
    }
  }

  return -1;
}
```

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```
Input:
console.log(solution1([2, 7, 3, 5, 2, 2]));

Output:
3
```

Time complexity: O(n ^ 2).

Space complexity: O(1).

Method 2: In O(n) but with extra space.

Implementation

- We are going to use two different arrays to calculate and store the left sum and right sum of each elements.
- Then compare the left and right sum for each elements.

```
let solution2 = (arr, n = arr.length) => {
  //Return if there is only one element in the array
  if(arr.length === 1){
    return arr[0];
  }

  //Calculate the left sum for each element
  let prefixSum = [];
  prefixSum[0] = arr[0];
  for(let i = 1; i < n; i++){
    prefixSum[i] = prefixSum[i - 1] + arr[i];
  }

  //Calculate the right sum for each element
  let suffixSum = [];
  suffixSum[n-1] = arr[n-1];
  for(let i = n-2; i >= 0; i--){
    suffixSum[i] = suffixSum[i + 1] + arr[i];
  }

  //Check the left sum and right sum for each element
  for(let i = 0; i < n; i++){
    if(prefixSum[i] === suffixSum[i]){
      return arr[i];
    }
  }

  return -1
}
```

```
Input:
console.log(solution2([2, 3, 4, 1, 4, 5]));

Output:
1
```

Time complexity: O(n).

Space complexity: O(n).

Method 3: Best approach, Time and space efficient.

Implementation to find the element with equal left and right sum.

- We are going to first calculate the sum of all the elements on the right of the first element in the array.
- Then start calculating the left sum, while calculating it we will add the element to the left sum and subtract it from right sum.
- Every time we will check if left sum is equal to right sum or not and return the element if they are equal.

```
let solution3 = (arr, n = arr.length) => {
  //Return if there is only one element in the array
  if(arr.length === 1){
    return arr[0];
  }

  let leftSum = 0, rightSum = 0;

  //Calculate the sum of all the right elements
  for(let i = 1; i < n; i++){
    rightSum += arr[i];
  }

  //Now subtract the element from the right sum
  //And add to the element to the left sum
  //Check if the rightSum === leftSum
  for(let i = 0, j = 1; j < n; i++, j++){
    rightSum -= arr[j];
    leftSum += arr[i];

    if(rightSum === leftSum){
      return arr[i+1];
    }
  }

  return -1;
}
```

```
Input:
console.log(solution2([2, 3, 4, 1, 4]));

Output:
4
```

Time complexity: O(n).

Space complexity: O(1).

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