CCO '23 P1 - Binaria

Time limit: 1.0s **Memory limit:** 1G

Canadian Computing Olympiad: 2023 Day 1, Problem 1

You have been hired by the Cheap Communication Organization (CCO) to work on a communication breakthrough: sub-message sum (SMS). This revolutionary idea works as follows.

Given a binary string of length N, and some positive integer K with $K \leq N$, the SMS for the string consists of a sequence of $N - K + 1$ sums. The first sum in the sequence is the sum of digits 1 through K, the second sum is the sum of digits 2 through $K + 1$, and so on until the last sum which is the sum of digits $N - K + 1$ through N.

For example, if $K = 4$, the SMS of the binary string `110010` is $2, 2, 1$. This is because $1 + 1 + 0 + 0 = 2, 1 + 0 + 0 + 1 = 2$, and $0 + 0 + 1 + 0 = 1$.

Since you are a very junior developer, your job is not to find the original binary string from a given SMS, but rather the number of binary strings that could have formed this SMS.

Input Specification

The first line of input contains the two space-separated integers N and K where $1 \leq K \leq N$. The second line of input contains $N - K + 1$ space-separated integers which is the SMS of at least one binary string.

Marks Awarded	Bounds on N	Additional Bounds on K
3 marks	$1 \leq N \leq 10$	$K \leq 3$
3 marks	$1 \leq N \leq 10$	None
4 marks	$1 \leq N \leq 1\,000$	$K \leq 10$
4 marks	$1 \leq N \leq 10^6$	$K \leq 20$
4 marks	$1 \leq N \leq 10^6$	$K \leq 3\,000$
7 marks	$1 \leq N \leq 10^6$	None

Output Specification

Output the remainder of T divided by the prime number $10^6 + 3$ where T is the positive integer equal to the total number of possible binary strings that correspond to the given SMS.

Sample Input

```
7 4
3 2 2 2
```

Output for Sample Input

```
3
```

Explanation of Output for Sample Input

The possible strings of length 7 are `1011001`, `1101010`, and `1110011`.