

2023 Canadian Computing Olympiad  
Day 1, Problem 1  
**Binaria**

**Time Limit:** 1 second

**Problem Description**

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.