

Partition

Temur n'umufasha we, Ulug'bek, barimo gutegeza amayeri y'ubumaji mu gitaramo cya *Uzbekistan Got Talent*. Amayeri areba Temur mu gukemura ikibazo gikurikira **partition problem**: kugabanya icyegeranyo cy'imibare myiza mu matsinda K atari ay'ubusa ku buryo igiteranyo cy'ibintu muri buri tsinda ari kimwe. Mu yandi magambo, umubare wose w'itsinda ugomba gushyirwa kuri rimwe mu matsinda ya K , kandi igiteranyo kiri muri buri tsinda kigomba kuba kingana. Urugero, niba icyegeranyo cyatanzwe ari $[2, 1, 6, 4, 5]$ na $K = 3$, igice cyemewe cyaba $[2, 4]$, $[1, 5]$, na $[6]$. Muri iki gihe, igiteranyo cy'ibintu muri buri tsinda ni 6 neza neza.

The trick is performed as follows:

- Ulug'bek na Temur binjira mu tuzu dutandukanye kandi ntibashobora kuvugana.
- Umwe mu bagize akanama nkemurampaka aha Ulug'bek array ya integer A za N , $A[0], A[1], \dots, A[N-1]$, aho buri gaciro kari hagati ya 1 na M inclusive, hamwe n'agaciro ka K .
- Ulug'bek ihitamo nibura $K - 1$ (si ngombwa ko iba itandukanye) kugira ngo **add as new element** kuri array A . Buri integer yongewemo igomba kandi kuba iri hagati ya 1 na M irimo.
- Akanama nkemurampaka kongerera integers Ulug'bek yatoranyije kuri array ya original. Hanyuma uyi extended array **iba sorted muri non-decreasing order** hanyuma igahabwa Temur, hamwe n'agaciro ka K .
- Hanyuma, Temur agomba gukemura ikibazo cyo kugabanya iyi extended array.

Inshingano yawe ni ugutegeza no gushyira mu bikorwa ingamba za Temur na Ulug'bek.

Implementation Details

Ugomba gushyira mu bikorwa inzira ebyiri.

Uburyo ugomba gushyira mu bikorwa kuri **Ulug'bek** ni:

```
std::vector<int> add_numbers(std::vector<int> A, int K, int M)
```

- A : array of length N rugaragaza original array yahawe Temur.
- K : umubare w'amatsinda yifuzwa.
- M : agaciro ntarengwa kemewe kuri buri mubare w'umwimerere n'umubare mushya wongewemo.
- Ubu buryo bwitwa rimwe gusa kuri buri test case.

Uburyo bugomba gusubiza urutonde C rurimo integer Ulug'bek ashaka kongeramo ku rutonde rw'umwimerere. Reka S yerekane uburebure bw'urutonde C .

- S igomba kuba iri hagati ya $K - 1$.
- Buri gice cya C kigomba kuba kiri hagati ya 1 na M .

Uburyo ukwiye gushyira mu bikorwa kuri **Temur** ni:

```
std::vector<int> find_partition(std::vector<int> B, int K)
```

- B : ni array ya length $N + S$ rurimo umubare w'umwimerere w'a integers kuva kuri A ndetse na integrs Ulug'bek yongeyeho. elema(element) za array B ziba sorted muri non decreasing order
- K : umubare w'amatsinda yifuzwa.
- Ubu buryo bwitwa rimwe gusa kuri buri test case

Uburyo bugomba ku return array P rugaragaza igabanywa rya B mu matsinda K adahuje.

- Uburebure bwa P bugomba kuba $N + S$.
- Kuri buri j ku buryo $0 \leq j < N + S$, $P[j]$ yerekana itsinda $B[j]$ ibarizwamo.
- Amatsinda agomba kubarwa kuva kuri 0 kugeza kuri $K - 1$, bivuze ko $0 \leq P[j] < K$ igomba kuba ifite kuri buri $0 \leq j < N + S$.
- Kuri buri i iri hagati ya 0 na $K - 1$ harimo, hagomba kuba hari nibura ikintu kimwe j ($0 \leq j < N + S$) ku buryo $P[j] = i$.
- Igiteranyo cy'a elements za buri tsinda rya K kigomba kuba kimwe.

Mu isuzuma nyaryo, porogaramu ihamagara inzira zavuzwe haruguru ikorwa **inshuro ebyiri neza**.

- Mu gihe cyo gutangira gahunda ya mbere:
 - `add_numbers` yitwa rimwe gusa.
 - The returned array is processed by the grading system to compute array B .
- Mu gihe cyo gutangira gahunda ya kabiri:
 - `find_partition` byitwa rimwe gusa.

Constraints

- $3 \leq N \leq 100\,000$
- $2 \leq K \leq 100\,000$
- $K \leq N$
- $1 \leq M \leq 10^9$
- $1 \leq A[i] \leq M$ for each i such that $0 \leq i < N$.

Subtasks

Subtask	Score	Additional Constraints
1	5	$N = 3$
2	4	$M = 1$
3	7	$M \leq 2$
4	10	$N \leq 10$
5	7	$K = 2$
6	12	$K \leq 3$
7	17	$K \leq 10$
8	20	$K \leq 100$
9	18	No additional constraints.

urugero

Consider the following call:

```
add_numbers([8, 2, 9, 6, 1, 5, 5], 3, 9)
```

Muri uru rugero $A = [8, 2, 9, 6, 1, 5, 5]$. Turashaka kugabanya imibare mu matsinda ya $K = 3$. Ulug'bek ishobora kongeramo imibare iri hagati ya 1 na $M = 9$.

Uburyo bushobora gusubiza $[5, 4]$, bivuze ko Ulug'bek ifata icyemezo cyo kongeramo $S = 2$ umubare mushya wa integers: 5 na 4 . Ibi bifite agaciro kuko ibintu byombi biri hagati ya 1 na $M = 9$.

The extended array is then sorted and passed to Temur with the following call:

```
find_partition([1, 2, 4, 5, 5, 5, 6, 8, 9], 3)
```

Dushobora kugabanya umubare w'a integers muri iyi array muri aya matsinda atatu: $[1, 5, 9]$, $[2, 5, 8]$, na $[4, 5, 6]$. Menya ko igiteranyo cya buri tsinda muri aya kingana na 15 . To report this partition, the procedure should return the array $[0, 1, 2, 0, 1, 2, 2, 1, 0]$.

Sample Grader

Input format:

```
N K M
A[0] A[1] ... A[N-1]
```

Output format:

After the call to `add_numbers` completes, the sample grader:

- Computes the sorted array B .
- Prints arrays C and B in the following format, **followed by an empty line**:

```
S
C[0] C[1] ... C[S-1]
B[0] B[1] ... B[N+S-1]
```

After the call to `find_partition` completes, the grader outputs:

```
L
P[0] P[1] ... P[L-1]
```

Here, L is the length of the array P returned by `find_partition`.