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g.paul759@gmail.com ▾

NPTEL (<https://swayam.gov.in/explorer?ncCode=NPTEL>) » **Design and analysis of algorithms (course)**

Announcements (announcements)

About the Course (https://swayam.gov.in/nd1_noc20_cs27/preview) Ask a Question (forum)

Progress (student/home) Mentor (student/mentor)

Course outline

How does an NPTEL online course work?

 Week 1 :
Introduction

 Week 1 :
Analysis of algorithms

Week 1 Quiz

 Week 2 :
Searching and sorting

Week 2 Quiz

 Week 2
Programming Assignment

 Week 3 :
Graphs

Week 6 Programming Assignment: Book Cartons

Due on 2020-03-16, 23:59 IST

- Select your language (C/C++/Java/Python2/Python3)
- Paste your code into the submission window.
- There are some public test cases and some (hidden) private test cases.
- "Compile and run" will evaluate your submission against the public test cases.
- "Submit" will evaluate your submission against the hidden private test cases. There are 10 private testcases in all, each with equal weightage. You will get feedback about which private test cases pass or fail, though you cannot see the actual test cases.
- For each private testcase, you will get a status 'Evaluated', 'Not Evaluated' or 'Time Limit Exceeded'.
 - 'Evaluated' does not mean your answer is correct, just that the entire testcase completed and reported some answer.
 - 'Time Limit Exceeded' means your code took too long.
 - 'Not Evaluated' means this testcase was not run. This typically happens to all testcases after the first one that times out.
- Ignore warnings about "Presentation errors".

Book cartons

A university department is shifting its department library to a more spacious room on a newly constructed floor. The books from the library have been packed into m cartons, numbered $1, 2, \dots, m$, containing b_1, b_2, \dots, b_m books, respectively, and transported to the new library room.

Week 3 Quiz**Week 3
Programming
Assignment****Week 4 :
Weighted
graphs****Week 4 Quiz****Week 4
Programming
Assignment****Week 5: Data
Structures:
Union-Find and
Heaps****Week 5 : Divide
and Conquer****Week 5 Quiz****Week 6: Data
Structures:
Search Trees****Week 6: Greedy
Algorithms****Week 6 Quiz****Week 6
Programming
Assignment****Week 6
Programming
Assignment:
Book Cartons
(/noc20_cs27/progassignment?
name=122)****Week 7:
Dynamic
Programming****Week 7 Quiz**

There are k student volunteers available to unpack the m cartons, where $k \leq m$. Each carton must be assigned to a single volunteer, and every volunteer must get a non-empty continuous sequence of cartons to unpack.

More formally, we need to find numbers $0 = c_0 < c_1 < c_2 < \dots < c_k = m$ such that volunteer j , $1 \leq j \leq k$ unpacks cartons $c_{j-1}+1$ to c_j .

The time each volunteer takes to unpack a carton is directly proportional to the number of books in the carton. The goal is parallelize the unpacking to finish in the fastest possible time. For this, we need to assign cartons such that the maximum number of books assigned to any one volunteer is minimized.

Solution hint

Given a target T , use a greedy strategy to check if there is a legal allocation where no volunteer is assigned more than T books. Find the optimum T using binary search. Note that if a greedy strategy finds an allocation achieving target T using $k' < k$ volunteers, this allocation can always be subdivided to achieve the same target with exactly k volunteers.

Input format

Each test case consists of exactly two lines. The first line has two integers m and k . The second line has m integers b_1, b_2, \dots, b_m separated by spaces.

Output format

Your output should be a single line with the input sequence b_1, b_2, \dots, b_m divided into exactly k parts such that the maximum sum in a single part is as small as possible. Use the slash character ('/') to separate the parts. There must be exactly one space character between any two successive numbers and between the number and the slash. If there is more than one solution, print the one that minimizes the work assigned to the first volunteer, then to the second volunteer etc. Each volunteer must be assigned at least one carton.

Test Data:

You may assume that $1 \leq k \leq m \leq 500$, always. Also, each carton contains a positive number of books, which is less than 10,000,000.

Sample Input 1:

```
9 3
100 200 300 400 500 600 700 800 900
```

Sample Output 1:

```
100 200 300 400 500 / 600 700 / 800 900
```

Week 7
Programming
Assignment

Week 8: Linear
Programming
and Network
Flows

Week 8:
Intractability

Week 8 Quiz

Text Transcripts

Books

Download
Videos

Sample Input 2:

```
5 4
100 100 100 100 100
```

Sample Output 2:

```
100 / 100 / 100 / 100 100
```

Private Test cases used for evaluation				
	Input	Expected Output	Actual Output	Status
Test Case 1	17 4			Wrong Answer
	100 200 3			
	00 400 50	100 200 300 40	100 200 300 400	
	0 600 700	0 500 / 600 700	500 600 / 700 8	
	800 900 8	800 / 900 800 7	00 900 / 800 70	
	00 700 60	00 / 600 500 40	0 600 / 500 400	
	0 500 400	0 300 200 100\n	300 200 100	
	300 200 1			
	00			