

The 47th International Collegiate Programming Contest Asia Shenyang Regional Contest Warmup

November 05



東北大學
NORTHEASTERN UNIVERSITY



Problems

- A The introduction of NEU
- B Random Permutation
- C The Great Wall
- D A Bite of Teyvat

Do not open before the contest has started.

Problem A. The Introduction of NEU

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 512 megabytes

In its history of nearly 100 years, Northeastern University (NEU) has formed its unique spirit: “Striving constantly for improvement and behaving in conformity with truth”. It has gained a number of high-level scientific research achievements, such as the first analog computer, the first domestically produced CT, the first piece of super steel, the new technology of smelting vanadium titanium magnetite, the energy-saving theory and technology of steel industry, the controlled rolling and controlled cooling technique, and the mixed intelligent optimization control technology. By establishing the first university science park in China, it has established a series of high-tech enterprises, such as the Neusoft Corporation and the Neunn Technology Inc., and formed its unique characteristics in the areas of technological innovation, technological transfer, and industry-university cooperation.

The university is situated in Shenyang, the central city of Northeastern China, and it also has a campus in Qinhuangdao City, Hebei Province. The university occupies a total area of 2,550,000 square meters, of which the architectural area amounts to 1,680,000 square meters. Northeastern University (NEU) was founded on **XXX 26, 1923**. It has 4,538 faculty members, among whom 2,711 are full-time teachers. The university has 5 academicians of the Chinese Academy of Engineering, 4 foreign academicians, 18 scholars who are selected into “National High-level Personnel of Special Support Program”, 23 winners of “The National Science Fund for Distinguished Young Scholars”, 16 winners of the “Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao”, 102 who are selected into the “New Century Excellent Talents Support Project”, and 14 who are selected into “the National Outstanding Talents Project”. The university has 4 innovation groups of the National Natural Science Foundation and 3 innovation teams of the Ministry of Education. It has more than 100 research institutes including 3 national key laboratories, 4 national engineering (technology) research centers, and 3 national engineering laboratories. Besides, it has 2 national collaborative innovation centers and 3 collaborative innovation centers of Liaoning province.

Input

There is no input for this problem.

Output

Little Q notices that the month when NEU was founded has been lost on the website. Can you tell him the missing data?

The only line contains a string, denoting the abbreviation of the month. Note that the abbreviations of the 12 months are Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sept, Oct, Nov, and Dec, respectively.

Example

standard input	standard output
(no input)	Nov

Note

The sample output, which is not the correct answer, only shows the output format.

Problem B. Random Permutation

Input file: `standard input`
Output file: `standard output`
Time limit: `1 second`
Memory limit: `512 megabytes`

An integer sequence with length n , denoted by a_1, a_2, \dots, a_n , is generated randomly, and the probability of being $1, 2, \dots, n$ are all $\frac{1}{n}$ for each a_i ($i = 1, 2, \dots, n$).

Your task is to calculate the expected number of permutations p_1, p_2, \dots, p_n from 1 to n such that $p_i \leq a_i$ holds for each $i = 1, 2, \dots, n$.

Input

The only line contains an integer n ($1 \leq n \leq 50$).

Output

Output the expected number of permutations satisfying the condition. Your answer is acceptable if its absolute or relative error does not exceed 10^{-9} .

Formally speaking, suppose that your output is x and the jury's answer is y . Your output is accepted if and only if $\frac{|x-y|}{\max(1,|y|)} \leq 10^{-9}$.

Examples

<code>standard input</code>
2
<code>standard output</code>
1.000000000000
<code>standard input</code>
3
<code>standard output</code>
1.333333333333
<code>standard input</code>
50
<code>standard output</code>
104147662762941310907813025277584020848013430.758061352192

Problem C. The Great Wall

Input file: standard input
Output file: standard output
Time limit: 2 seconds
Memory limit: 512 megabytes

Beacon towers are built throughout and alongside the Great Wall. There was once a time when there were n beacon towers built from west to east for defending against the invaders. The altitude of the i -th beacon tower, based on historical records, is a_i .

The defenders divide strategically all beacon towers into k parts where each part contains several, but at least one, consecutive beacon towers. The scale of an individual part is given by the difference between the highest and the lowest altitudes of beacon towers, and the most sensible partition maximizes the sum of scales of all parts.

As a historian, you are dying to know the maximum sums of scales for every $k = 1, 2, \dots, n$.

Input

The first line contains an integer n ($1 \leq n \leq 10^4$), denoting the number of beacon towers alongside the Great Wall.

The second line contains n integers a_1, a_2, \dots, a_n , where the i -th integer a_i ($1 \leq a_i \leq 10^5$) is the altitude of the i -th beacon tower.

Output

Output n lines, the i -th of which contains an integer indicating the maximum sum for $k = i$.

Examples

standard input	standard output
5 1 2 3 4 5	4 3 2 1 0
5 1 2 1 2 1	1 2 2 1 0

Problem D. A Bite of Teyvat

Input file: standard input
Output file: standard output
Time limit: 2 seconds
Memory limit: 512 megabytes

Xiangling, one of the greatest chef in Teyvat, is preparing for the Moonchase banquet. Xiangling has bought n round plates and her friend and companion Guoba will help place these n plates on the table in a line. The i -th plate placed has radius r_i and the center of this plate locates at $(x_i, 0)$ on the table.

However, Paimon the emergency food has been tired of waiting for the banquet a long time and begins finding the total area covered by the plates on the table after each placement.



Pixiv ID: 93526437

Input

The first line contains an integer n ($1 \leq n \leq 10^5$), indicating the number of plates Xiangling has bought. Then follow n lines, the i -th of which contains two integers x_i ($-10^5 \leq x_i \leq 10^5$) and r_i ($1 \leq r_i \leq 10^6$), indicating that the i -th plate placed by Guoba has radius r_i and the center of this plate locates at $(x_i, 0)$ on the table.

Output

Output n lines, the i -th of which contains a real number, indicating the total area covered by the plates on the table after Guoba places the first i -th plates.

Your answer is acceptable if its absolute or relative error does not exceed 10^{-9} . Formally speaking, suppose that your output is x and the jury's answer is y , your output is accepted if and only if $\frac{|x-y|}{\max(1, |y|)} \leq 10^{-9}$.

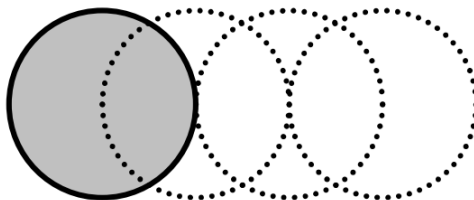
Example

standard input	standard output
4	3.141592653589793
0 1	6.283185307179586
2 1	8.196408262160623
3 1	8.881261518532902
1 1	

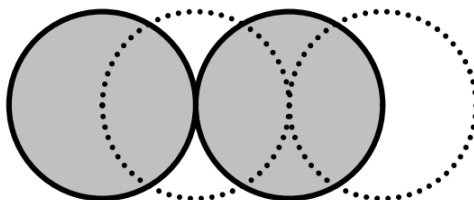
Note

In the sample case:

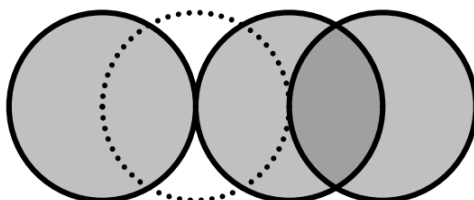
1. The total area covered by the first plate is π ;



2. The total area covered by the first two plates is 2π ;



3. The total area covered by the first three plates is $\frac{14\pi+3\sqrt{3}}{6}$;



4. The total area covered by all the four plates is $\frac{4\pi+3\sqrt{3}}{2}$.

