Problem H. Halves Not Equal

Time limit: 3 seconds
Memory limit: 512 megabytes

The king died and his gold had to be divided among his n wives. He had not left his will about the parts of his wives, so they started arguing. The i-th wife claimed that she should get a_i dinars.

However, it turned out that the total property of the king was only s dinars, and $s \le a_1 + a_2 + \ldots + a_n$. A wise man was called to help divide the king's inheritance. But he said that he only knew a fair way to divide gold between two persons.

The *fair way* is the following. Without loss of generality, let the claims of the two persons be $a_1 \le a_2$, and let there be b dinars of gold to be divided, $0 \le b \le a_1 + a_2$. If $b \le a_1$, each of the persons would get $b/2$ dinars. If $a_1 < b < a_2$, the first one would get $a_1/2$ dinars and the second one would get $b - a_1/2$ dinars. Finally, if $a_2 \le b$, the first one would get $a_1/2 + (b - a_2)/2$ and the second one would get $a_2/2 + (b - a_1)/2$. Gold can be divided to any fractional part, so the amount one gets can be fractional. Note that the amount each one would get is a monotonic and continuous function of b.

Now you have been called as an even wiser person to help divide the gold among the n wives. Each wife should get no more than she claims. The division is called fair if for any two wives who claim a_i and a_j dinars of the inheritance and get c_i and c_j dinars, correspondingly, these values are the *fair way* to divide $c_i + c_j$ dinars between them.

Help the wives of the late king divide his inheritance.

Input

The first line of the input contains n — the number of wives of the king ($2 \le n \le 5000$).

The second line contains n integers $a_1, a_2, \ldots, a_n$ ($1 \le a_i \le 5000$).

The third line contains an integer s ($0 \le s \le a_1 + a_2 + \ldots + a_n$).

Output

Output n floating point numbers $c_1, c_2, \ldots, c_n$ — the amounts of gold each wife should get in a fair division.

For each pair of wives i and j the absolute or relative difference between their parts and their parts in the *fair way* to divide $c_i + c_j$ between them must not exceed 10^{-9}. The sum of c_i must be equal to s with an absolute or relative error of at most 10^{-9}.

It can be proved that a fair division always exists. If there is more than one solution, output any of them.

Examples

standard input	standard output
3 10 20 30 10	3.33333333333333 3.33333333333333 3.33333333333333
3 10 20 30 20	5 7.5 7.5
3 10 20 30 30	5 10 15