

heritage

100 points

Source code: **heritage.c**, **heritage.cpp**, **heritage.pas**

Input file: **heritage.in**

Output file: **heritage.out**

Time limit: **0.3 s**

Memory limit: **64 MB**

The old Count D has a surface of land which he wants to leave as heritage to his n sons. The surface is delimited by an horizontal segment $[AB]$ placed on the Ox axis, two vertical segments $[AP_1]$ and $[BP_m]$, and a polygonal line $P=[P_1P_2 \dots P_m]$ placed entirely upside the Ox axis. The Count D builds $n-1$ vertical fences each of them connecting the $[AB]$ segment with the polygonal line P . As a result n parcels of land with different areas will be created and left as heritage to his sons. The Count D wishes that the following two conditions should be respected:

1. Each son should receive a parcel with an area directly proportional with his age.
2. The sum of the fences` lengths should be minimal.

Task

Knowing the coordinates of the m points P_1, P_2, \dots, P_m and his n sons` age, a parcelling, that respects the two conditions, must be determined.

Description of Input

On the first line of the file `heritage.in` there are two natural numbers n and m with the meaning above. The following line contains n natural numbers v_1, v_2, \dots, v_n representing the age of the n sons. The following m lines contain each a pair of natural numbers x_i, y_i , representing the coordinates of the points P_i . The numbers from each line are separated by one space.

Description of output

The `heritage.out` file will have two lines. The first line will contain a real number representing the sum of the fences` lengths. The second will contain $n-1$ real numbers.

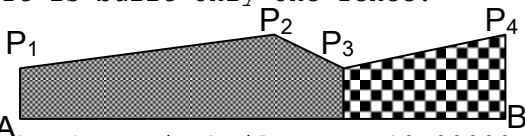
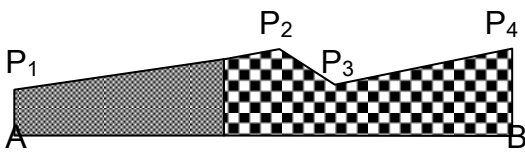
The k^{th} number ($k=1,2,\dots,n-1$) will represent the coordinate of the k^{th} fence on the Ox axis.

The numbers from the second line will be given in the increasing order and will be separated by one space.

Constrains and remarks:

- $1 \leq n \leq 8$
- $1 \leq m \leq 500$
- $1 \leq v_i \leq 50$
- $0 \leq x_1 < x_2 < \dots < x_m \leq 32000$
- $1 \leq y_1, y_2, \dots, y_m \leq 32000$
- The width of the fences are ignorable;
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- Each value will be assessed with a precision of 0.001;
- For the contestants that use C/C++ , it is recommended the `double` type.
- Your program will obtain a 100% score if the output respects both conditions;
- Your program will obtain a 20% score if the output respects only the first condition.

Example

heritage.in	heritage.out	Remarks
2 4 4 2 2 1 8 3 10 1 14 3	1.000000 10.00	<p>It is built only one fence.</p>  <p>The fence is built at $x=10.00000$, the 4 years old son will receive the parcel from the left and the 2 years old son will receive the parcel from the right. This way both conditions are respected.</p> <p>Analysis</p>  <p>If the fence is built at $x=6.54984$ the 2 years old son will receive the parcel from the left and the 4 years old son will receive the parcel from the right. This way only the first condition would be respected.</p> <p>Any other position of the fence will not respect any of the two conditions.</p>