

1. Price to Sell

A real estate agent is advising a seller on the price to ask for a home. To do this, the agent will look at homes that have sold in the area and base the valuation on this data. The only factors that will be considered are square footage and sale price.

The agent starts by removing any outliers from the list of comparable homes. To determine the outliers:

- Select the home to test.
- Create a list of prices of other homes of the same size. It will be called *compList* in the examples.
- If there are no other homes of the same size, the house being tested is not an outlier.
- Otherwise:
 - Calculate the mean price, $P[m]$, and the standard deviation, σ , for the homes *compList*.
 - If $|price[i] - P[m]| > 3 * \sigma$, the house is an outlier.

The valuation is then calculated against the resulting list using the following rules:

- If there are no houses in the list, use 1000 per square foot as the price.
- If there is only 1 house in the list, its square foot price is used.
- If there are 1 or more houses in the list with the exact square footage of the house to price, use the mean of those prices.
- If the required square footage is between the square footage of two houses in the list, interpolate the square foot price using the means of the closest higher and lower-priced homes.
- If the required square footage is outside of the range of houses listed, extrapolate the price based on the means of the two square footage values that are closest to the home to value.

In all cases, if the final price is less than 10^3 or greater than 10^6 , the price will be 10^3 and 10^6 , respectively. For any square footage, the square foot price is the mean of the prices at that square footage. Return an integer that represents the valuation of the seller's house.

For example, there are $n = 6$ houses with *area* = [1200, 1300, 1200, 1300, 1200, 2000], *price* = [12000, 24000, 14000, 22000, 13000, 30000] and the house to value has *reqArea* = 1500 square feet. The following table shows the test for outliers:

To Test area/price	compList	P[m]	σ	$ price - P[m] $	$3 * \sigma$	Is outlier?
1200/12000	[14000, 13000]	13500	500	1500	1500	False
1300/24000	[22000]	22000	0	2000	0	True
1200/14000	[12000, 13000]	12500	500	1500	1500	False
1300/22000	[24000]	24000	0	2000	0	True
1200/13000	[12000, 14000]	13000	1000	1000	3000	False
2000/30000	[]	NIL	N/A			False *

* There is only one house with this area, so it cannot be an outlier.

The 1300 square foot houses are both outliers, so they are discarded. The new arrays are *area'* = [1200, 1200, 1200, 2000] and *price'* = [12000, 14000, 13000, 30000]. Interpolate the price between the two house sizes remaining. The interpolated price is $13000 + (30000 - 13000)/(2000 - 1200) * (1500 - 1200) = 19375$.

Function Description

Complete the function *valuation* in the editor below. The function must return the expected price rounded to the nearest integer.

valuation has the following parameter(s):

int reqArea: the area of the seller's house in square feet
int area[n]: each value is an area of a house sold in the past
int price[n]: *price[i]* is the price of the i^{th} house in *area[i]*

Constraints

- $500 \leq reqArea \leq 10^5$
- $500 \leq area[i] \leq 10^5$ for all i such that $0 \leq i < n$
- $10^3 \leq price[i] \leq 10^6$ for all i such that $0 \leq i < n$
- $1 \leq n \leq 10^5$

▼ Input Format For Custom Testing

The first line contains an integer, *reqArea*, the area of the house required.
The second line contains an integer, *n*, the size of the array *area*.
Each line *i* of the *n* subsequent lines (where $0 \leq i < n$) contains an integer that describes *area[i]*.
The next line again contains the integer, *n*, the size of the array *price*.
Each line *i* of the *n* subsequent lines (where $0 \leq i < n$) contains an integer that describes *price[i]*.

▼ Sample Case 0

Sample Input For Custom Testing

STDIN	Function
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1200	→ reqArea = 1200
5	→ area[] size n = 5
1500	→ area = [1500, 500, 1000, 2000, 2500]
500	
1000	
2000	
2500	
5	→ price[] size n = 5
30000	→ price = [30000, 10000, 20000, 40000, 50000]
10000	
20000	
40000	
50000	

Sample Output

24000

Explanation

1000 and 1500 are the closest smaller and larger areas for 1200. The seller's house value is $20000 + (1200 - 1000) * (30000 - 20000)/(1500 - 1000)$.

▼ Sample Case 1

Sample Input For Custom Testing

2500
4
1200
1200
1200
2000
4
15000
11000
17000
25000

Sample Output

30625

Explanation

To Test area/price	compList	P[m]	σ	$ price - P[m] $	$3 * \sigma$	Is outlier?
1200/15000	[11000, 17000]	14000	3000	1000	9000	False
1200/11000	[15000, 17000]	16000	1000	5000	3000	True
1200/17000	[15000, 11000]	13000	2000	4000	6000	False
2000/25000	[]	NIL	N/A			False*

* There is only one house of this area, so it cannot be an outlier.

After removing the outlier, the new arrays are *area'* = [1200, 1200, 2000] and *price'* = [15000, 17000, 25000]. The mean price for the 1200 sf houses is 16000. The seller's house is larger than any of the comparable houses, so extrapolate its price: $25000 + (2500 - 2000) * (25000 - 16000)/(2000 - 1200) = 30625$.