Task Overview Sheet

	Post Office	Hareedifone	Yoghurt
Type	Batch (stdin/stdout)	Batch (stdin/stdout)	Batch (stdin/stdout)
Time Limit (per test case)	1.5 seconds	1 second	1 second
Memory Limit (per test case)	32 MB	128 MB	64 MB
Points	150	150	150

Post Office

Hareedi and Hanadi's village has only one straight road and **N** buildings built along this road. The village's mayor wants to build two post offices in any two buildings in the village. As the mayor is fair, he wants the locations of the post offices to be **chosen** such that the sum of the distances from each building to its nearest post office is minimized.

TASK

Write a program that given the positions of the buildings on the road, finds the best positions for the 2 post offices to minimize the sum of the distances from each building to its nearest post office.

CONSTRAINTS

1 <= **N** <= 1,000,000	The number of buildings.
0 <= $\mathbf{P_i}$ <= 1,000	The position of the $\mathbf{i^{th}}$ building on the road.

INPUT

- Line 1 contains an integer **N**.
- Each of the next **N** lines contains an integer $\mathbf{P_i}$, The position of the $\mathbf{i^{th}}$ building on the road.

OUTPUT

- A single line containing a single integer which is the minimum sum of the distances from each building to its nearest post office.

GRADING

- For some test cases, worth **40 points N** will not exceed 500.
- For some test cases, worth **100 points N** will not exceed 10,000.

EXAMPLE

Sample Input	Sample Output
5 6 1 3 10 4	6

The best solution is to build the two post offices in the buildings at positions 3 and 10.

Position of the building.	1	3	4	6	10
Position of the nearest post office.	3	3	3	3	10
The distance to the nearest post office.	2	0	1	3	0

The minimum sum of distances from each building to its nearest post office is (2 + 0 + 1 + 3 + 0) = 6.

Hareedifone

Hareedi wants to establish his own cell phone network operator "Hareedifone" in his village. The village already has **N** towers and **N**-1 connections between some towers. In order to increase his network's coverage, Hareedi decided to build some signal amplifiers on top of some towers. Unfortunately for Hareedi, building an amplifier on tower **i** has a certain cost $\mathbf{C_i}$. However, building an amplifier on tower **i** and another on tower **j** will earn Hareedi a profit $\mathbf{P_{ij}}$ if there is a connection between the two towers. Obviously, Hareedi wants to maximize his net profit.
i.e.: maximize (the profits - the costs).

TASK

Write a program that given the costs and profits of building amplifiers, finds the maximum net profit Hareedi can obtain.

NOTE: Each two towers will be connected directly or by a series (path) of connections.

CONSTRAINTS

1 <= **N** <= 100,000	The number of towers.
1 <= $\mathbf{C_i}$ <= 1,000	The cost of building an amplifier on tower **i**.
1 <= $\mathbf{P_{ij}}$ <= 1,000	The profit of building an amplifier on tower **i** and another on tower **j**.

INPUT

- Line 1 contains an integer **N**.
- Line 2 contains **N** integers, the cost of building an amplifier on each tower.
- Each of next **N-1** lines represents a single connection and contains 3 integers.
  - Integer **i,** where **0<=i<=N-1.**
  - Integer **j,** where **0<=j<=N-1.**
  - Integer $\mathbf{P_{ij}}$**,** the profit of building an amplifier on tower **i** and another on tower **j**.

OUTPUT

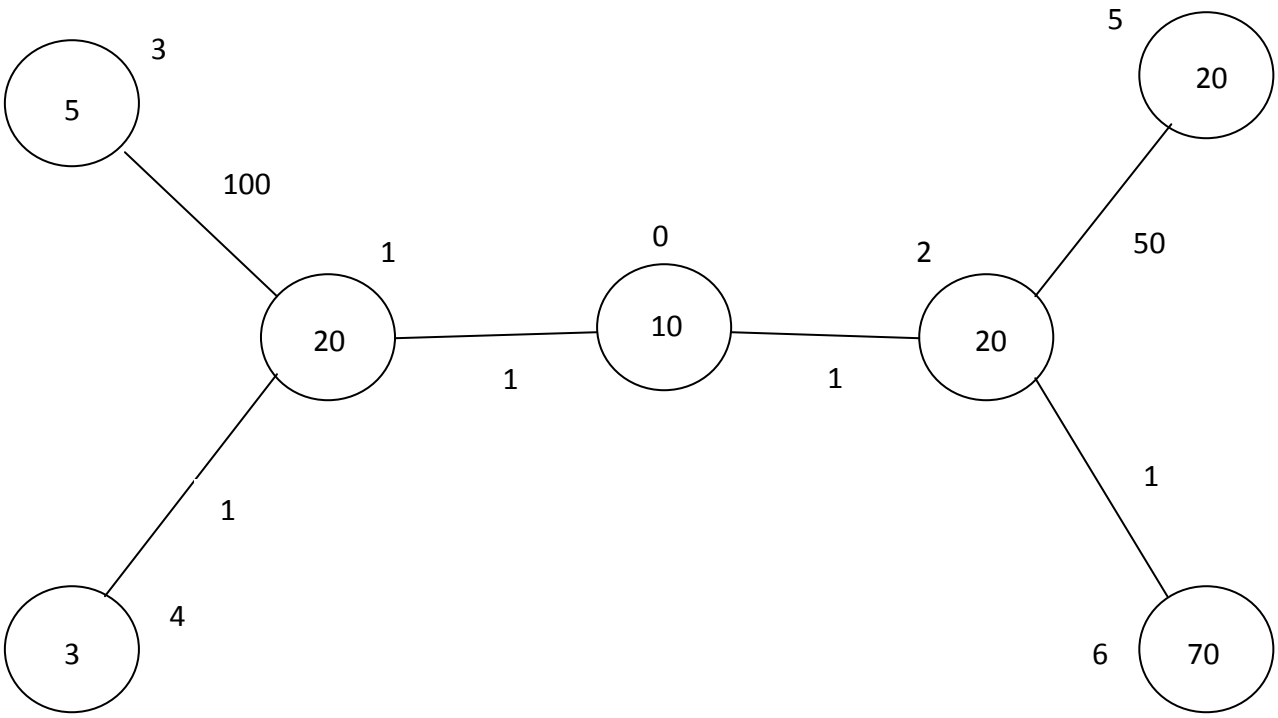
- A single line containing a single integer which is the maximum net profit Hareedi could obtain.

GRADING

- For some test cases, worth **40 points N** will not exceed 20.
- For some test cases, worth **100 points N** will not exceed 4,000.

EXAMPLE

Sample Input	Sample Output
7 10 20 20 5 3 20 70 0 1 1 0 2 1 1 3 100 1 4 1 2 5 50 2 6 1	85



- The number in each circle is the cost of building an amplifier on that tower.
- The number labeling each line is the profit obtained when building amplifiers on the two towers connected by that line.
- The number beside each circle is the number of the tower.

For maximum profit, the amplifiers will be built on towers 1, 2 , 3 and 5, with cost (20+20+5+20)=65, and profit 100+50, so net profit (150-65)=85.

Yoghurt

Hanadi made a new yoghurt recipe, and she now wants to produce it in large amounts. She wants to find time **X** the minimum time of incubation the yoghurt needs to be ready for selling. She puts a sample of the yoghurt in a special oven and specifies **some integer units of time,** which, she will open the oven and check the yoghurt's state after these units of time passes, when she checks on the yoghurt she will find it **ready or not ready.** If it is **ready** then she will repeat the process with a new sample to try to find less time that is enough for the yoghurt to be **ready**. If it is **not ready** then she will repeat the process with a new sample to try to find minimum time for the yoghurt to be **ready**. She knows for sure that **N** units of time are enough for the yoghurt to be **ready** and 0 is not enough for the yoghurt to be **ready**.

NOTE: All samples are identical.

TASK

Write a program that given integer N, calculates the time Hanadi will spend till she knows the minimum integer time the yoghurt needs to be ready (ignoring time of putting and removing the samples from the oven, and time of checking on the samples). **Assuming that the result of checking the samples will always be the worst result.**

CONSTRAINTS

1 <= **N** <= 500 The time that after it passes the yoghurt will be guaranteed to be ready.

INPUT

- Line 1 contains an integer **N**.

OUTPUT

- A single line containing a single integer which is the minimum time needed to determine **X**.

EXAMPLE

Sample Input	Sample Output
5	7

N equals 5, so **X** may be 1,2,3,4 or 5. Hanadi will try 3 units of time, assuming the worst case the result of the check will be not ready. So there will be two possibilities 4 or 5.She only needs to make one trial to know which one of them is **X,** so she will try 4 because it is less than 5. So the time needed will be (3+4 =7).