Lab3 Questions

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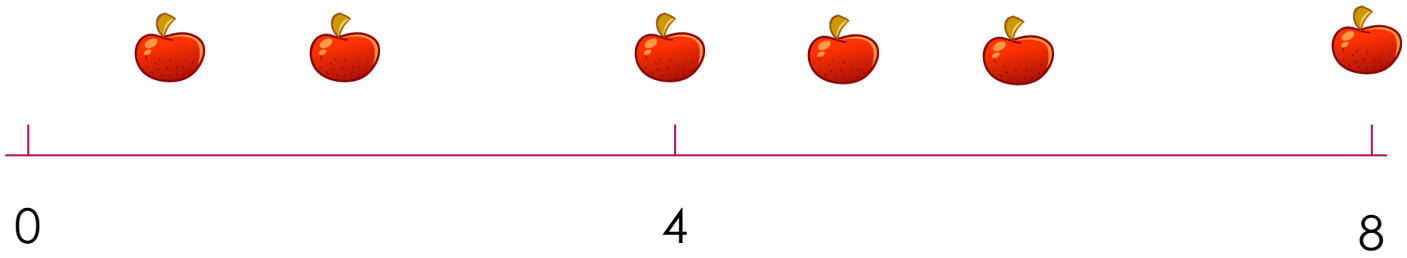
Lab3.A Careless Boy

- Dy is a careless boy. One day, on the way of delivering apples, Dy pays all attention on playing Nihsneg on his phone. Dy is so focused on playing that he doesn't realize that all apples drop out from the baskets! Now Dy needs to collect apples along the way and take them back to the truck. All tools he can use are the baskets on the truck and himself.
- Dy need to set off from the truck to collect apples with his baskets. Every basket has its own volume v_i, representing the number of apples it can hold. At any time, Dy can carry only one basket. The truck and the apples are on the same line. The line can be considered as a number axis and the truck is its origin. Every apple has its own position p_i on the number axis. Once Dy passes by an apple, he can pick up the apple and keep collecting apples if the basket is not full. Once the basket is full, Dy must take it back to the truck.
- Dy wonders how far it would take him to fill up all the baskets (If the total number of apples is less than the sum of basket volume ($n < \sum_1^{\mathrm{m}} v_i$), then Dy just need to collect all apples). And he wants the total distance to be as small as possible.

Input:

```
6 3
2 1 3
1 2 4 5 6 8
```



2→1→3: 2+2+4+4+8+8 = 28
1→2→3: 1+1+4+4+8+8 = 26
3→2→1: 4+4+6+6+8+8 = 36
…

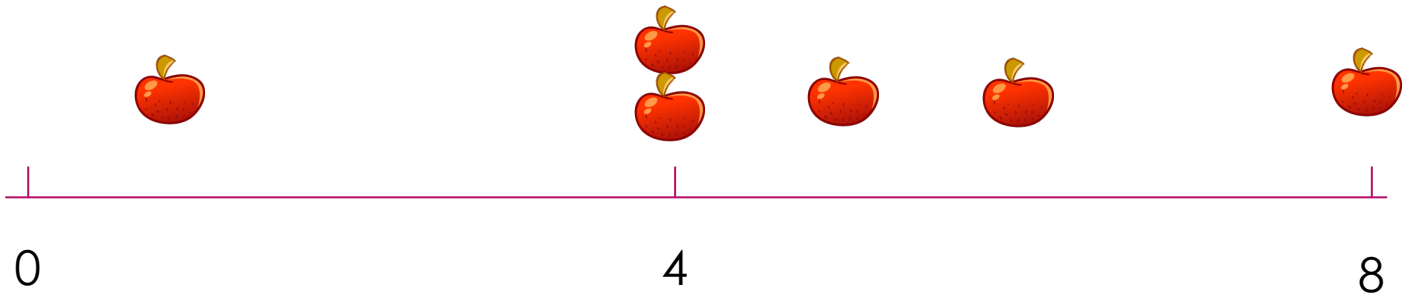
All possible total distance, 26 is the smallest.

Output:

```
26
```

Input:

```
6 3
1 2 2
1 4 4 5 6 8
```



1→2→2: 1+1+4+4+6+6 = 22
2→1→2: 4+4+4+4+6+6 = 28
2→2→1: 4+4+5+5+6+6 = 30

All possible total distance 22 is the smallest.

Output:

22

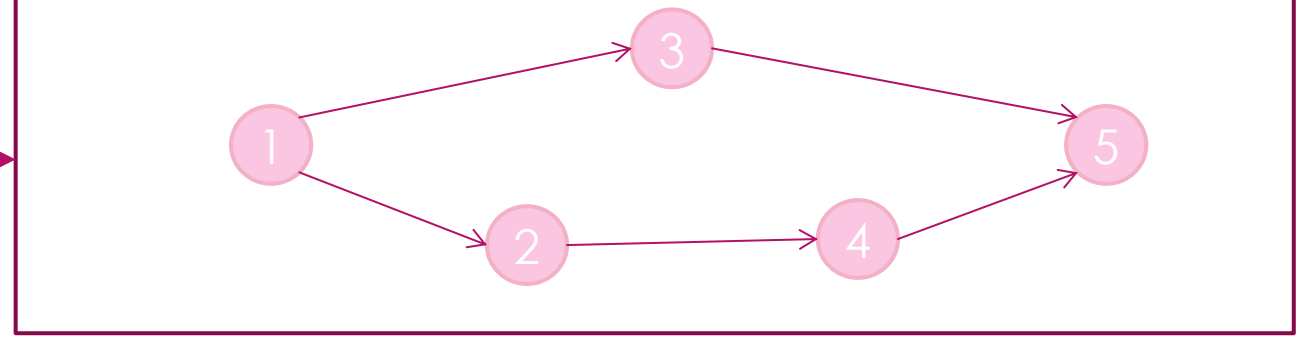
Lab3.B Flow Control

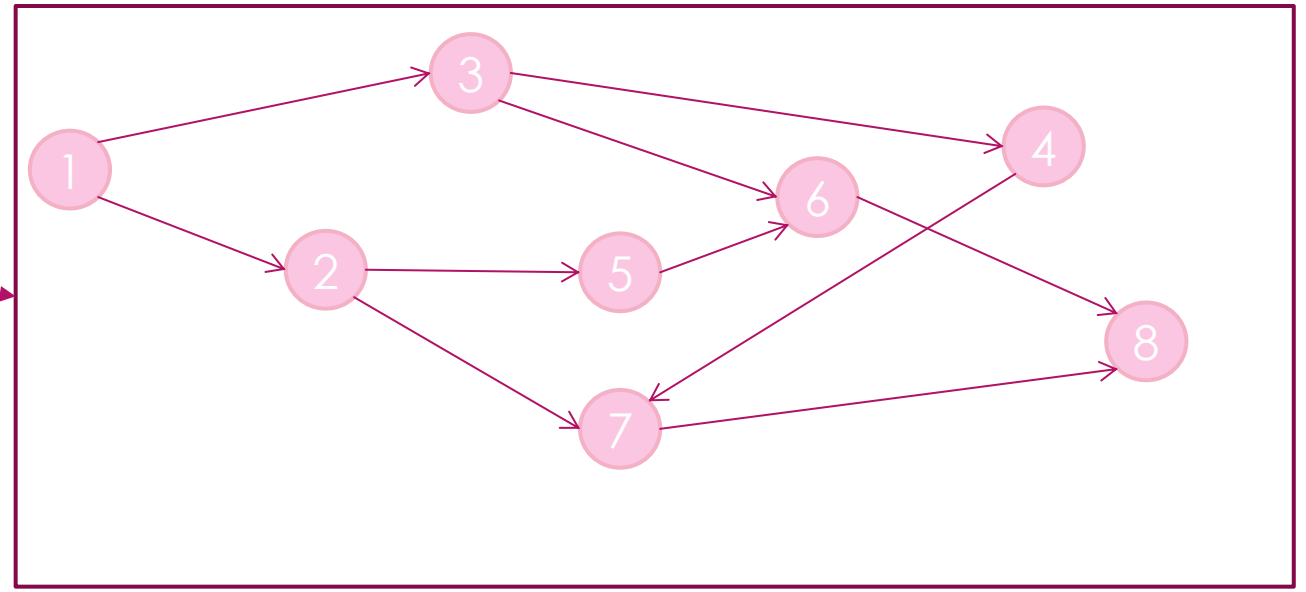
- There are n scenic spots in the scenic area, with the entrance as 1 and the exit as n. The roads between the scenic spots are directed edges, and the roads in the entire scenic area form a directed acyclic graph (DAG). In order to control the flow of each vertex in the scenic area, the manager hopes to assign a flow value w_i to each point, so that the sum of the flow on all paths from 1 to n is equal. Can you help him solve this problem?

Input:

2 test cases

```
2
5 5
1 2
1 3
2 4
3 5
4 5
8 10
1 2
1 3
2 5
2 7
3 4
3 6
5 6
4 7
6 8
7 8
```

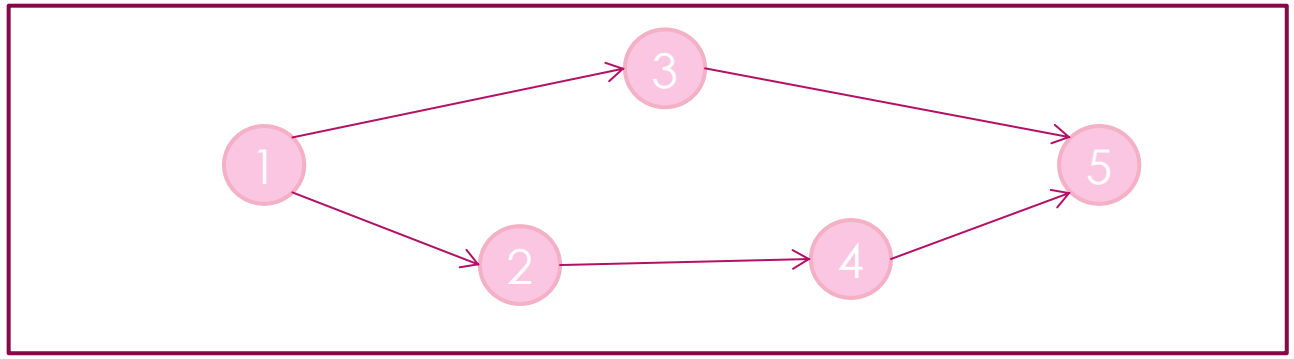




Output:

```
Yes
1 1 2 1 3
No
```

test case 1：



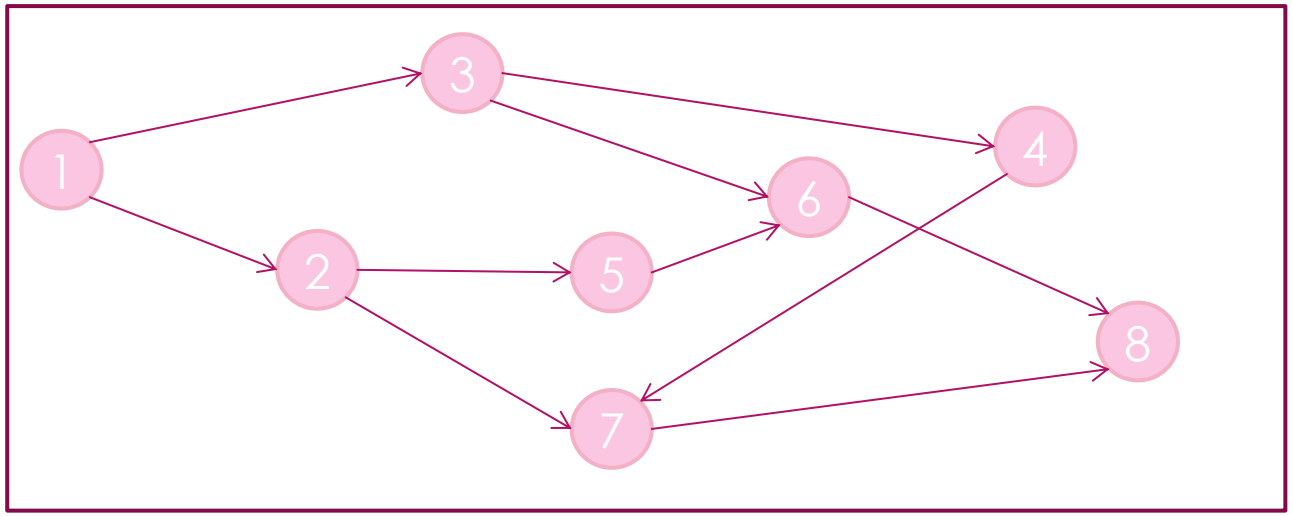
all paths from 1 to 5:
1 → 3 →5
1→ 2→4→5

$w_1 + w_3 + w_5 = w_1 + w_2 + w_4 + w_5$
let $w_3 = w_2 + w_4$

There are multiple solutions.
1 1 2 1 3
1 2 5 3 4
8 8 10 2 8
…

You can print any of them.

test case 1：



all paths from 1 to 8:

1 → 3 →4→7→8

1 → 3 →6→8

1 → 2 →5→6→8

1 → 2 →7→8

$w_1 + w_3 + w_4 + w_7 + w_8 = w_1 + w_3 + w_6 + w_8 = w_1 + w_2 + w_5 + w_6 + w_8 = w_1 + w_2 + w_7 + w_8$

$w_3 + w_4 = w_2$

$w_3 = w_2 - w_4$

$w_3 = w_2 + w_5$

All w_i are positive integers

no w_3 can satisfy the above equations