Lab 5

Lab5 OJ link

- https://lms.sustech.cloud/assignment/82

Lab5 has been released on the new OJ, you can sign in the new OJ using your account and password from the old OJ.

Lab5 A: Game

- Bob is a second-year student in SUSTech who wants to buy M games online to spend his holiday. Initially, he had N units money.
- The good news is that all the games he wants are on special sales promotion, in which the price of each game will decrease K units day by day as long as the price can maintain a **positive** price value. (If the price is 9, each day decreases 10, then the price should maintain at 9).
- The price of each game decreases on the morning of each day **except** the first day.
- Also, Bob adds his income of I to his wallet from his dear parents on the evening of each day including the first day.
- The task is to help Bob determine the minimum days to get all the games and the state (morning or evening).

Sample Input

4 1 6 2
3 2 4 2 6 5

4 N: original Deposit **1** I : income per day
6 M: games number **2** K :decrease units per day

	Income	Deposit	Game1	Game2	Game3	Game4	Game5	Game6	Deposit
Day 1-M		$ 4	3	-2->√	4	-2->√	6	5	$ 0
Day 1-E	+1	$ 1	3	√	4	√	6	5	$ 1
Day 2-M		$ 1	-1->√	√	2	√	4	3	$ 0
Day 2-E	+1	$ 1	√	√	2	√	4	3	$ 1
Day 3-M		$ 1	√	√	2	√	2	-1->√	$ 0
Day 3-E	+1	$ 1							$ 1
Day 4-M									
Day 4-E	+1	$ 2	√	√	-2-> √	√	2	√	$ 0
Day 5-M									
Day 5-E	+1	$ 1							$ 1
Day 6-M									
Day 6-E	+1	$ 2	√	√	√	√	-2-> √	√	$ 0

Analysis of Lab5A

k > 0 4 1 6 **2**
3 2 4 2 6 5

Sort the sequence：

3 2 4 2 6 5 →

	Total price		Deposit
2 2 3 4 5 6	22	Day 1	4+1*1
2 2 1 2 3 4	22 – 4*2 = 14	Day 2	4+1*2
2 2 1 2 1 2	14 – 2*2 = 10	Day 3	4+1*3
2 2 1 2 1 2	10 – 0*2 = 10	Day 4	4+1*4
.....			
2 2 1 2 1 2	10	**Day 6**	4+1*6 >= 10 ✓

morning or evening?

4+1*6 – 1 **<** 10 →

In the morning, cannot buy all the games.
It should be **evening** in this case.

minus the income from the day6's evening

Analysis of Lab5A

k = 0

4 1 6 **0**
3 2 4 2 6 5

	Total price		Deposit
3 2 4 2 6 5	22	Day 1	4+1*1
3 2 4 2 6 5	22	Day 2	4+1*2
	.....		
3 2 4 2 6 5	22	Day 18	4+1*18

Directly calculate the day and the state(morning or evening)

Lab5.B: Elevator

- TB-X is a wonderful teaching building in SUSTech.
- TB-X has k floors. Today, there are n people going to take the elevator.
- The i-th person wants to go from a_i-th floor to b_i-th floor. The elevator has a capacity of m people. It starts from the first floor. The elevator takes 1 unit of time to go up or down one floor. The time people enter and exit the elevator can be ignored.
- The elevator could not change its direction arbitrarily. When the elevator is going down, it can change its running direction if and only if it reaches the first floor.
- The task is to find out the minimum time to carry all people to their destination and let the elevator back to the first floor.

Sample Input

5 2 6

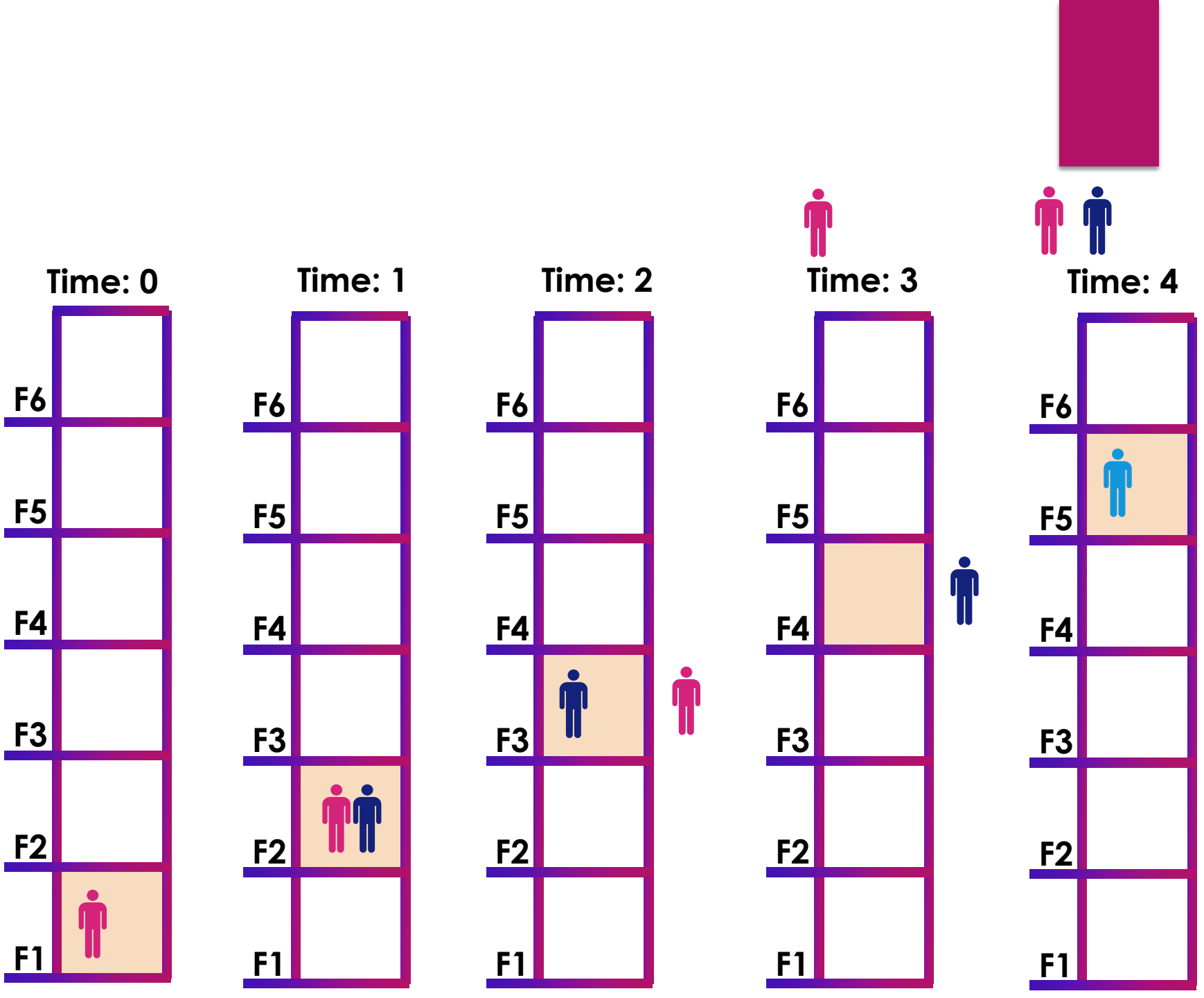
1 3

2 4

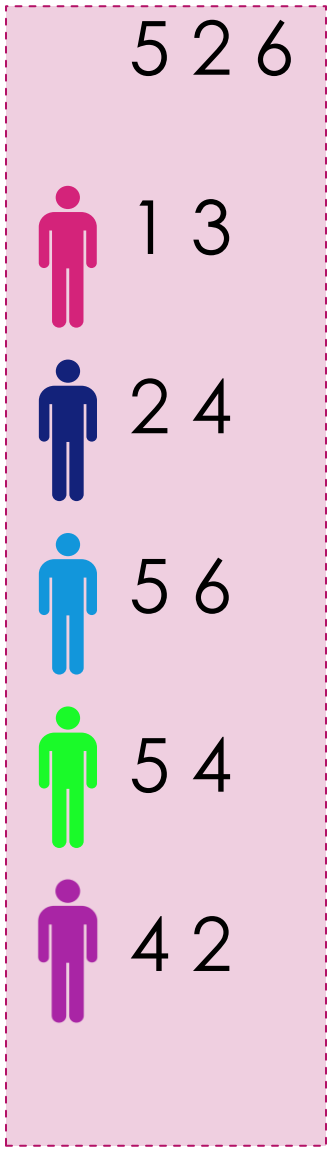
5 6

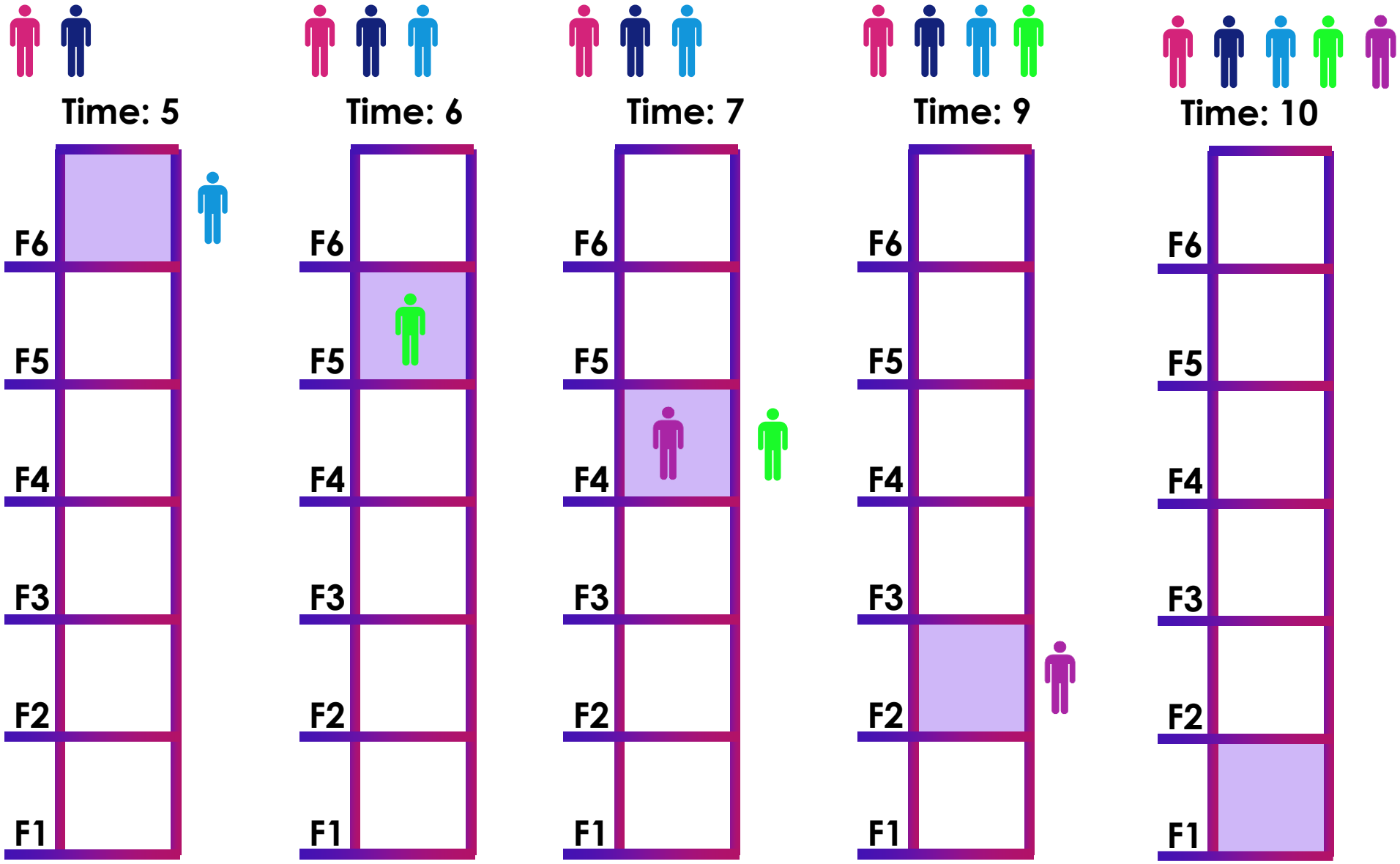
5 4

4 2



Sample Input





Analysis of Lab5B

6 2 5

2 4

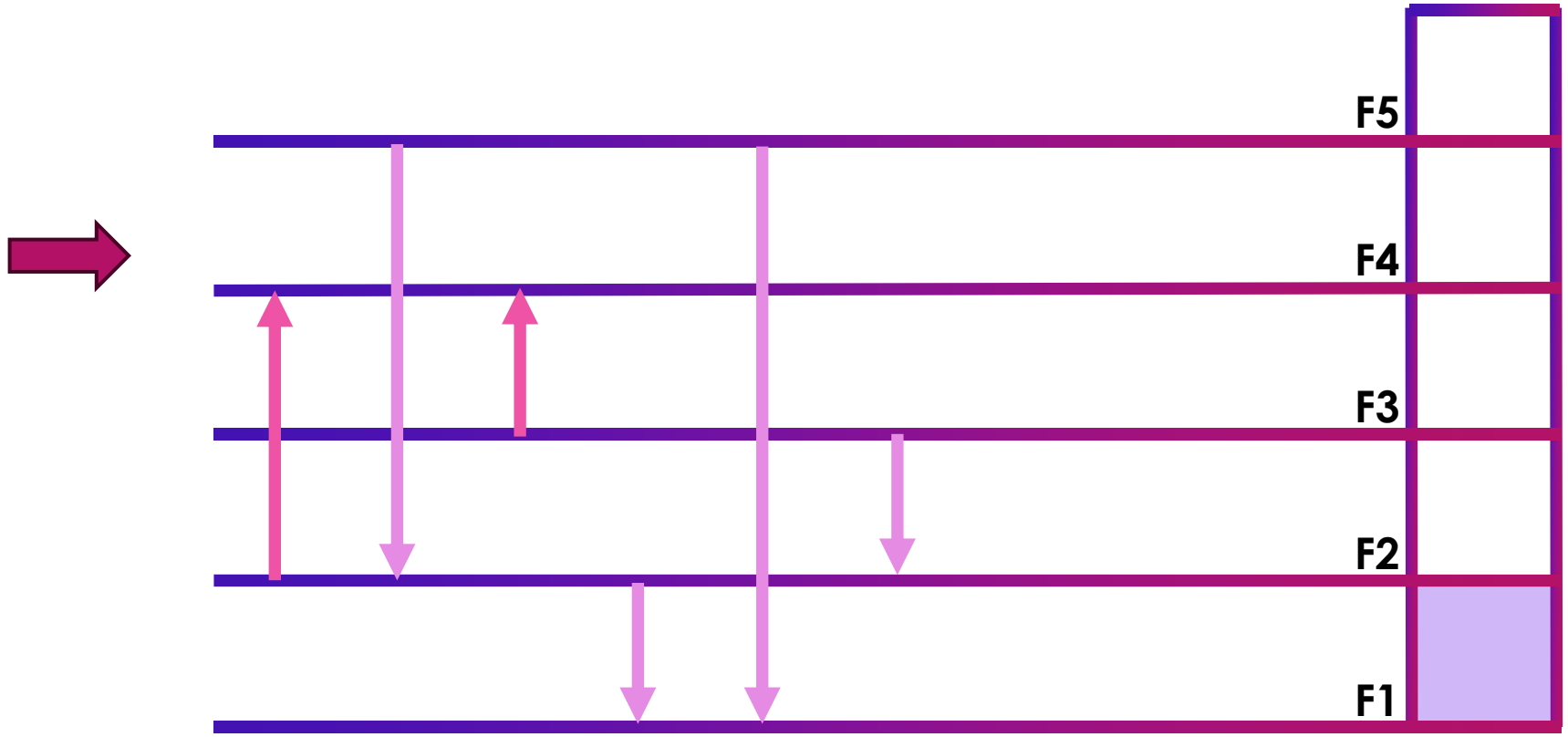
5 2

3 4

2 1

5 1

3 2



Analysis of Lab5B

6 2 5

2 4

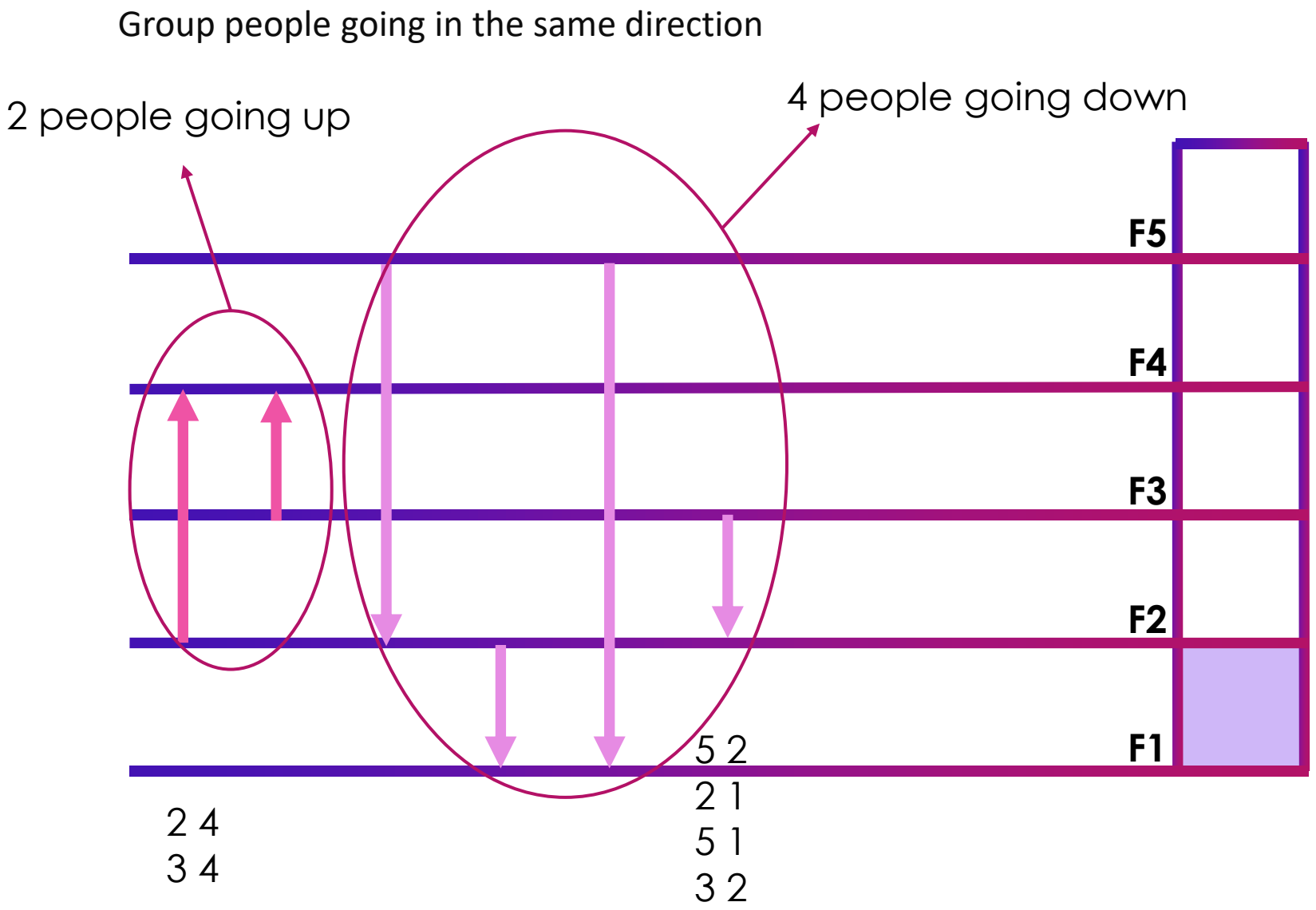
5 2

3 4

2 1

5 1

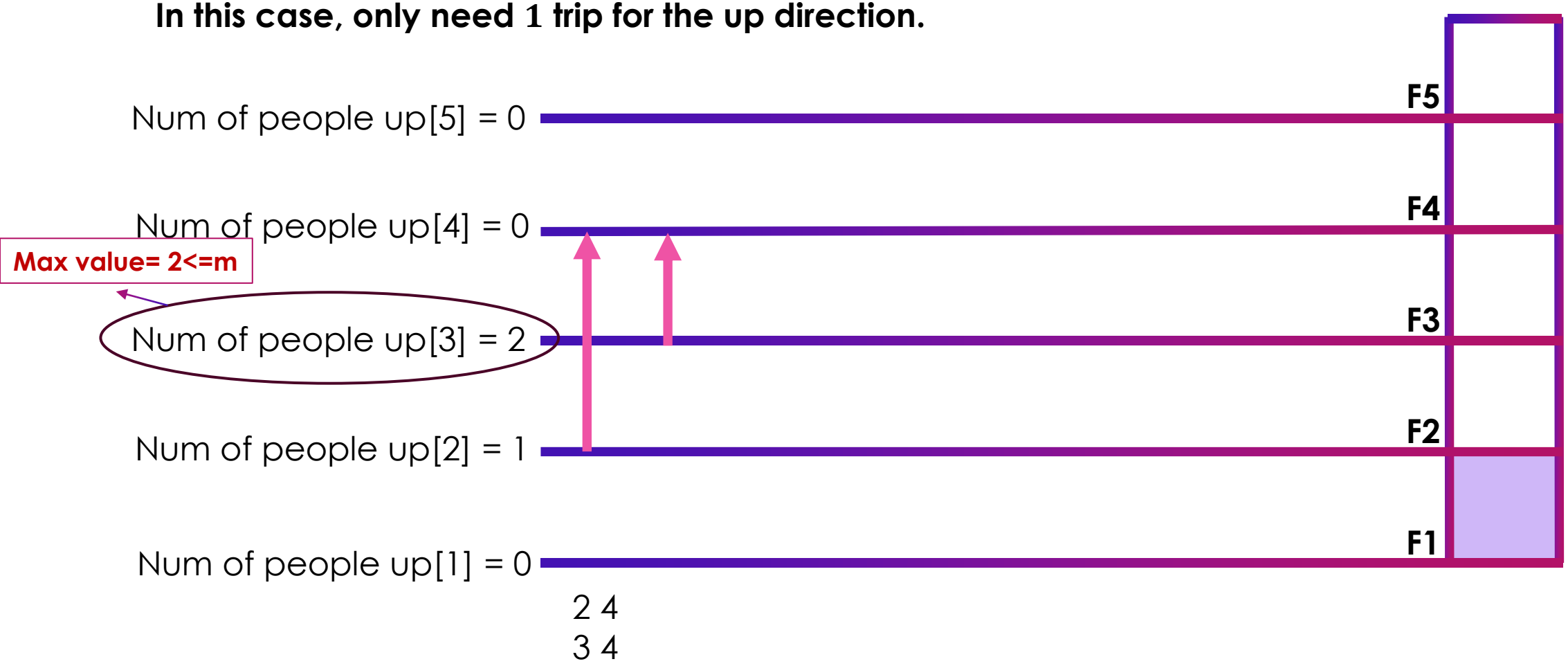
3 2



Analysis of Lab5B

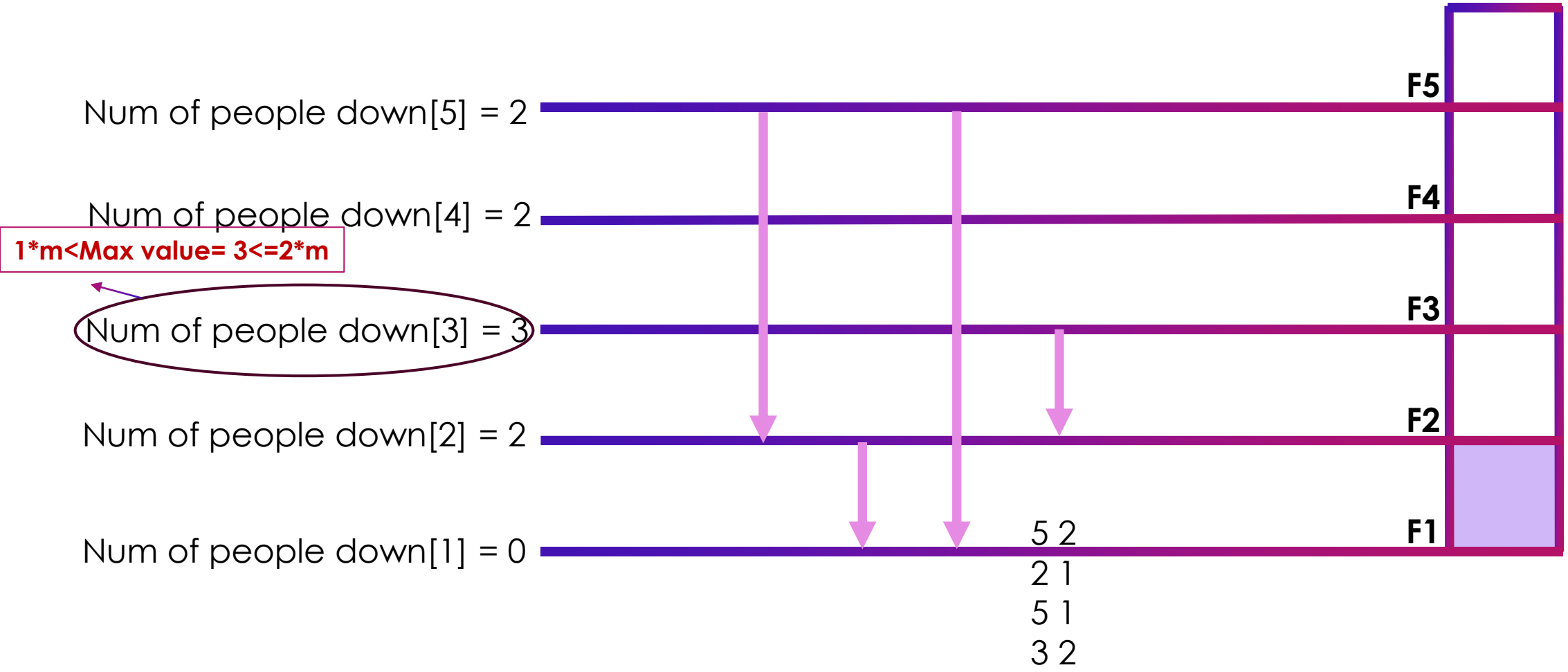
Step 1:
Use the elevator's capacity m to determine how many trips are needed for each direction.

In this case, only need 1 trip for the up direction.



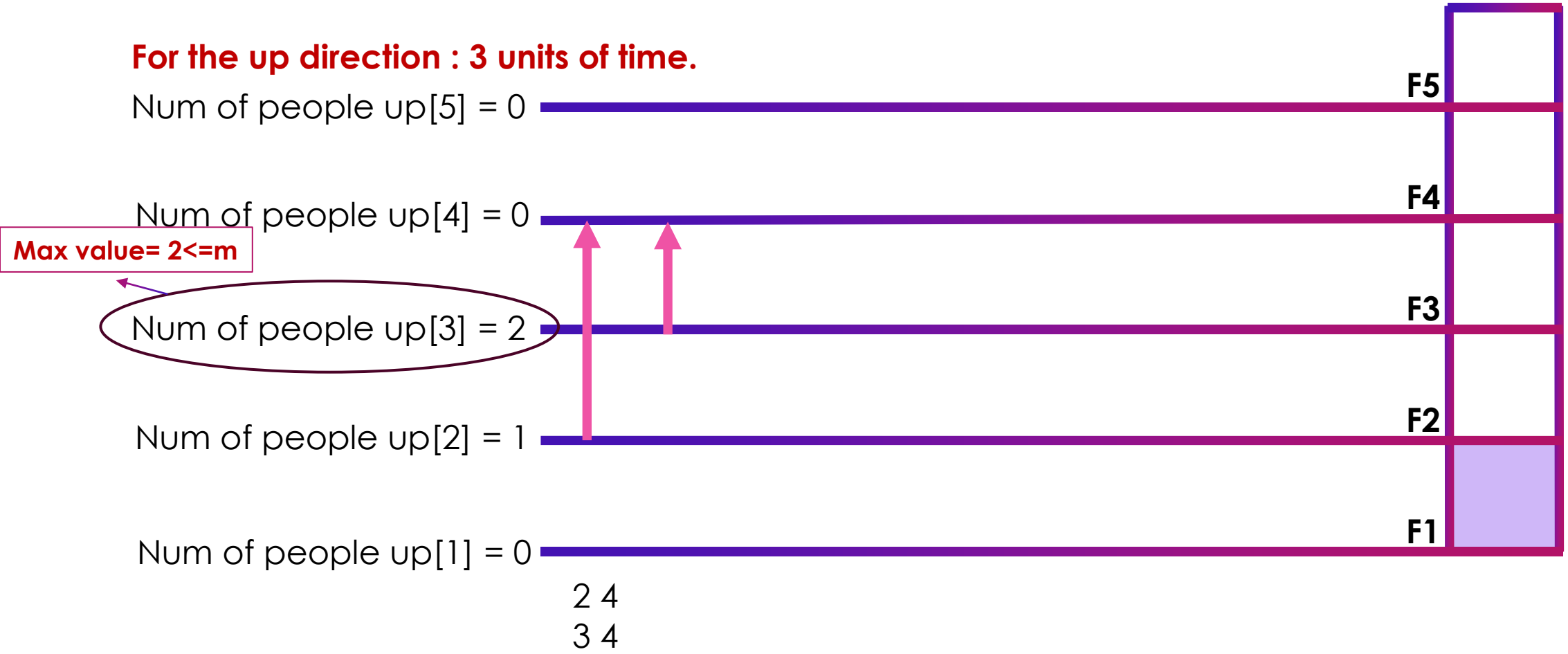
Analysis of Lab5B

Need 2 trips for the down direction.



Analysis of Lab5B

Step 2:
Calculate the time taken for each trip. Up and down direction need to be paired off, and each time, we should greedily deal with the people at the highest floors.

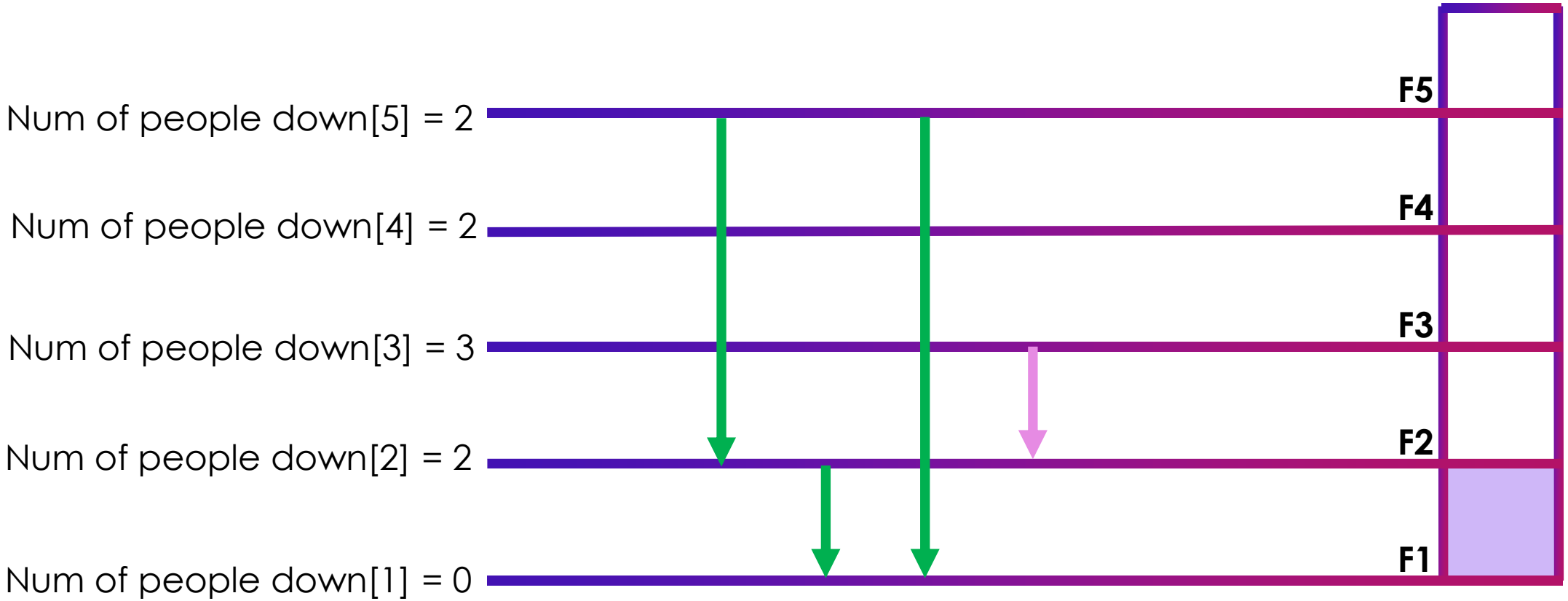


Analysis of Lab5B

For the 1st up and down, the time cost should be:
Max(1st up time, 1st down time)*2

For the 1st down direction: 4 units of time.

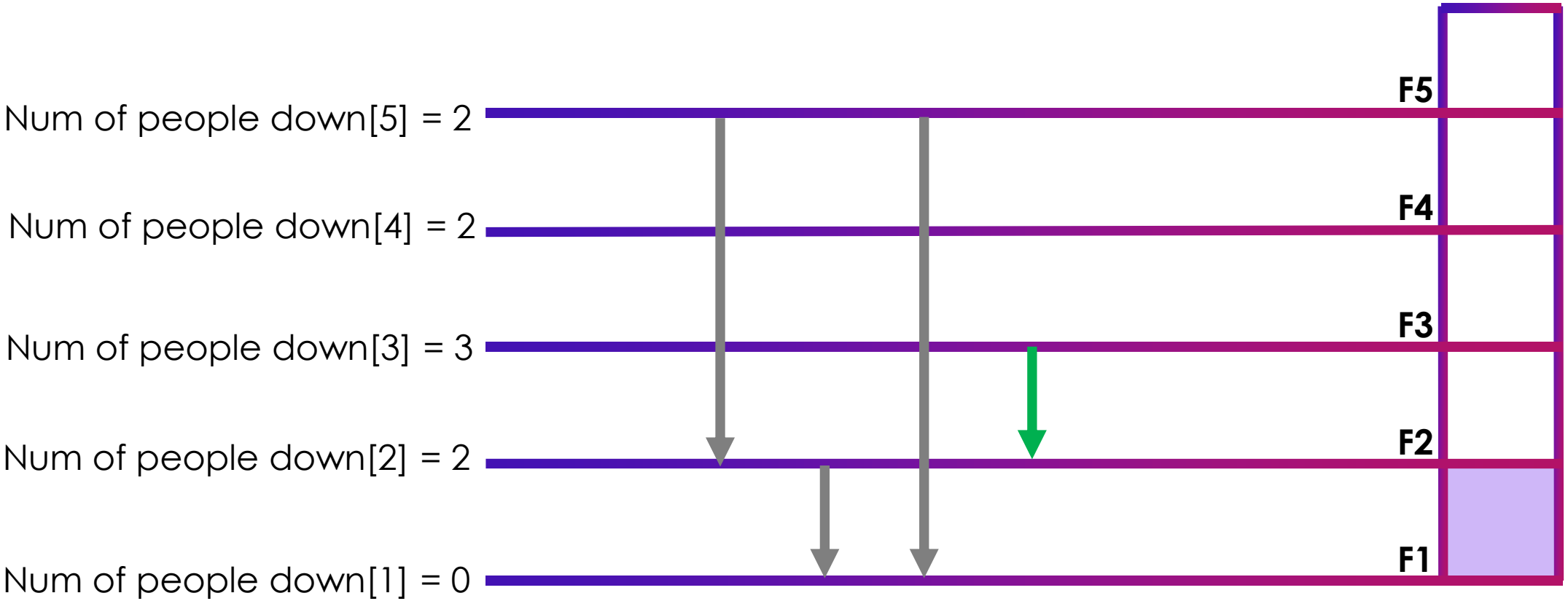
The time of 1st up and down = max(3,4)*2 =8



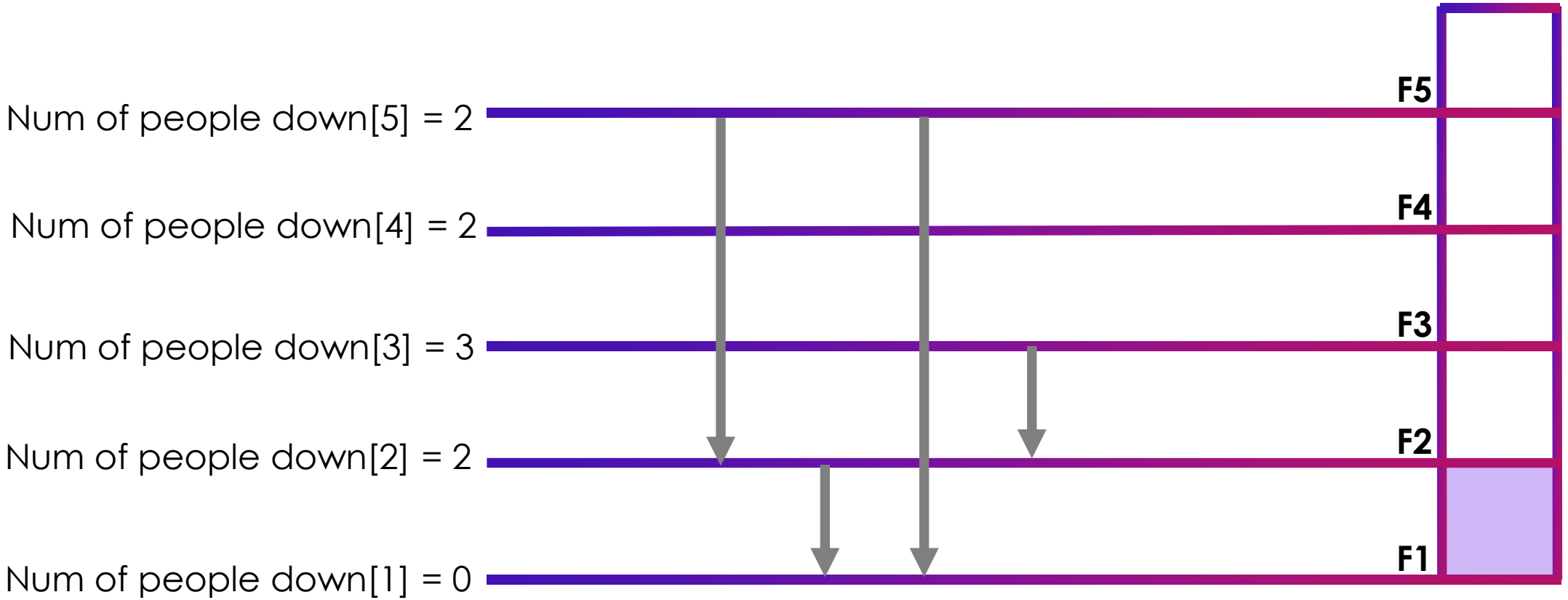
Analysis of Lab5B

For the 1st down direction: 2 units of time.

The time of 2nd up and down = max(0,2)*2 =4



Remove tasks related to the higher floors as much as possible.

Analysis of Lab5B

Total time: 8+4 =12