

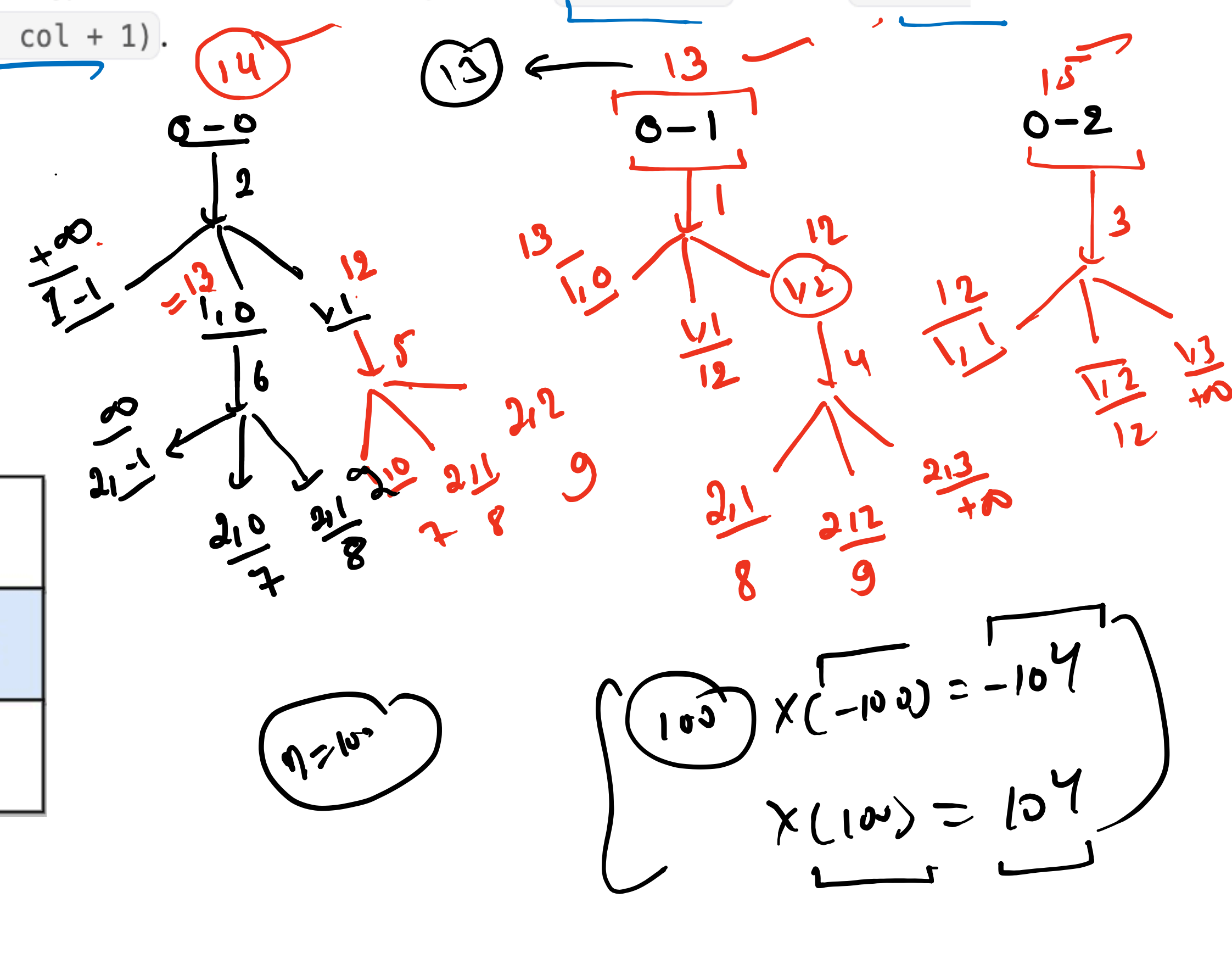
1	3	1
1	5	1
4	2	1

1	4	5
2	7	6
6	8	7

Given an  $n \times n$  array of integers `matrix`, return the **minimum sum** of any **falling path** through `matrix`.

A **falling path** starts at any element in the **first row** and **chooses the element in the next row** that is either directly below or diagonally left/right. Specifically, the next element from position  $(row, col)$  will be  $(row + 1, col - 1)$ ,  $(row + 1, col)$ , or  $(row + 1, col + 1)$ .

0	2	0	2
1	6	5	4
2	7	8	9

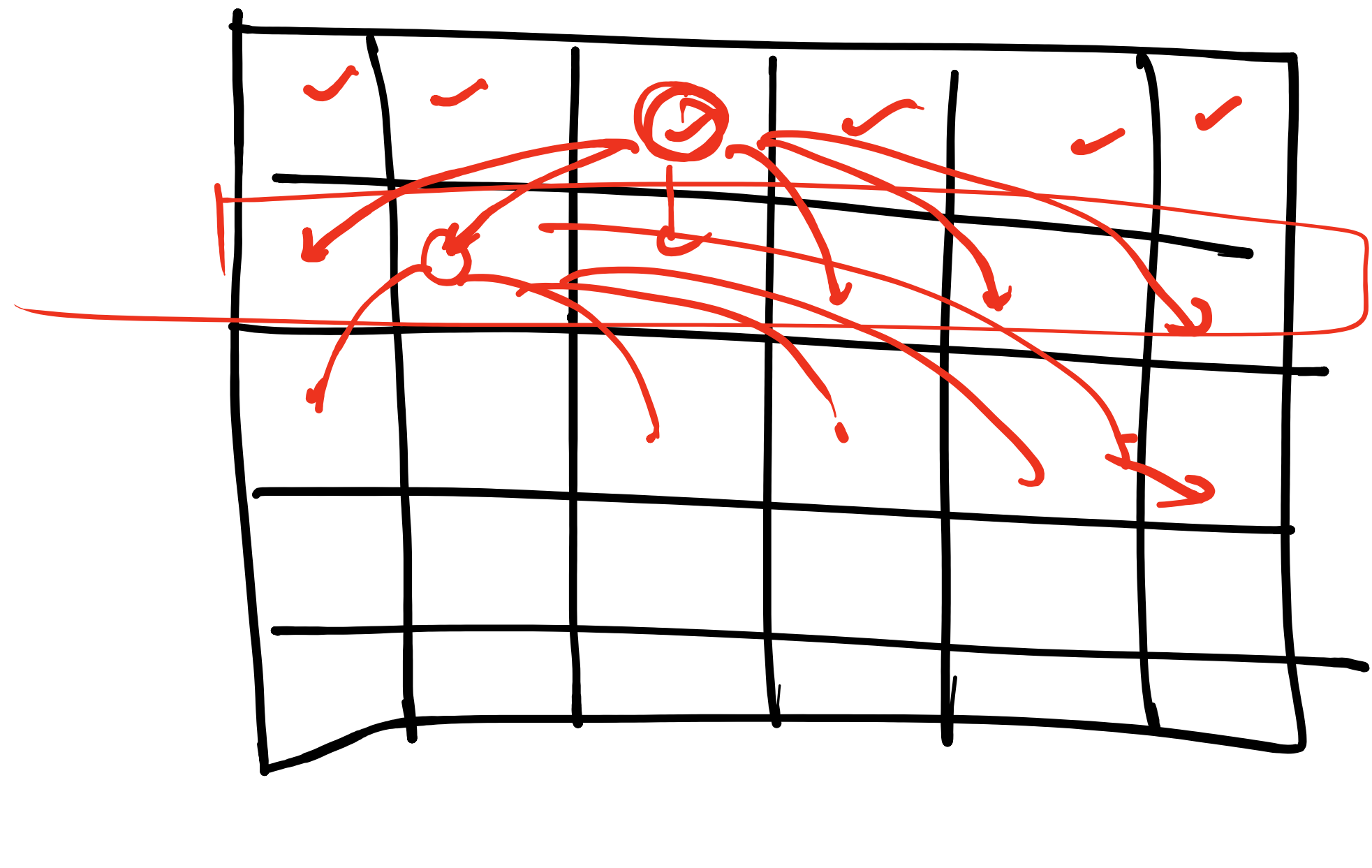


2	1	3
6	5	4
7	8	9

2	1	3
6	5	4
7	8	9

Given an  $n \times n$  integer matrix `grid`, return the **minimum sum** of a **falling path with non-zero shifts**.

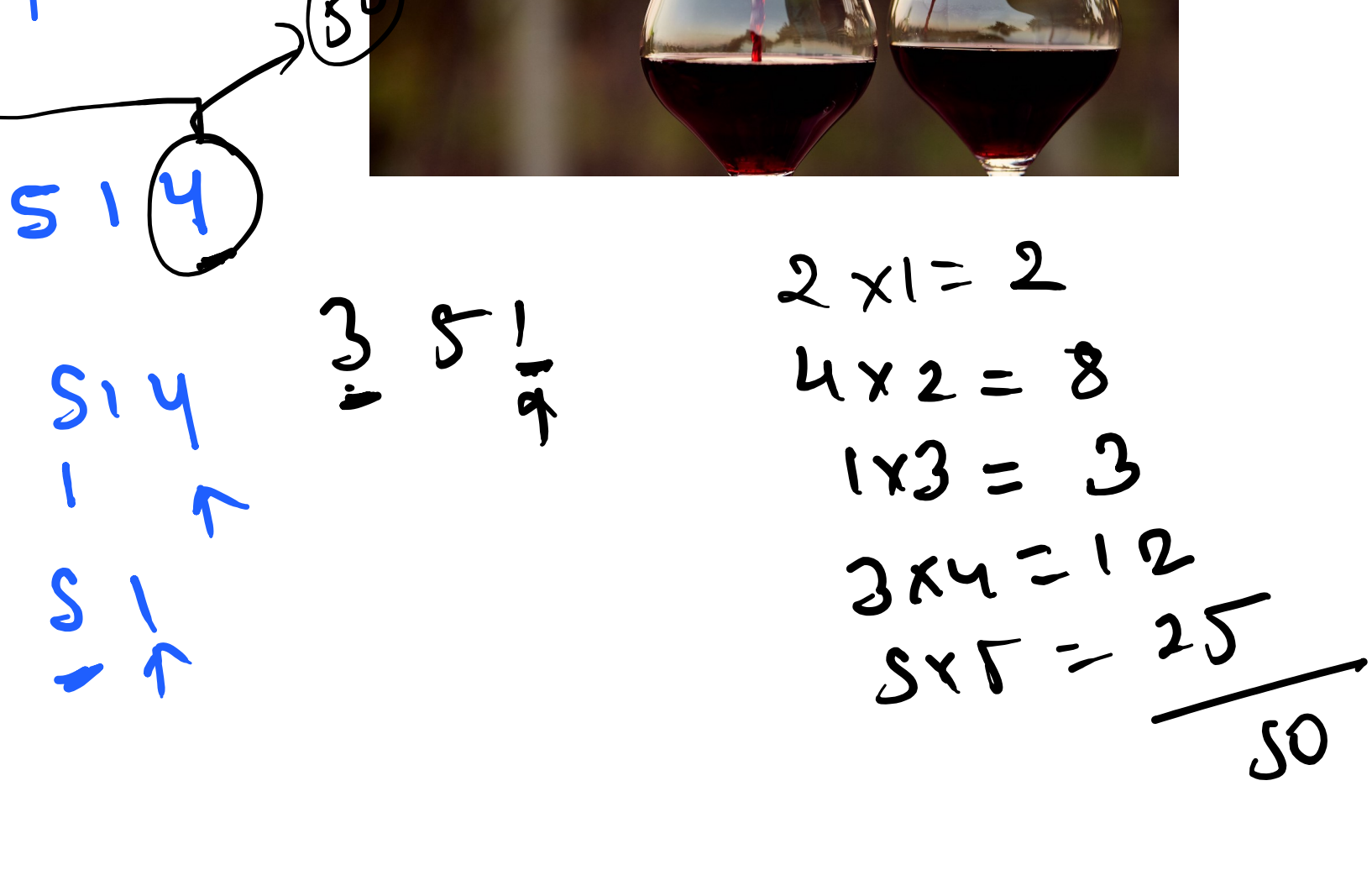
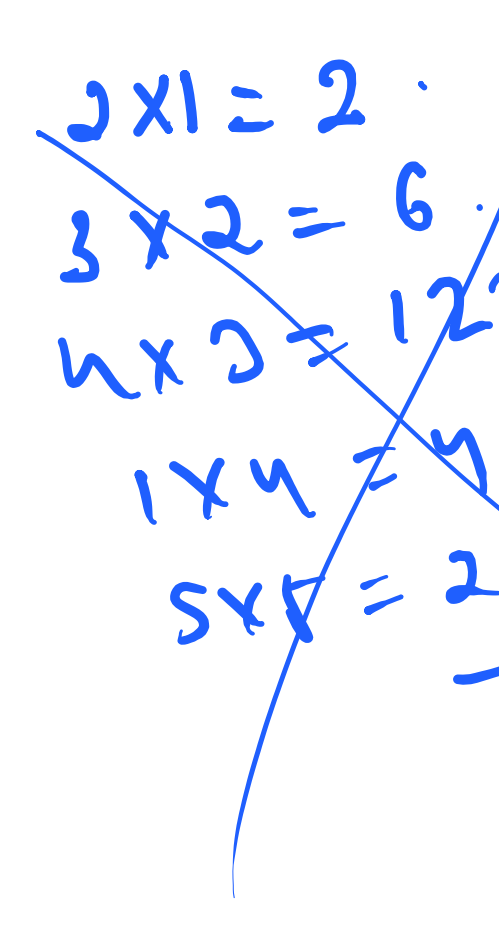
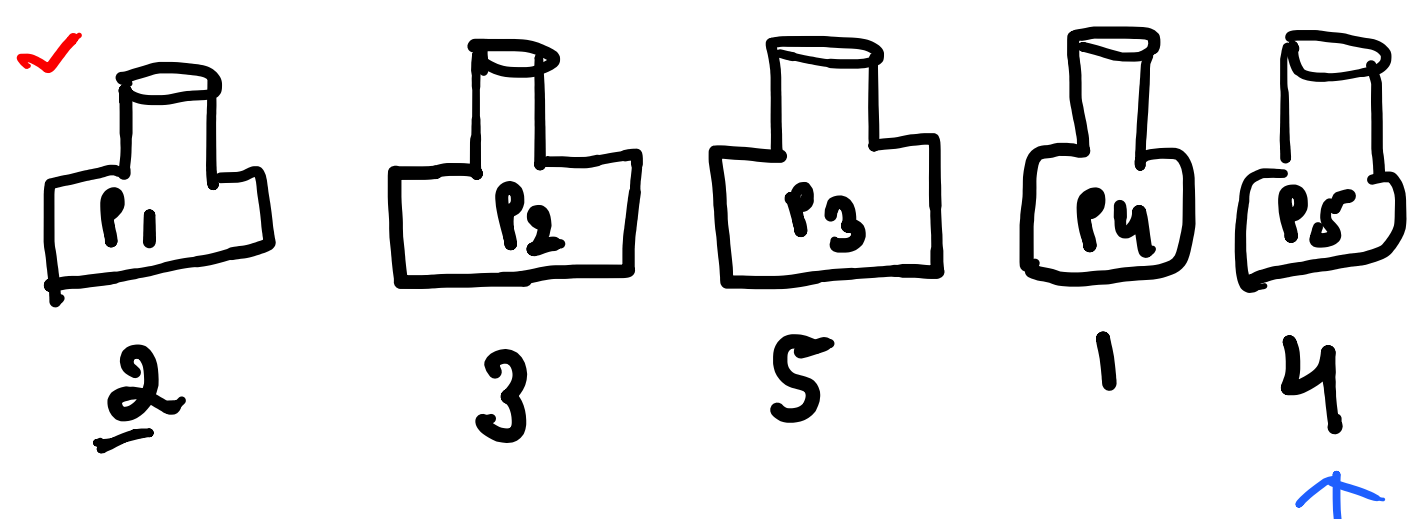
A **falling path with non-zero shifts** is a choice of exactly one element from each row of `grid` such that no two elements chosen in adjacent rows are in the same column.



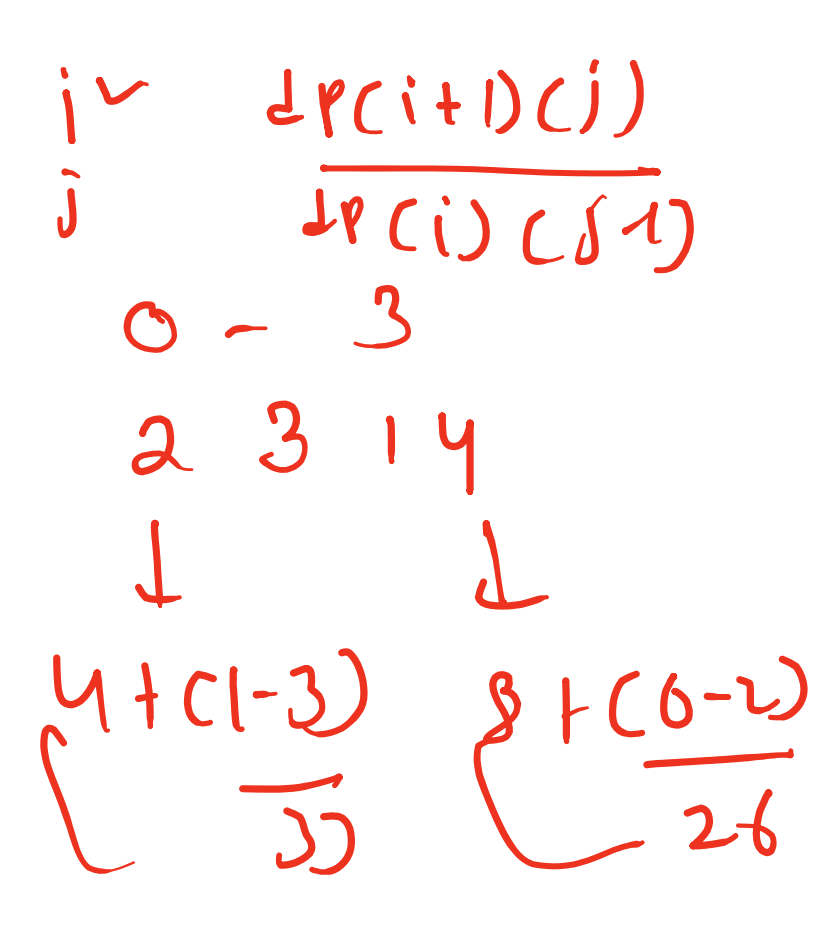
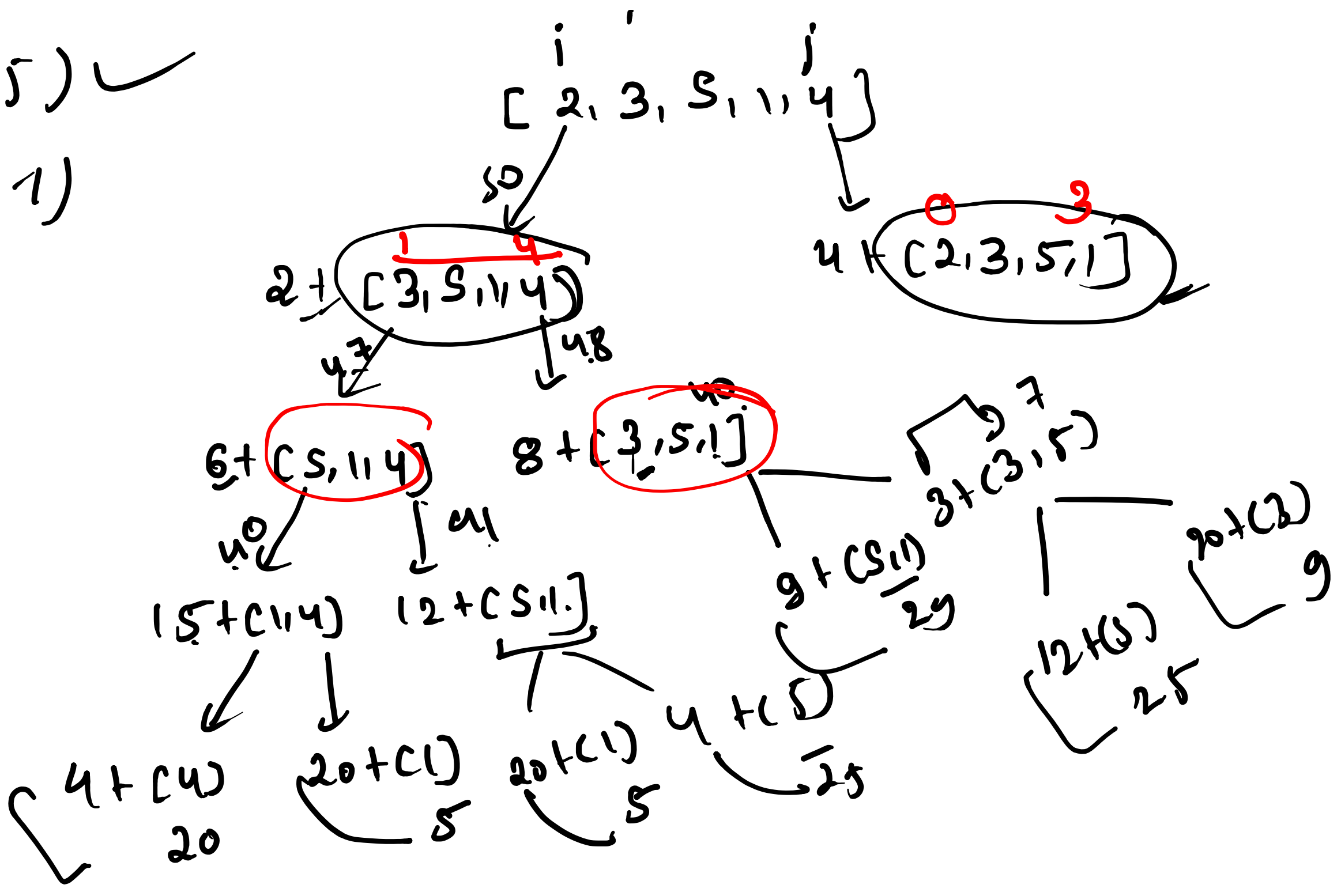
Given  $n$  wines in a row, with integers denoting the cost of each wine respectively. Each year you can sell the first or the last wine in the row. Let the initial profits from the wines be  $P_1, P_2, P_3, \dots, P_n$ . In the  $Y$ th year, the profit from the  $i$ th wine will be  $Y * P[i]$ . The goal is to calculate the maximum profit that can be earned by selling all the wines.

Suppose, wine array denotes the initial cost of each wine in the first year.

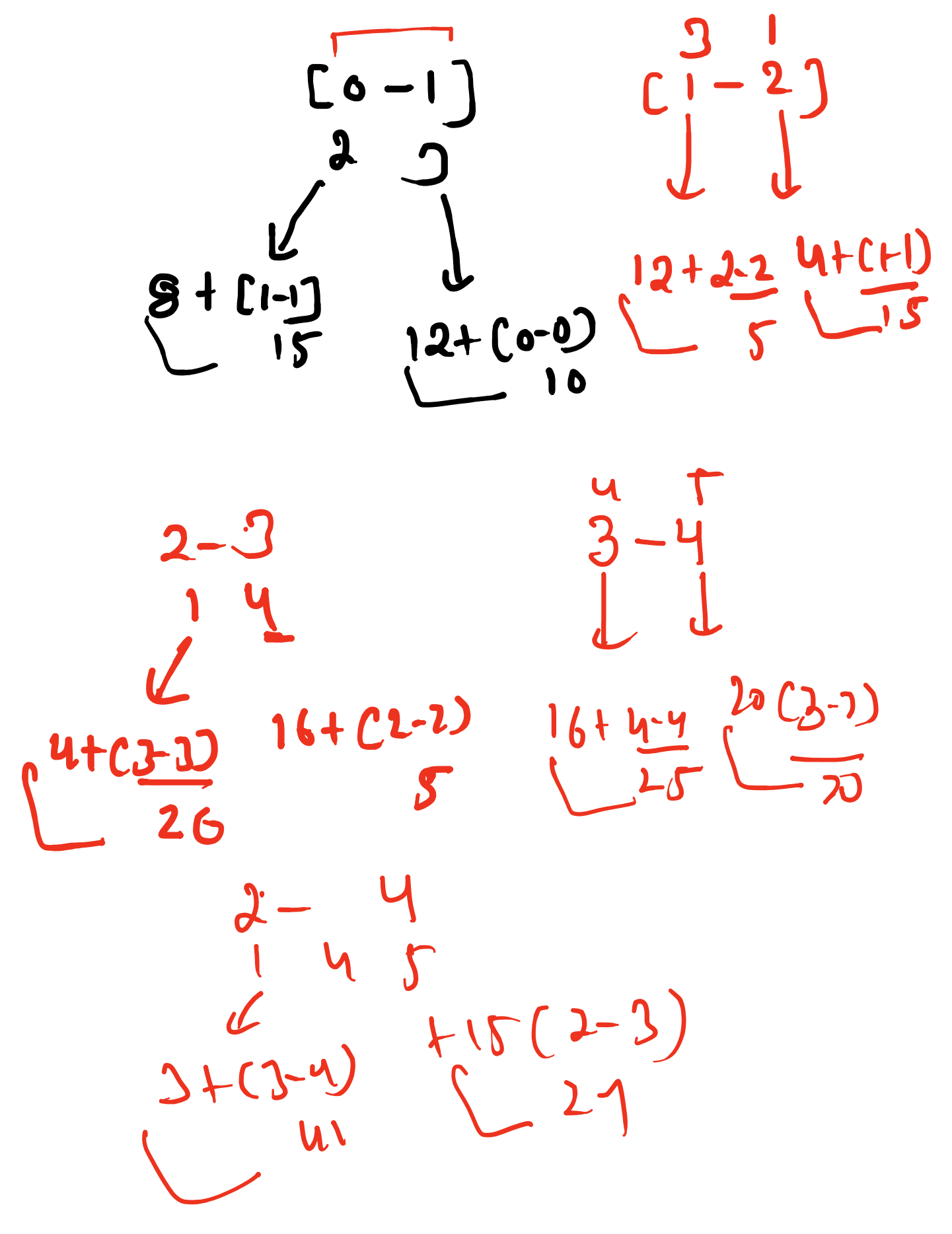
wine[] = [2, 3, 5, 1, 4]



$$F(i, j) = \max(F(i+1, j), F(i, j+1)) + \text{wine}[i] * \text{year}$$



0	1	2	3	4	5
0	2	3	1	3	4
1	3	1	3	4	5
2	1	3	1	3	4
3	4	5	6	7	8
4	5	6	7	8	9



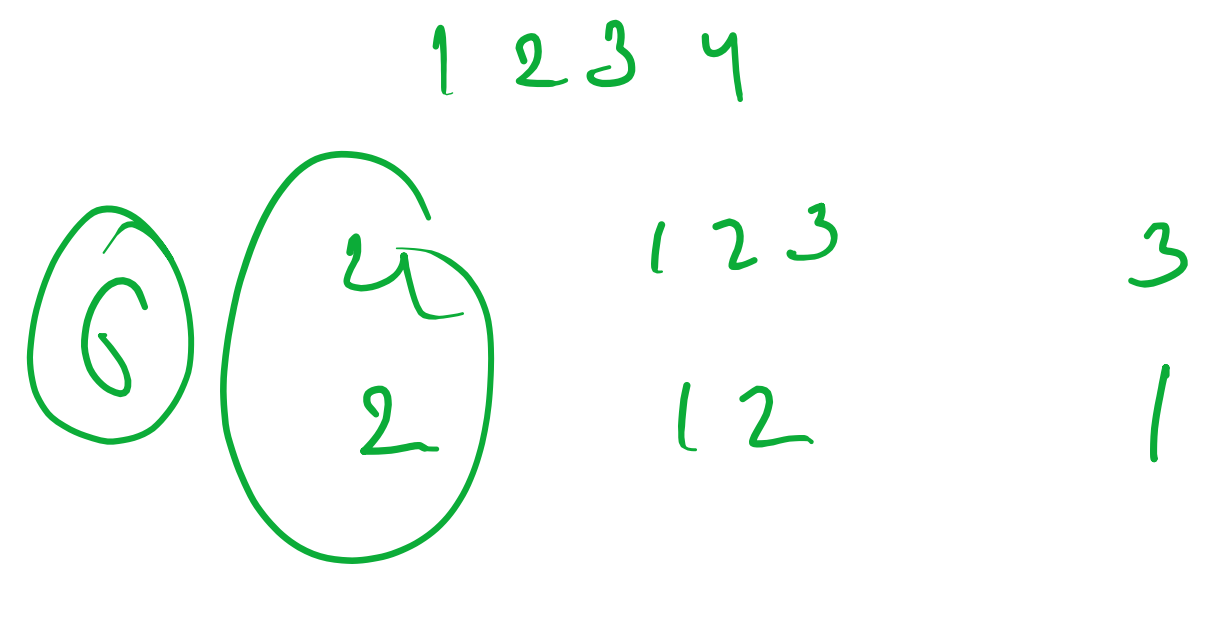
2	3	1	4	5
0	1	2	3	4
1	2	3	4	5
2	3	4	5	6
3	4	5	6	7
4	5	6	7	8

$$j - i = \text{year}$$
$$q = j - \text{year}$$

$$F(i, j) = \max(F(i+1, j), F(i, j+1)) + \text{wine}[i] * \text{year}$$

Piyush and Nimit are playing a coin game. They are given  $n$  coins with values  $x_1, x_2, \dots, x_n$  where 'n' is always even. They take alternate turns. In each turn, a player picks either the first coin or the last coin from the row and removes it from the row. The value of coin is received by that player. Determine the maximum value that Piyush can win with if he moves first. Both the players play optimally.

$$x_1, x_2, x_3, x_4, x_5, \dots, x_n$$



$$(2, 13, 4)$$
$$(1, 13, 4)$$
$$(1, 13)$$

$$2 + 13 = 15$$
$$4 + 1 = 5$$

$$x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8$$
$$= x_1 + (x_2, x_3, x_4, x_5, x_6, x_7, x_8) + x_8 (x_1, x_2, x_3, x_4, x_5, x_6, x_7)$$
$$= x_1 + (x_2, x_3, x_4, x_5, x_6, x_7, x_8) + x_8 (x_1, x_2, x_3, x_4, x_5, x_6, x_7)$$

