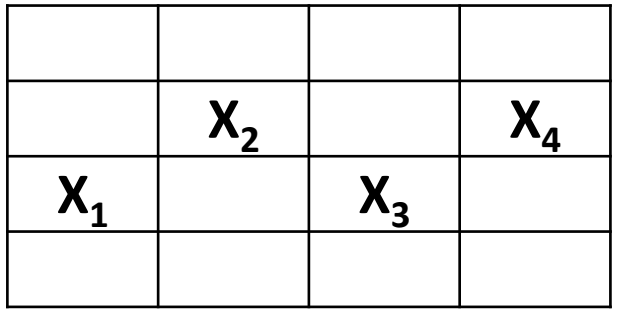
Simple Hill Climbing

4-queens problem. **X** is a queen

There are 8 operators to choose:

1. $\mathbf{X_1}$ moves up
2. $\mathbf{X_1}$ moves down
3. $\mathbf{X_2}$ moves up
4. $\mathbf{X_2}$ moves down
5. $\mathbf{X_3}$ moves up
6. $\mathbf{X_3}$ moves down
7. $\mathbf{X_4}$ moves up
8. $\mathbf{X_4}$ moves down



Solve this using various local search problem using the cost.

The cost here is the number of queens that attack a queen. For example $\mathbf{X_1}$ is attacked by two queens ($\mathbf{X_2}$, $\mathbf{X_3}$), then the cost for $\mathbf{X_1}$ is 2.

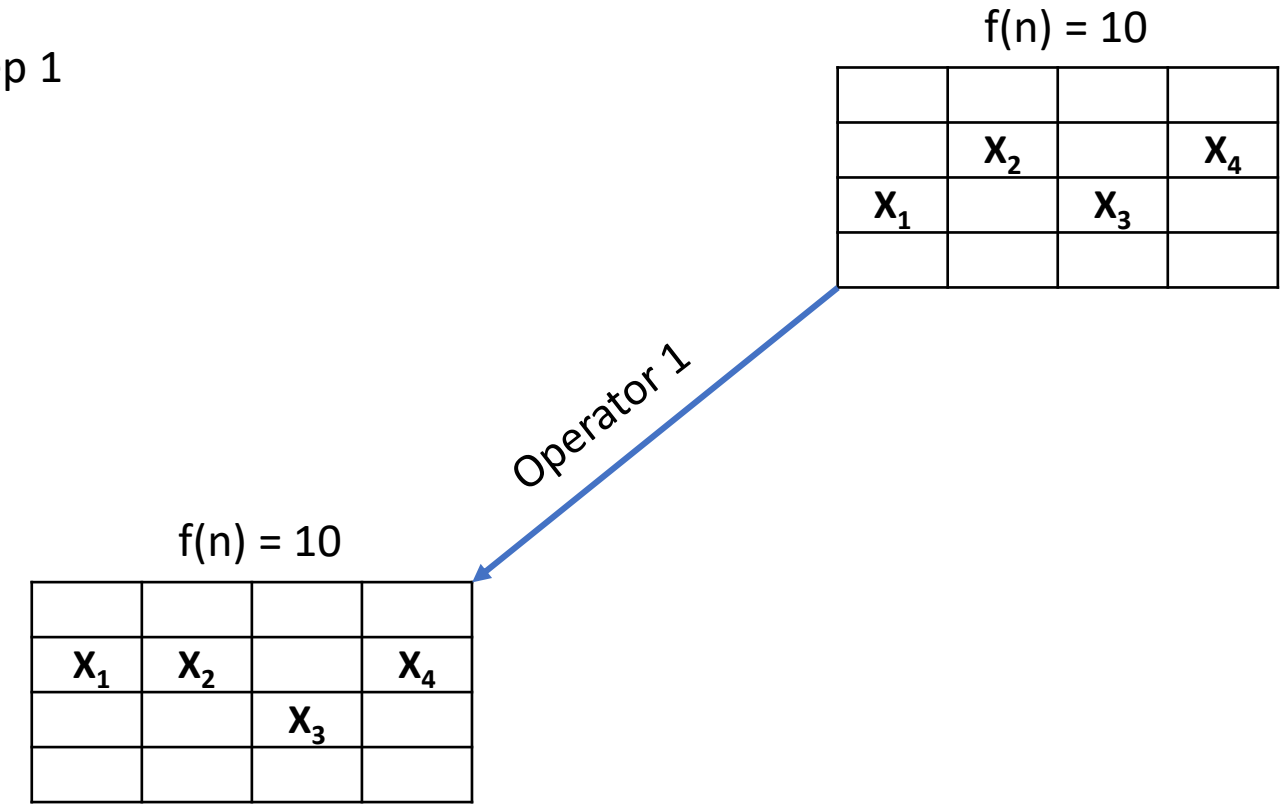
Step 1

f(n) = 10

	$\mathbf{X_2}$		$\mathbf{X_4}$
$\mathbf{X_1}$		$\mathbf{X_3}$	

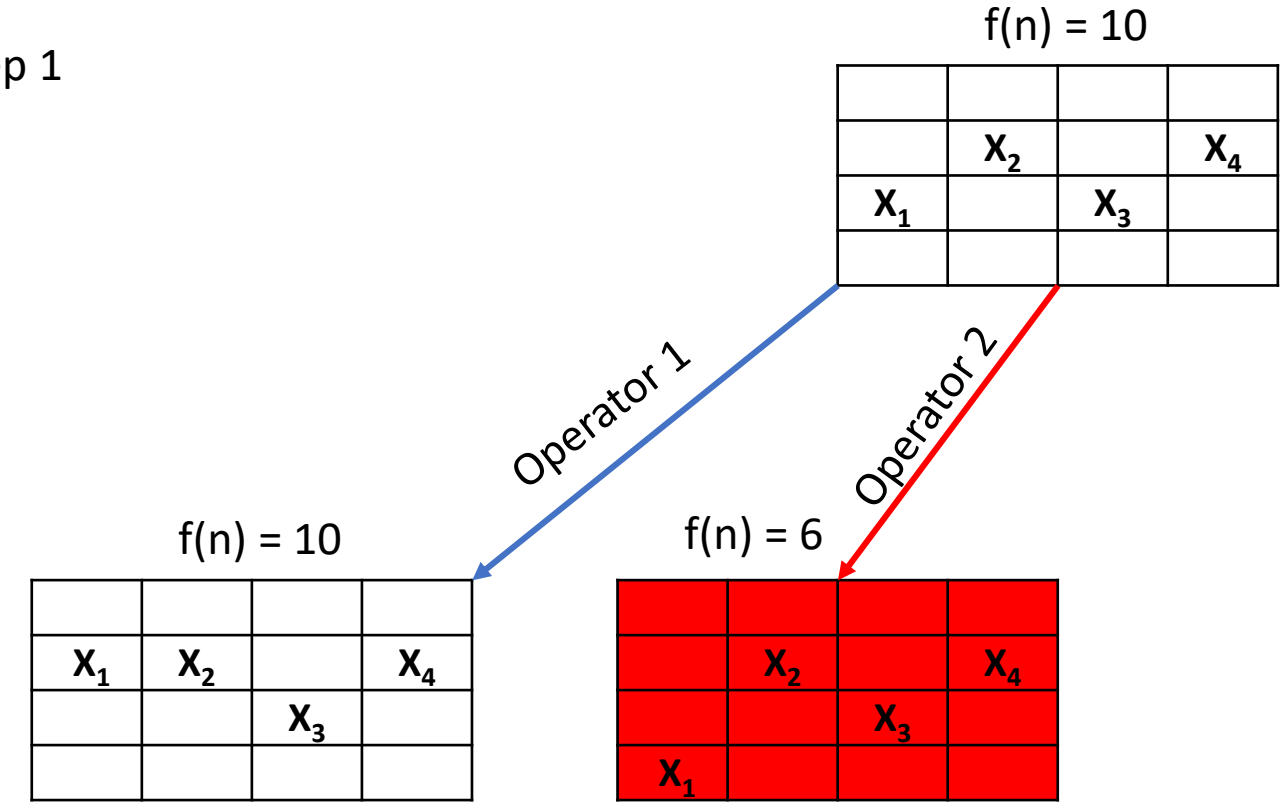
- Hitung total cost dari posisi awal
  - f(n) = f($\mathbf{X_1}$) + f($\mathbf{X_2}$) + f($\mathbf{X_3}$) + f($\mathbf{X_4}$) = 2 + 3 + 3 + 2 = 10

Step 1



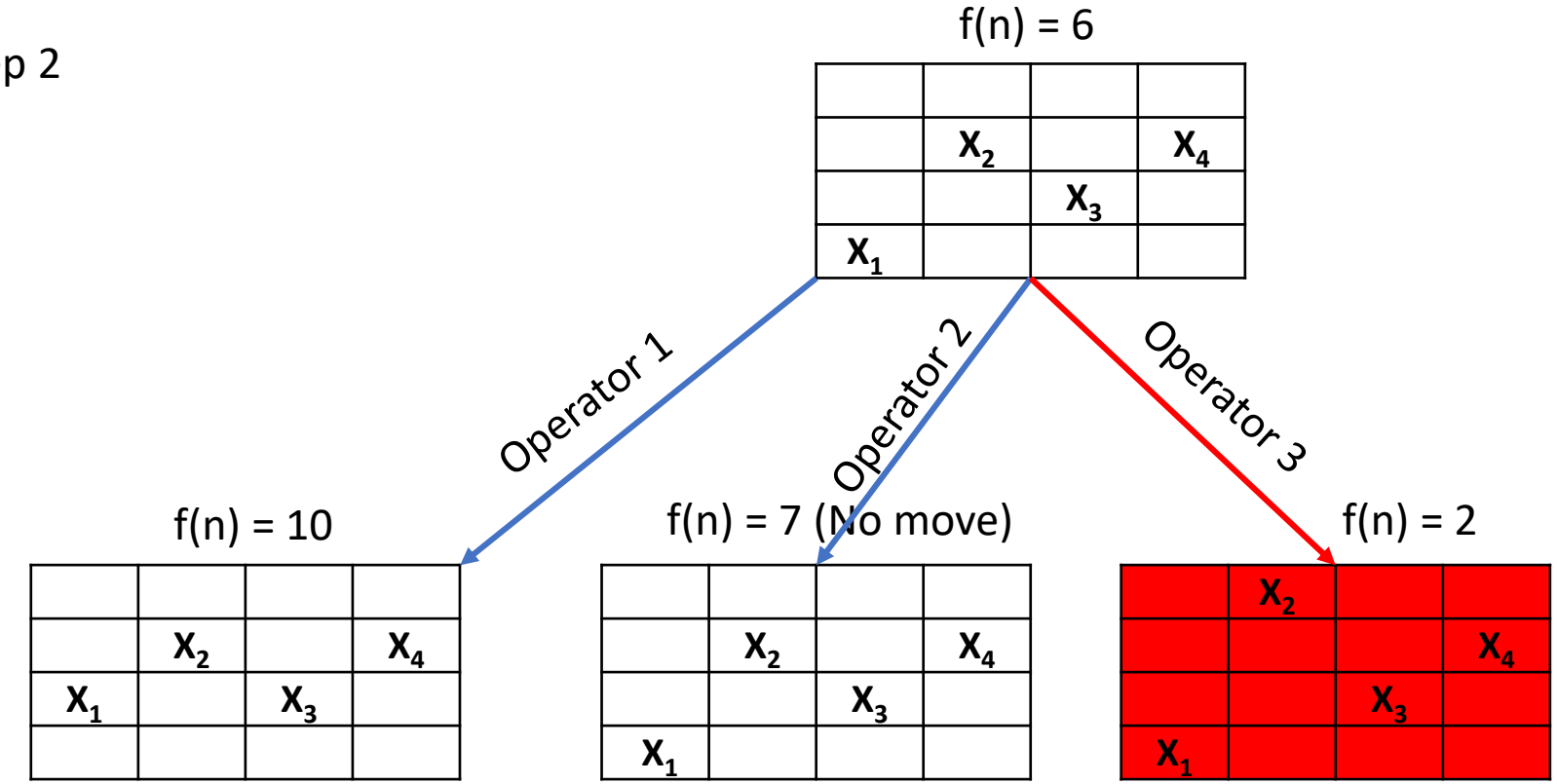
- Untuk setiap operator yang dijalankan, hitung cost yang diperlukan. Apabila kita menemukan cost yang lebih kecil dari cost posisi sebelumnya, kita langsung memilih operator tersebut untuk dijalankan.
  - Operator 1 = f(n) = 2 + 3 + 2 + 3 = 10

Step 1

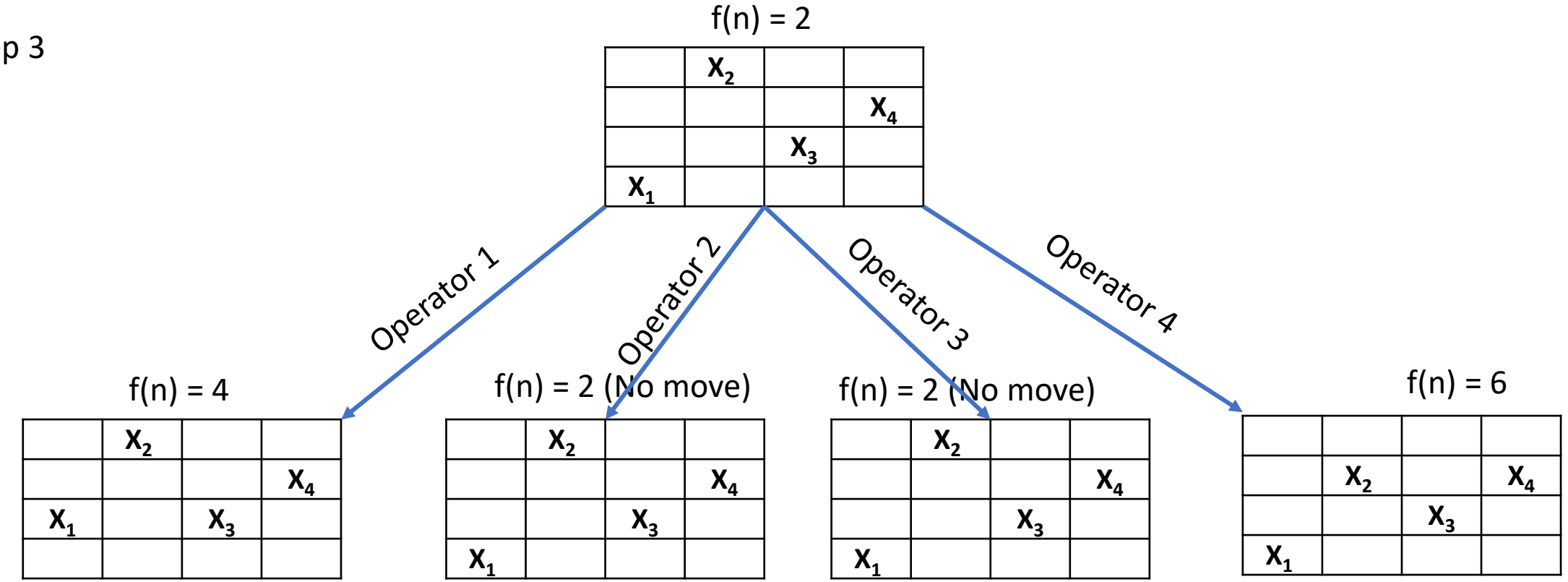


- Untuk setiap operator yang dijalankan, hitung cost yang diperlukan. Apabila kita menemukan cost yang lebih kecil dari cost posisi sebelumnya, kita langsung memilih operator tersebut untuk dijalankan.
  - Operator 2 = f(n) = 0 + 2 + 2 + 2 = 6 ➔ Lebih kecil dari 10, Kita langsung menjalankan operator 2

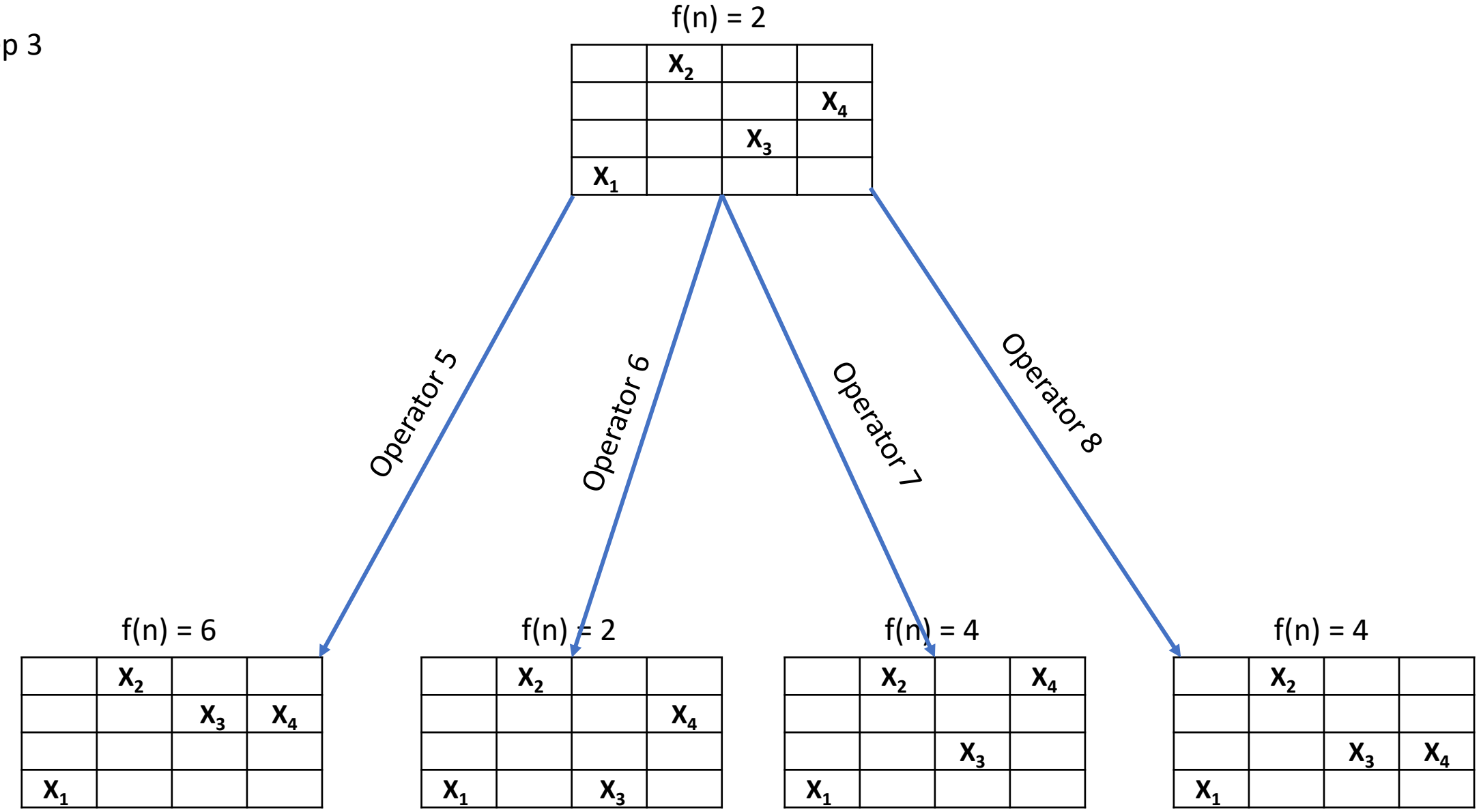
Step 2


f(n) = 6
X2
X4
X3
X1
Operator 1
Operator 2
Operator 3
f(n) = 10
f(n) = 7 (No move)
f(n) = 2

Step 3


f(n) = 2
Operator 1
Operator 2
Operator 3
Operator 4
f(n) = 4
f(n) = 2 (No move)
f(n) = 2 (No move)
f(n) = 6

Step 3


f(n) = 2
X2
X4
X3
X1
Operator 5
Operator 6
Operator 7
Operator 8
f(n) = 6
X2
X3
X4
X1
f(n) = 2
X2
X4
X1
X3
f(n) = 4
X2
X4
X3
X1
f(n) = 4
X2
X3
X4
X1

Step 3

f(n) = 2

	X_2		
			X_4
		X_3	
X_1			

?

Tidak ada pilihan yang lebih baik dari f(n) = 2, Simple hill climbing terjebak di dataran (plateau) pada soal ini

f(n) = 4

	X_2		
			X_4
X_1		X_3	

f(n) = 2 (No move)

	X_2		
			X_4
		X_3	
X_1			

f(n) = 2 (No move)

	X_2		
			X_4
		X_3	
X_1			

f(n) = 6

	X_2		X_4
		X_3	
X_1			

f(n) = 6

	X_2		
		X_3	X_4
X_1			

f(n) = 2

	X_2		
			X_4
X_1		X_3	

f(n) = 4

	X_2		X_4
		X_3	
X_1			

f(n) = 4

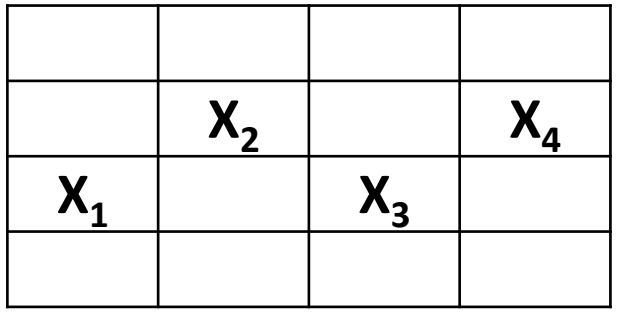
	X_2		
		X_3	X_4
X_1			

Steepest Ascent Hill Climbing

4-queens problem. **X** is a queen

There are 8 operators to choose:

1. $\mathbf{X_1}$ moves up
2. $\mathbf{X_1}$ moves down
3. $\mathbf{X_2}$ moves up
4. $\mathbf{X_2}$ moves down
5. $\mathbf{X_3}$ moves up
6. $\mathbf{X_3}$ moves down
7. $\mathbf{X_4}$ moves up
8. $\mathbf{X_4}$ moves down



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Step 1

f(n) = 10

	$\mathbf{X_2}$		$\mathbf{X_4}$
$\mathbf{X_1}$		$\mathbf{X_3}$	

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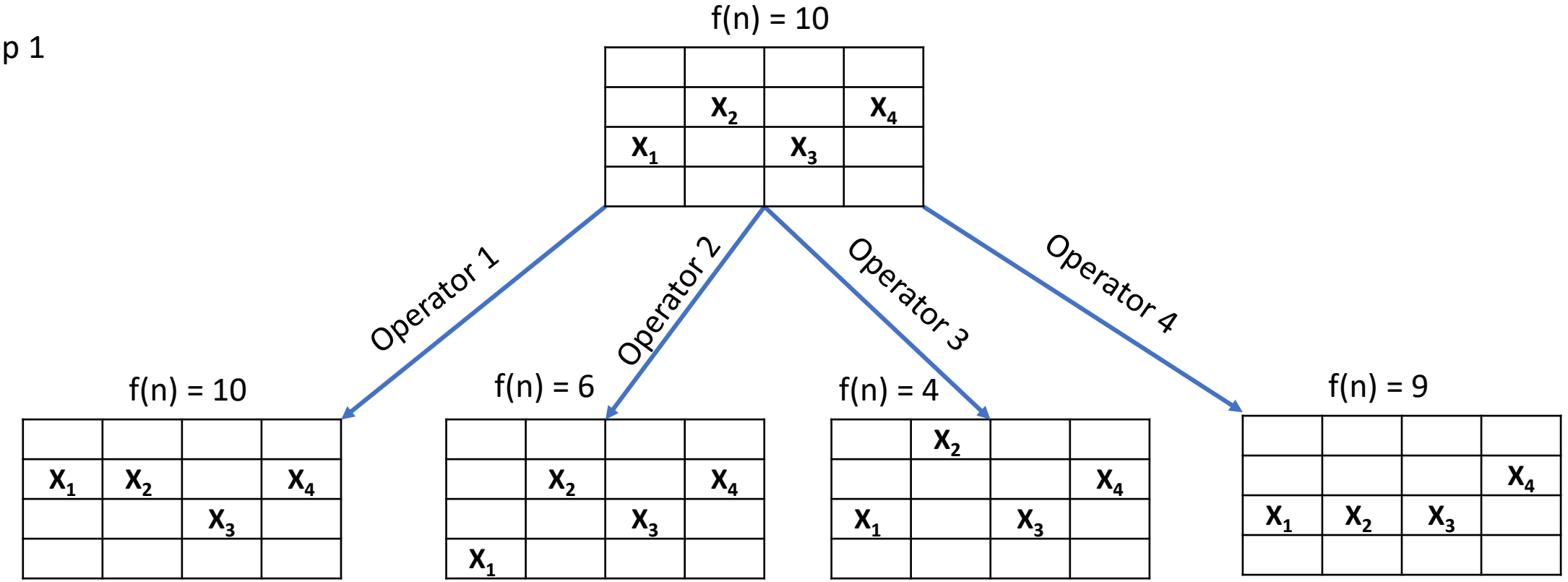
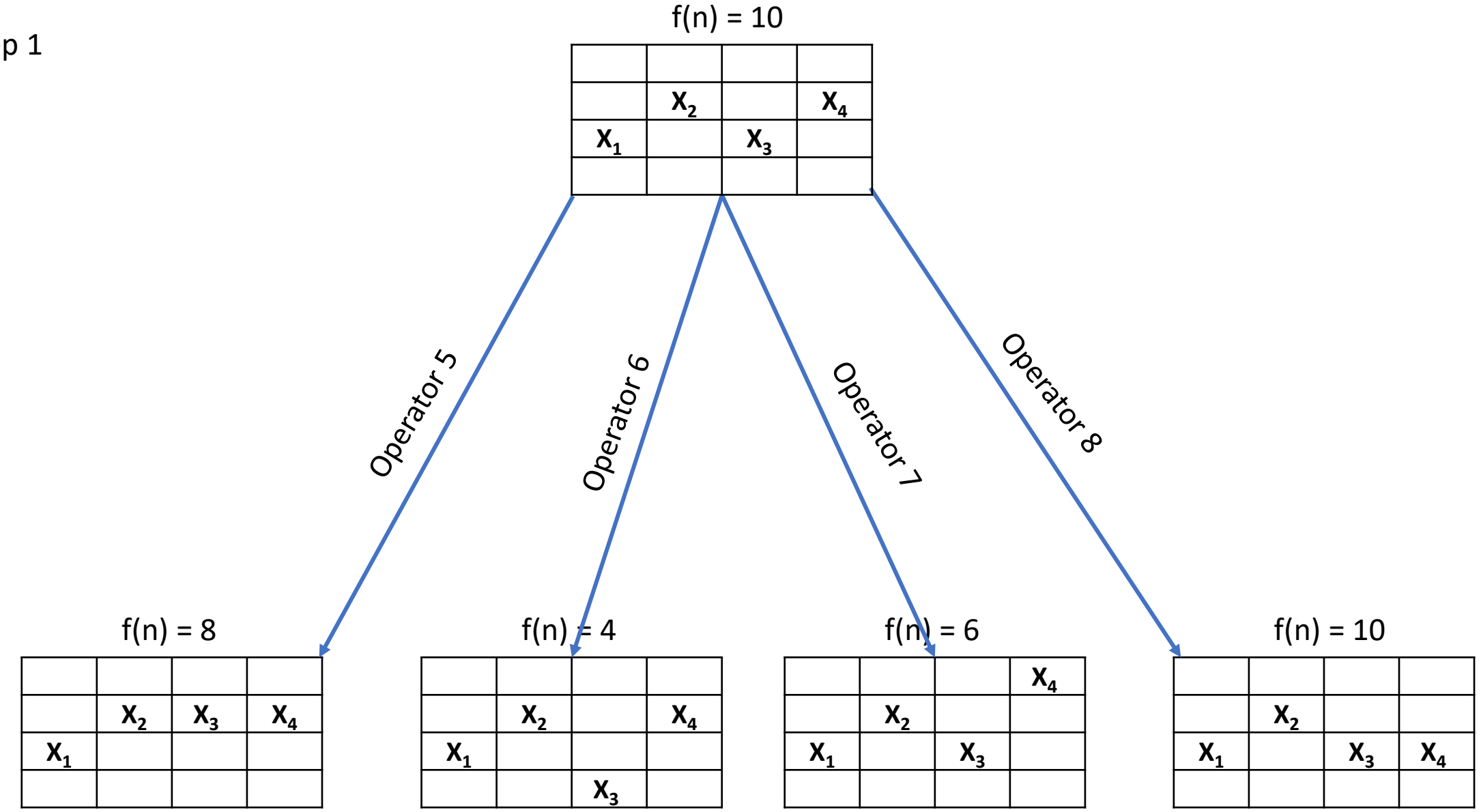
  - f(n) = f($\mathbf{X_1}$) + f($\mathbf{X_2}$) + f($\mathbf{X_3}$) + f($\mathbf{X_4}$) = 2 + 3 + 3 + 2 = 10

Step 1



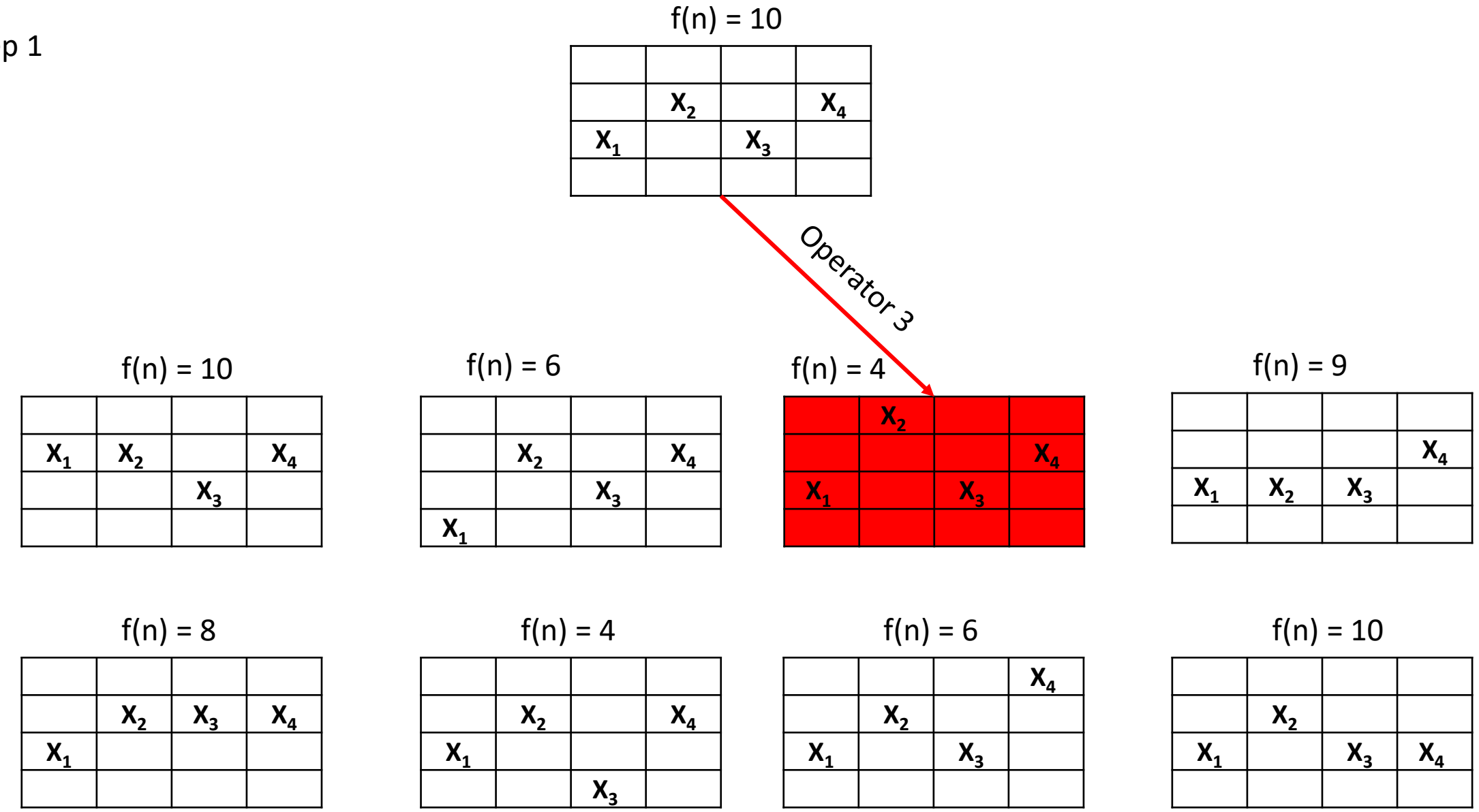
- Untuk setiap operator yang dijalankan, hitung cost yang diperlukan.
  - Operator 1 = f(n) = 2 + 3 + 2 + 3 = 10
  - etc

Step 1



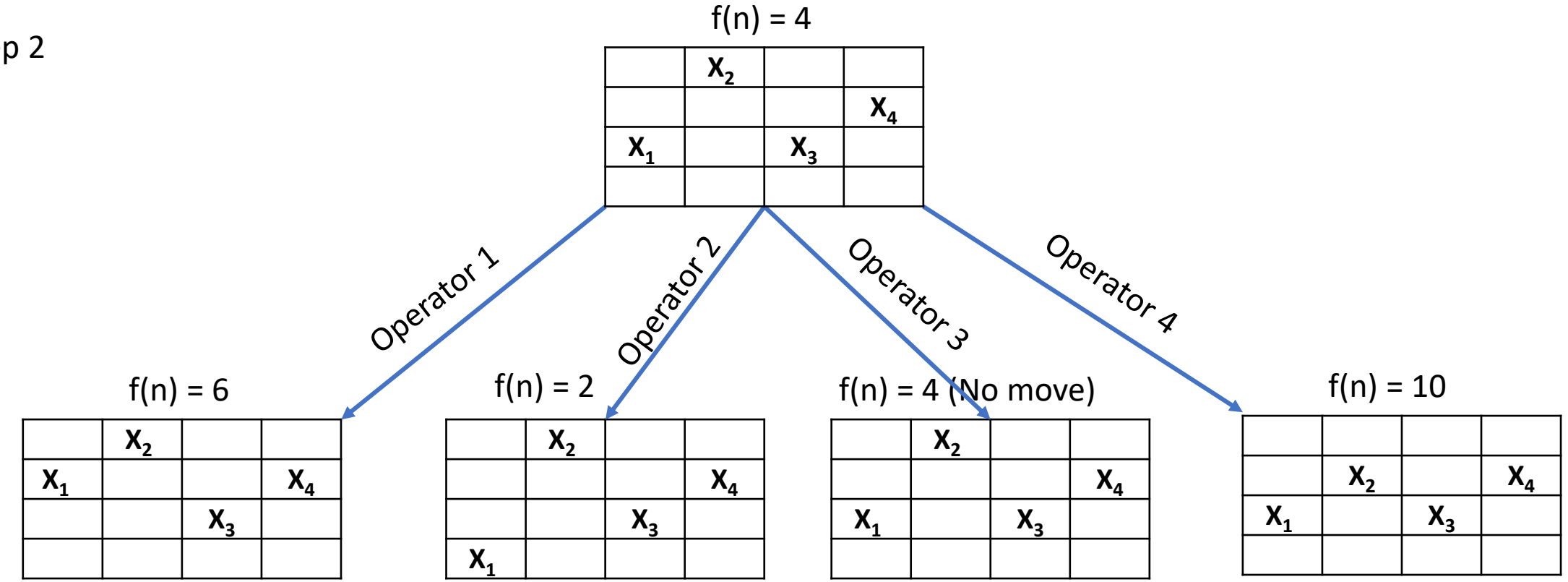
- Untuk setiap operator yang dijalankan, hitung cost yang diperlukan.
  - Operator 5 = f(n) = 1 + 3 + 2 + 2= 8
  - etc

Step 1

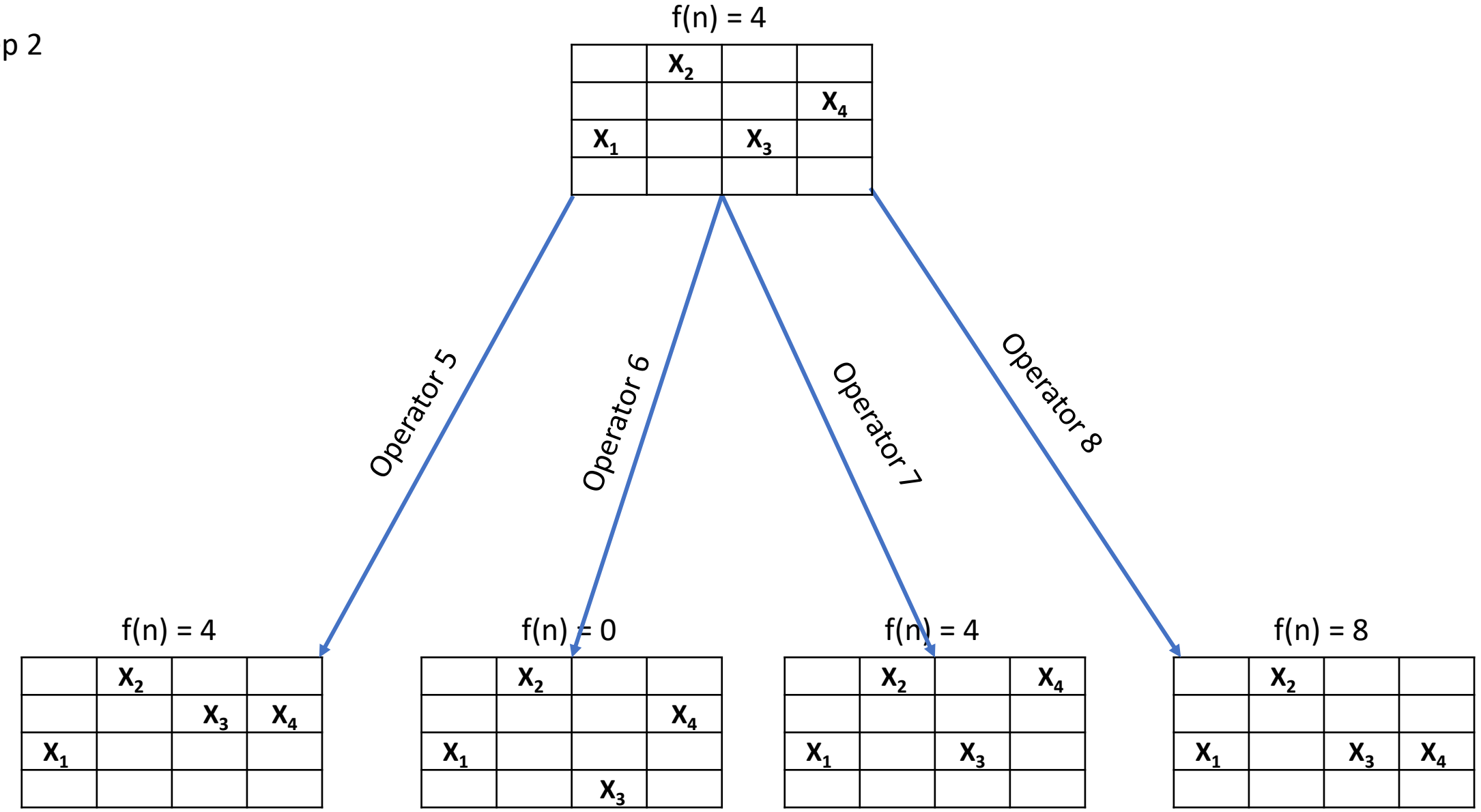


- Setelah semua operator dijalankan, pilih operator yang menghasilkan cost terkecil
  - Disini kita memilih operator 3, yang menghasilkan f(n) = 4

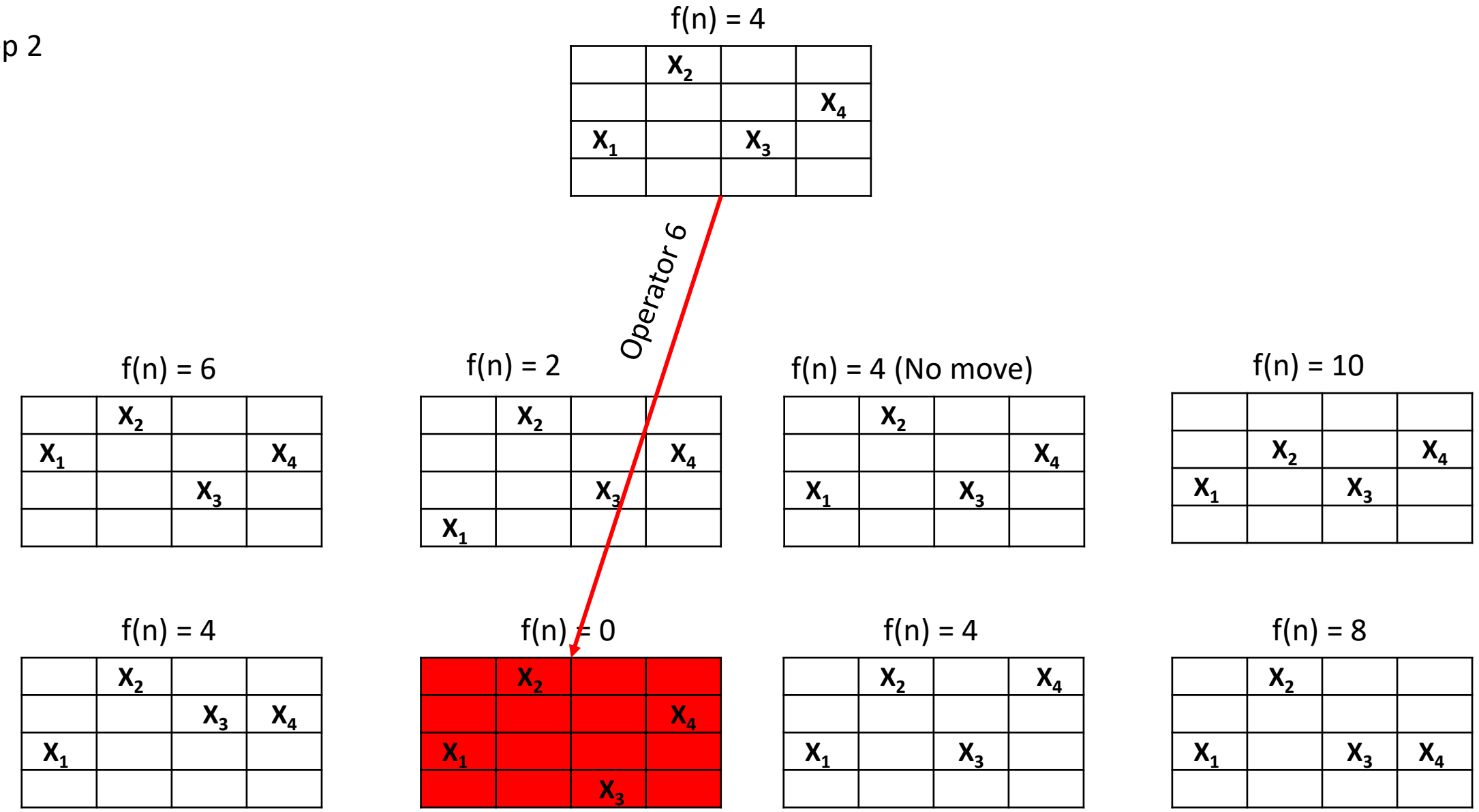
Step 2


f(n) = 4
Operator 1
Operator 2
Operator 3
Operator 4
f(n) = 6
f(n) = 2
f(n) = 4 (No move)
f(n) = 10

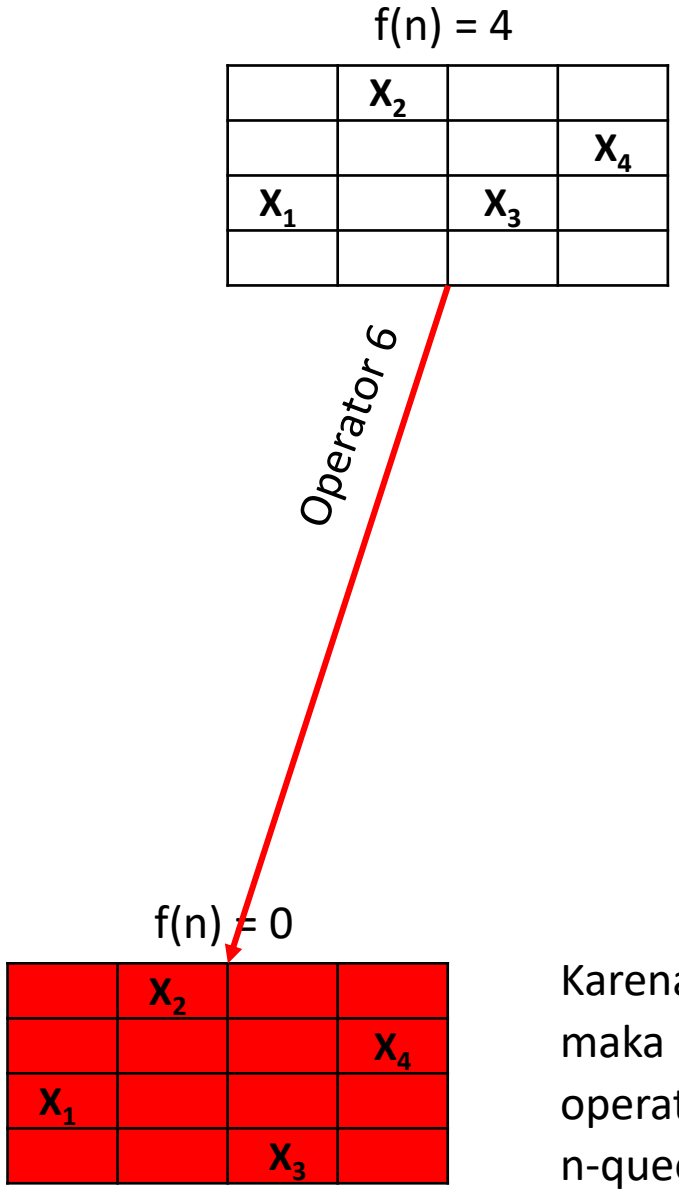
Step 2


f(n) = 4
Operator 5
Operator 6
Operator 7
Operator 8
f(n) = 4
f(n) = 0
f(n) = 4
f(n) = 8

Step 2



- Setelah semua operator dijalankan, pilih operator yang menghasilkan cost terkecil
  - Disini kita memilih operator 6, yang menghasilkan f(n) = 0



Karena kita sudah mendapatkan f(n) = 0, maka hasil terakhir setelah melakukan operator adalah solusi dari permasalahan n-queen