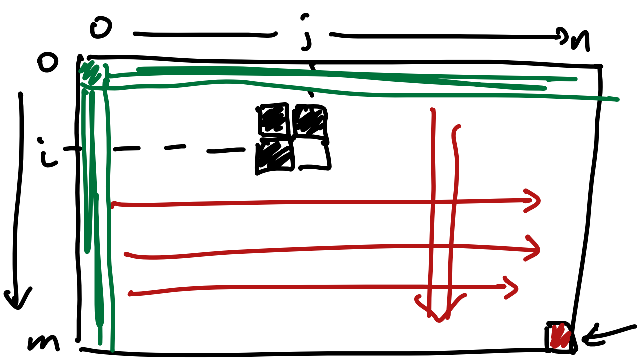
Edit distance:
min # ins, del, rep to change
A[1..m] into B[1..n]

Edit(i,j) = edit distance from A[1..i] to B[1..j]

ALGORI | TH MS
ALTRUIS | T IC

Future ← past

$$Edit(i,j) = \begin{cases} i & \text{if } j = 0 \\ j & \text{if } i = 0 \\ \min \left\{ \begin{array}{c} Edit(i, j-1) + 1 \\ Edit(i-1, j) + 1 \\ Edit(i-1, j-1) + [A[i] \neq B[j]] \end{array} \right\} & \text{otherwise} \end{cases}$$



Final answer ← Edit(m,n)

for i ← 0 to m
  for j ← 0 to n
    compute Edit(i,j)

```
EditDistance(A[1..m], B[1..n]):
  for j ← 0 to n
      Edit[0, j] ← j

  for i ← 1 to m
      Edit[i, 0] ← i
      for j ← 1 to n
          ins ← Edit[i, j − 1] + 1
          del ← Edit[i − 1, j] + 1
          if A[i] = B[j]
              rep ← Edit[i − 1, j − 1]
          else
              rep ← Edit[i − 1, j − 1] + 1
          Edit[i, j] ← min {ins, del, rep}

  return Edit[m, n]
```

O(1) time

O(mn) time

4 Russians → $O(mn/\log(mn))$ time
Faster?? IDK, but prob. not.

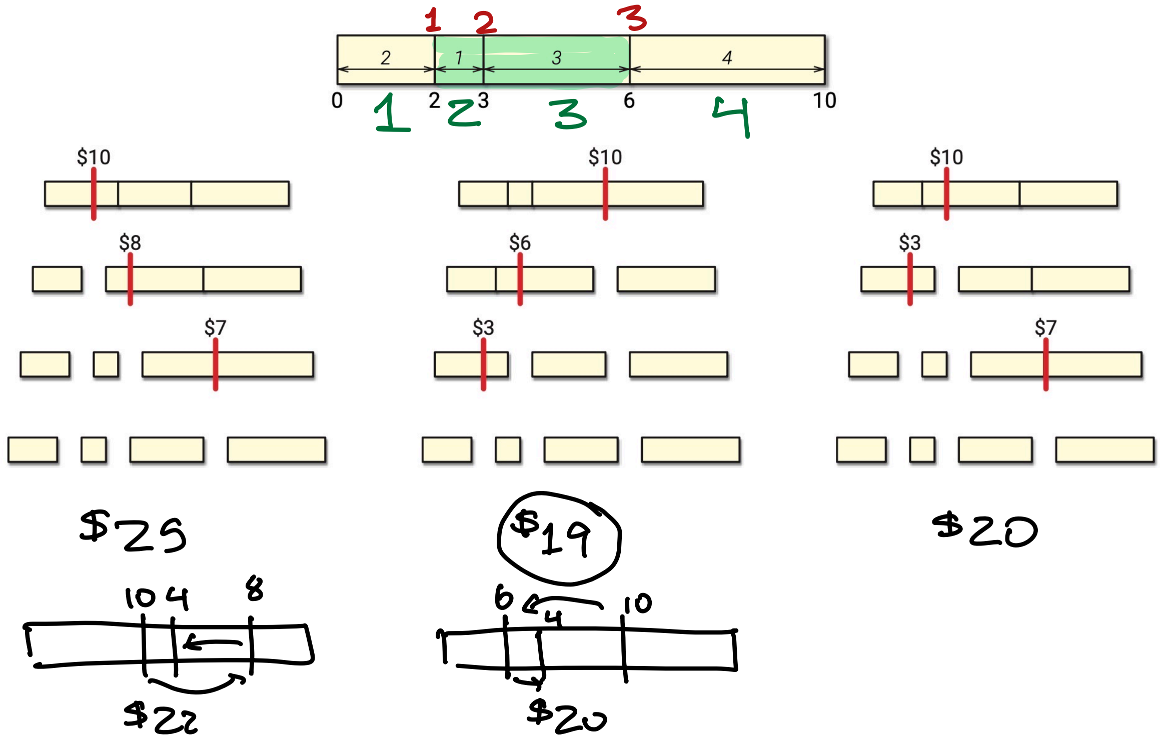
		A	L	G	O	R	I	T	H	M
	0	1	2	3	4	5	6	7	8	9
A	1	0	1	2	3	4	5	6	7	8
L	2	1	0	1	2	3	4	5	6	7
T	3	2	1	1	2	3	4	4	5	6
R	4	3	2	2	2	2	3	4	5	6
U	5	4	3	3	3	3	3	4	5	6
I	6	5	4	4	4	4	3	4	5	6
S	7	6	5	5	5	5	4	4	5	6
T	8	7	6	6	6	6	5	4	5	6
I	9	8	7	7	7	7	6	5	5	6
C	10	9	8	8	8	8	7	6	6	6

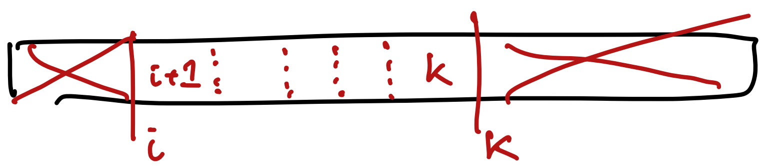
```
A L G O R I   T H M
A L T R U I S T I C
```

```
A L G O R   I   T H M
A L   T R U I S T I C
```

```
A L G O R   I   T H M
A L T   R U I S T I C
```

$L = [2, 1, 3, 4]$





Given array $L[1..n]$ where
$L[i]$ is length of i^{th} board from left

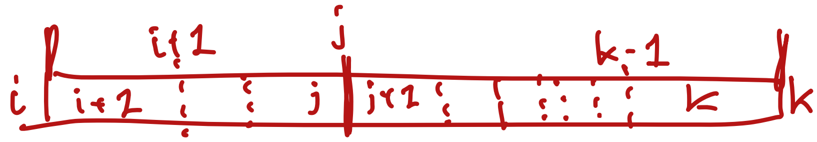
$\boxed{\text{OptCost}(i,k) = \text{min possible cost of cutting long plank consisting of short boards } i+1..k}$

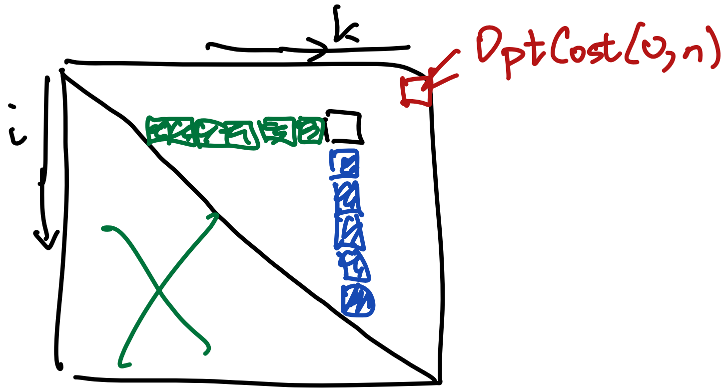
between cut i and cut k

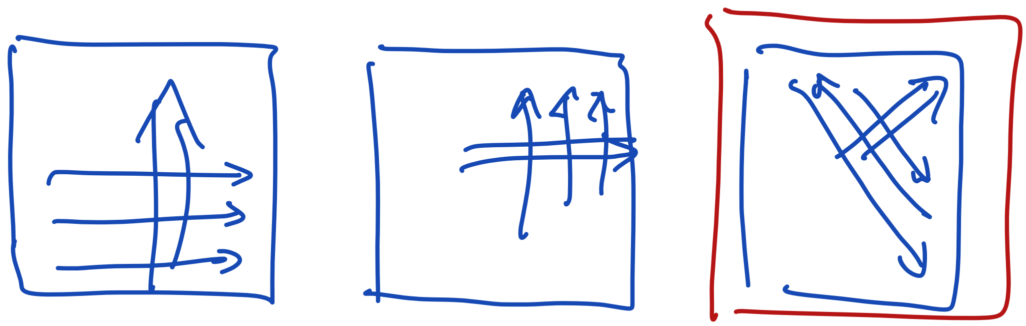
$\boxed{\text{We want OptCost}(0,n)}$

$$\text{OptCost}(i,k) = \begin{cases} 0 & \text{if } k-i=1 \\ \underbrace{\sum_{j=i+1}^{k} L[j]}_{\text{cost of first cut}} + \min\limits_{i<j<k} \underbrace{\left(\text{OptCost}(i,j) + \text{OptCost}(j,k)\right)}_{\text{cost of remaining cuts}} \end{cases}$$

Posn of first cut







for $k \leftarrow n$ to 0
  for $i \leftarrow 0$ to n
    compute OptCost$[i,k]$ ← $O(n)$ time
    For $j \leftarrow i+1$ to $k-1$
      case

$O(n^3)$ time → $O(n^2)$ time

→ $O(n \log n)$ time!