Edit Distance

Back to Week 5

4/4 points earned (100%)

Quiz passed!

1 / 1 points

1.
How many insertions are needed to make **axybc** from **abc?**

- 1
- 3
- 2 ✓

Correct
Insert **x** between **a** and **b**, then **y** between **x** and **b**.

1 / 1 points

2.
What is the edit distance between words **bread** and **really**?

- 6
- 4 ✓

Correct
Delete **b**, then change **d** to **l**, then insert **l** and **y** in the end.

- 3

1 / 1 points

3.
What is the edit distance between **bread** and **really** if it is allowed to insert and delete symbols, but forbidden to replace symbols?

- 4
- 5 ✓

Correct

Remove **b**, remove **d**, insert **l**, **l** and **y.**

6

1 / 1 points

4.

(*This is an advanced problem*)

We want to compute not only the edit distance d between two words, but also the number of ways to edit the first word to get the second word using the minimum number d of edits. Two ways are considered different if there is such $i, 1 \leq i \leq d$ that on the i-th step the edits in these ways are different.

To solve this problem, in addition to computing array T with edit distances between prefixes of the first and second word, we compute array $ways$, such that $ways[i, j]$ = *the number of ways to edit the prefix of length i of the first word to get the prefix of length j of the second word using the minimum possible number of edits.*

Which is the correct way to compute $ways[i, j]$ based on the previously computed values?

```
ways[i, j] = 0
if T[i, j] == T[i - 1, j] + 1:
  ways[i, j] += ways[i - 1, j]
if T[i, j] == T[i, j - 1] + 1:
  ways[i, j] += ways[i, j - 1]
```

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ways[i, j] = 0
ways[i, j] += ways[i - 1, j]
ways[i, j] += ways[i, j - 1]
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ways[i, j] = 0
if T[i, j] == T[i - 1, j] + 1:
  ways[i, j] += ways[i - 1, j]
if T[i, j] == T[i, j - 1] + 1:
  ways[i, j] += ways[i, j - 1]
if word1[i] == word2[j] and T[i, j] == T[i - 1, j - 1]:
  ways[i, j] += ways[i - 1, j - 1]
if T[i, j] == T[i - 1, j - 1] + 1:
  ways[i, j] += ways[i - 1, j - 1]
```

Correct

$T[i, j]$ is computed based on $T[i - 1, j]$, $T[i, j - 1]$ and $T[i - 1, j - 1]$: we decide what will be the last edit and then try to use the minimum number of edits needed before that, which is already stored in the table T for all the variants of the last editing action. If the minimum number of edits $T[i, j]$ can be obtained via different last editing actions, we should sum all the ways that exactly $T[i, j]$ edits can be made to change the i-th prefix of the first word into the j-th prefix of the second word.

First *if* checks all the ways when the last action is to delete the last symbol. Second *if* checks all the ways when the last action is to insert the necessary symbol. Third *if* checks all the ways to match last symbols of the prefixes. Last *if* checks all the ways to replace the last symbol of the i-th prefix of the first word by the last symbol of the j-th prefix of the second word.

```
ways[i, j] = 0
if T[i, j] == T[i - 1, j] + 1:
  ways[i, j] += ways[i - 1, j]
if T[i, j] == T[i, j - 1] + 1:
  ways[i, j] += ways[i, j - 1]
if word1[i] == word2[j] and T[i, j] == T[i - 1, j - 1]:
  ways[i, j] += ways[i - 1, j - 1]
```