Dolphins

Problem ID: dolphins

Recently Lea read a book about, among other things, the creation of the earth. In this scientifically accurate work it was detailed that the earth was a construction ordered by mice. Even more, it was said that dolphins are the second most intelligent species on earth, after the mice. This left Lea baffled: could it really be that humans are a mere third on the intelligence scale? Only one way to find out!

Lea wants to make sure that humans are superior to dolphins by comparing their DNA to the DNA of mice. Should she find out that they are closely related, it is clear that humans must be more intelligent than dolphins.

Comparing DNA is done by scoring: Lea has some DNA sequences from humans and some from mice. A sequence is a string consisting only of the letters A,C,T and G. Two equal length sequences are scored with a 4×4 scoring matrix whose rows and colums are labelled with A,C,T and G. An entry in row A and column T is then called $score(A, T)$. The sequences are scored by computing the score of the first letters of each sequence, the second letters, and so on, and summing up the result. For example, the sequences ATA and CGT would be scored as $score(A, C) + score(T, G) + score(A, T)$.

The matrix must have the following properties:

- All entries must be integers between -10 and 10, inclusively.
- It must be symmetric ($score(x, y) = score(y, x)$ for all $x, y \in \{A, C, T, G\}$).
- Diagonal entries must be non-negative ($score(x, x) \geq 0$ for all $x \in \{A, C, T, G\}$).
- The sum of all 16 entries must be 0.

Of course Lea wants to choose the matrix such that the sum of the scores she gets when comparing every human DNA sequence to every mouse DNA sequence is maximal. Can you compute the maximal score that she can achieve?

Input

The first line of the input contains an integer t. t test cases follow, each of them separated by a blank line.

The first line of each test case contains two integers n m, the number of human and mouse DNA sequences. The next n lines contain one human DNA sequence each. The last m lines contain a mouse DNA sequence each.

Output

For each test case, print a line containing "Case #i: x" where i is its number, starting at 1, and x is the maximal score that can be reached. Each line of the output should end with a line break.

Constraints

- $1 \leq t \leq 20$
- $1 \leq m, n \leq 200$
- A sequence consists of at most 100 letters of A,C,T and G.
- For each test case, all sequences have equal length.

Sample Input 1

```
2
1 1
ACAC
ATGC

2 2
AAA
CTG
TCC
GGT
```

Sample Output 1

```
Case #1: 40
Case #2: 0
```

Sample Input 2

```
5
3 3
ACACACTGGTCTATACTTCG
ACTCGCTGAAGTTAATTACC
ACTGTGCGTCCAAGGGTAAT
ATCGGACAGATCACGCCCCT
ATGGTGATATTCAATGCTGT
CATATCGTACTAGGGTAAAG

2 5
CTATTTAGTT
AAACTGTAAT
GATTGATTTG
CTAGAGACCA
ATTGCTCCCG
GAGTACTAAA
TGCCGTTCTT

3 2
GGACGCG
ATTCGAT
ATAGCGA
TCACCCG
CCCACAG

4 5
TACG
GGAG
ACCC
GTCA
GCAC
GCGG
GAAG
GGTA
ATCT

3 2
CGTATGTCCCGCGA
GCAAGTGCGCTTTG
CAGGTTGGGGTCAA
GGTAAGGGGAAAAC
ATAAGCTTGCTCTC
```

Sample Output 2

```
Case #1: 330
Case #2: 370
Case #3: 150
Case #4: 240
Case #5: 150
```