**UNIVERSITY OF THE PHILIPPINES MANILA**
**COLLEGE OF ARTS AND SCIENCES**
**DEPARTMENT OF PHYSICAL SCIENCES AND MATHEMATICS**

CMSC 21: Fundamentals of Programming
Second Semester A.Y. 2020-2021

# MACHINE PROBLEM

## Bombs and $100 Bills

### The Problem

There are multiple bomb and $100 dollar bills in a room. You must save the bills before the bombs explode. The room is partitioned into $nxm$ cells, the rows of the room are numbered from 0 to n - 1 from north to south and the columns of the room are numbered from 0 to m - 1 from west to east.

The cell $[i, j]$ lies at the intersection of the $i$-th row and the $j$-th column, each cell has either a bomb (labeled as **B**) or **1** to **9** $100 dollar bills.

When bomb explodes all the bills in the same row and the same column as the bomb get incinerated. Because you have some time before the bombs explode, you can swap the positions of some of the bills. This can be done at most $k$ times, please calculate the maximum number of bills that can be saved if all bombs explode.

### Input Example 1

Test cases are saved in a file. The first three numbers describe the size of the grid and number of times you can swap bills:

```
3 5 0
B8B3B
53243
32452
```

First number $m = 3$ describes the number of rows, $n = 5$ the number of columns, and $k = 0$ the number of times you can swap positions of bills.

### Output

14

**Solution**

Since $k = 0$ (i.e., you have no time to swap positions of bills), you can only obtain a maximum value of $3 + 2 + 4 + 5 = 14$.

```
* * * * *
* 3 * 4 *
* 2 * 5 *
```

**Input Example 2**
Let us discuss another example,

```
3 5 1
B8B3B
53243
32452
```

**Output**
20

**Solution**

Given that $k = 1$, we are allowed to swap one position of bills before the bomb gets incinerated. To maximize the number of $100 dollar bills, we can swap 8 positioned at [0, 1] with 2 located at [2, 1]. In this case, you can obtain a maximum value of $3 + 8 + 4 + 5 = 20$.

```
* * * * *
* 3 * 4 *
* 8 * 5 *
```

**Specifications**
Create a program that takes in the filename of the input test case as an argument and prints out the maximum number of $100 bills that can be saved before all the bombs are incinerated.

**Sample Run 1**

```
$ mp "testcases/test0.txt"

Safe Positions:
* * * * *
* 3 * 4 *
* 2 * 5 *
```

```
Maximum number of $100 bills saved is: 14
```

**Sample Run 2**

```
$ mp "testcases/test1.txt"

Safe Positions:
* * * * *
* 3 * 4 *
* 8 * 5 *

Maximum number of $100 bills saved is: 20
```

**Notes**

1. The submission will be on the Final Exam week.
2. Three of the test cases will be provided for you to work on this MP.

Test Cases:

test0.txt

```
3 5 0
B8B3B
53243
32452
```

test1.txt

```
3 5 1
B8B3B
53243
32452
```

test2.txt

```
3 20 4
855367578439B557BB53
551B7615448B2588525B
BB36937332B672354476
```

test3.txt

```
6 10 15
3342795112
7127B72313
686227926B
7836219B16
9126128287
45B522B9B9
```