CSE351 Section 6: Arrays and Structs

We have a two-dimensional matrix of integer data of size M rows and N columns. We are considering 3 different representation schemes:

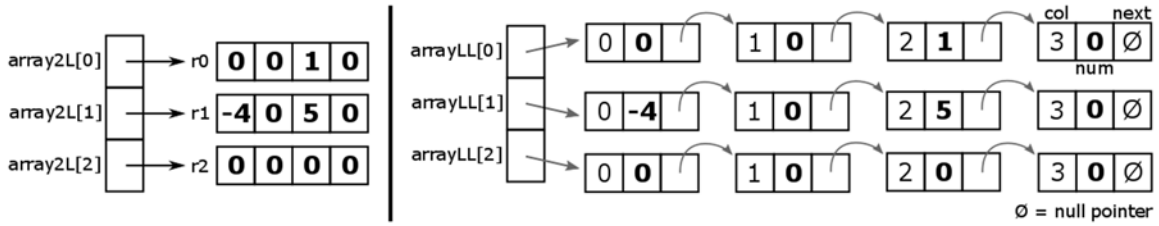
1) 2-dimensional array `int array2D[][]`, // M*N array of ints
2) 2-level array `int *array2L[]`, and // M array of int arrays
3) array of linked lists `struct node *arrayLL[]`. // M array of linked lists (struct node)

Consider the case where $M = 3$ and $N = 4$. The declarations are given below:

2-dimensional array:	**2-level array:**	**Array of linked lists:**

`int array2D[3][4];`	`int r0[4], r1[4], r2[4];`
	`int *array2L[] = {r0,r1,r2};`
		`struct node {`
		`  int col, num;`
		`  struct node *next;`
		`};`
		`struct node *arrayLL[3];`
		`// code to build out LLs`

For example, the diagrams below correspond to the matrix $\begin{bmatrix} 0 & 0 & 1 & 0 \\ -4 & 0 & 5 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ for `array2L` and `arrayLL`:



a) Fill in the following comparison chart:

	2-dim array	**2-level array**	**Array of LLs:**
Overall Memory Used			
Largest *guaranteed* continuous chunk of memory			
Smallest *guaranteed* continuous chunk of memory			
Data type returned by:	`array2D[1]`	`array2L[1]`	`arrayLL[1]`
Number of memory accesses to get `int` in the *BEST* case			
Number of memory accesses to get `int` in the *WORST* case			

b) Sam Student claims that since our arrays are relatively small ($N < 256$), we can save space by storing the `col` field as a char in `struct node`. Is this correct? If so, how much space do we save? If not, is this an example of internal or external fragmentation?