Algorithm explanation

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1. Algorithm X

   Algorithm X finds rows from a matrix such that those rows contain a 1 in each column

   For example, if algorithm X runs on the following matrix:

```
rows  matrix
A    | 1 0 0 1 0 0 1
B    | 1 0 0 1 0 0 0
C    | 0 0 0 1 1 0 1
D    | 0 0 1 0 1 1 0
E    | 0 1 1 0 0 1 1
F    | 0 1 0 0 0 0 1
```

   Algorithm X should return rows B, D, and F, because:

```
rows  matrix
B    | 1 0 0 1 0 0 0
D    | 0 0 1 0 1 1 0
F    | 0 1 0 0 0 0 1
sum  | 1 1 1 1 1 1 1
```

   This is the pseudocode for algorithm X:

```
If matrix A only contains 1s, the current solution is a valid
    solution
Thus, return the list solutions

If matrix A is empty this is not a valid solution, so terminate the
    branch

Choose column c such that it contains the least number of 1s

For each row r such that A[r][c] = 1 (row r contains a 1 in column r)
       Include row r in the solution.

       For each column j such that A[r][j] = 1
              Add column j to the list of columns that have to be
                  removed
              For each row i such that A[i][j] = 1
                     Add row i to the list of rows that have to be
                         removed

       Remove the rows and columns that have to be removed
```

```
        Repeat the algorithm recursively on matrix A

        If the recursive call finds an valid solution add the solution
             to the list of solutions
        Else, remove row r from the solution because it is not a valid
             solution

This is not a valid solution, so terminate the branch
```

2. Matrix Creator

   In order to solve the pentomino puzzle using algorithm x, we have to create a matrix that contains all the possible placements of the pentominos.

   The matrix has to look look this:

column	0	1	...	9	11	12	13	14	...
data	1	0		0	0	1	1	0	
	1	0		0	0	0	1	1	
	0	1		0	0	1	1	0	
	0	1		0	0	0	0	0	
	0	0		1	0	1	0	0	
	0	0		1	0	0	0	1	
	0	0		0	1	1	1	1	
	0	0		0	1	0	0	1	

   Each row represents a distinct position and orientation of distinct pentominos

   - The first 12 (depending on how many pentominos we use) columns should each represent a pentomino shape (eg, X, W, L, ...).
   - The remaining columns represent the board in a 1 dimensional way
     If the board had a state like this:

     ```
     0 1 0
     1 1 1
     1 0 1
     ```

     the remaining columns should look like this:

     ```
     0 1 0 1 1 1 1 0 1
     ```

   Each row should contain a single 1 in the firs 12 columns representing which pentomino it is, and 5 (each pentomino fills 5 cells) 1s in the remaining columns.

3. Actual implementation

   (a) Create matrix A using the Matrix Creator

   (b) Add row numbers to the 0th column of matrix A, in order to keep track of the rows that we remove

   (c) Use Algorithm X to solve matrix A

   (d) The rows Algorithm X returns contain the position and orientation of the pentominos we have to use