

1. An arrow matrix is a square matrix that contains ones on the diagonal, the last column, and last row.

1	0	0	0	1
0	1	0	0	1
0	0	1	0	1
0	0	0	1	1
1	1	1	1	1

Write a function that takes the number of rows and columns (for $N \geq 3$) as an input, and returns the corresponding arrow matrix.

2. A college professor would like to compare how students perform on a test she gives every year. Each year, she stores the data in a two-dimensional array. The first and second year's data are as follows:

Year 1	Question 1	Question 2	Question 3	Question 4
Student 1	3	6	4	10
Student 2	5	8	6	10
Student 3	4	9	5	10
Student 4	6	4	7	9
Student 5	3	5	8	10

Year 2	Question 1	Question 2	Question 3	Question 4
Student 1	2	7	3	10
Student 2	3	7	5	10
Student 3	4	5	5	10
Student 4	3	3	8	10
Student 5	3	5	2	10

- (a) Create a two-dimensional array called *year1* for the first year's data, and another called *year2* for the second year's data.
- (b) Combine the two arrays into a three-dimensional array with two pages, called *testdata*.
- (c) Use your three-dimensional array to perform the following calculations:
- Calculate the average score for each question, for each year, and store the results in a two-dimensional array. (Your answer should be either a 2×4 array or a 4×2 array.)
 - Calculate the average score for each question, using all the data.
 - Extract the data for Question 3 for each year, and create an array with the following format:

Question 3, Year 1	Question 3, Year 2
Student 1	
Student 2	
and so on	

3. Logical indexing works like this.

```
thresh = 4;  
vec     = [1 2 3 4 5 6 7 8];  
  
vi      = (vec > thresh)  
  
vi =  
  
      0      0      0      0      1      1      1      1
```

Once you have this TRUE FALSE vector (I call it vi: Valid Indices)

It can be used to get the values out:

```
big = vec(vi)  
  
big =  
  
      5      6      7      8
```

Given a vector, vec, and a value, v, return a binary vector that represents the indices where vector, vec, is equal to scalar, v.

4. **Given a string s , find the length of the longest substring without repeating characters.**

Example 1:

Input: $s = \text{"abcabcbb"}$

Output: 3

Explanation: The answer is "abc", with the length of 3.

Example 2:

Input: $s = \text{"bbbbbb"}$

Output: 1

Explanation: The answer is "b", with the length of 1.

Example 3:

Input: $s = \text{"pwwkew"}$

Output: 3

Explanation: The answer is "wke", with the length of 3.

Notice that the answer must be a substring, "pwke" is a subsequence and not a substring.

5. Write a function that converts elements in a numeric array into a different class.

Example:

```
a = [1:5]; % class: double
b = convertto(a,'uint32');
b =

     1     2     3     4     5

class(b)
ans =
uint32
```

-
6. Given a year number (eg. 2000) as input, find how many days are there in the given year.

7. Given two date strings d1 and d2 of the form yyyy/mm/dd HH:MM:SS (assume hours HH is in 24 hour mode), determine how much time, in decimal hours, separates them. Assume d2 is always later than d1.

Example:

```
Input d1 = '2010/12/14 12:00:00'
```

```
Input d2 = '2010/12/14 13:06:36'
```

```
Output elapsed is 1.11
```

8.

[String array](#) and cell array are two types of containers for storing pieces of data. In this problem, you will be given a cell array of character vectors. Your job is to convert the cell array to a string array, which stores the same pieces of text data.

To begin with, let's assume that there are no missing type values in the input cell array.

Example:

```
Input:
>> x = {'I', 'Love', 'MATLAB'}
x =
    1×3 cell array
        'I'      'Love'      'MATLAB'
```



```
Output:
>> y = strings(size(x));
>> [y{:}] = x{:}
y =
    1×3 string array
        "I"      "Love"      "MATLAB"
```

Note that the example shown above is not the best way to solve this problem. Try other approaches in order to achieve a leading score.

9. You are given a cell array containing information about a number of soccer games.
Each cell contains one of the following:

- 'H', meaning the home team won
- 'A', meaning the away team won
- 'D', meaning a draw, or tie game

So if

```
games = {'D', 'D', 'A', 'H', 'D', 'H'}
```

then

```
draws = 3
```


10. Given two input structures (s1, s2), determine which field values have been modified in s2 compared to s1. Your output should be a cell array of appropriate fieldnames and a cell array of the corresponding s2 field values. If s1 and s2 are identical (i.e. no values have been changed), return [] for both outputs.

Example

Suppose

```
s1.foo = 1;  
s1.bar = 2;  
s1.baz = 3;
```

and

```
s2.foo = 1;  
s2.bar = 0;  
s2.baz = 3;
```

then the correct output is

```
f = {'bar'}  
v = {0}
```

Assumptions

- Inputs are scalar structures
- Inputs have identical fieldnames
- Field values can be numeric arrays, strings, or cell arrays
- The *i*th cell in output *f* corresponds to the *i*th cell in output *v*