**MCS 253**

**HW 2**

[Read this first on what to submit for a homework.](https://drive.google.com/open?id=1vvTZzNrXNrxFCFVuzryEuAX6c8rfGERsEc7t4TS1vAA)

**HW 2.1 (25 points)**

Write *strstr(string needle, string haystack)* that returns the index of the starting character of the first occurrence of needle in the haystack, or -1 if the needle does not exist in the haystack.

Input:

* a needle string called *needle* and a haystack string called *haystack*

Output:

* an integer denoting the index of the starting character of the first occurrence of needle in haystack, or -1 if needle does not appear in haystack

Example 1:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- chem

haystack <-- alchemy

output:

2

Example 2:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- chem

haystack <-- heartache

output:

-1

**HW 2.2 (25 points)**

Write *numOccurrences(string needle, string haystack)* that returns the number of occurrences of needle in the haystack

Input:

* a needle string called *needle* and a haystack string called *haystack*

Output:

* an integer representing the number of occurrences of needle in haystack

Example 1:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- na

haystack <-- bananas

output:

2

Example 2:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- na

haystack <-- potato

output:

0

**HW 2.3 (25 points)**

Write *anagram(string needle, string haystack)* that returns a list of indices of characters in haystack that mark the beginning of an anagram for needle.

Input:

* a needle string called *needle* and a haystack string called *haystack*

Output:

* a list integers for the indices in haystack that mark the start of an anagram for needle, or -1 if an anagram of needle does not appear in haystack

Example 1:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- tap

haystack <-- captain

output:

1, 2

Example 2:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- tap

haystack <-- talapia

output:

-1

**HW 2.4 (25 points)**

Write *strstrx(string needle, string haystack)* from problem 1 above but use one of the faster algorithms: Boyer Moore, Rabin Karp, or Knuth-Morris-Pratt.

Input:

* a needle string called *needle* and a haystack string called *haystack*

Output:

* an integer denoting the index of the starting character of the first occurrence of needle in haystack, or -1 if needle does not appear in haystack

Example 1:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- chem

haystack <-- alchemy

output:

2

Example 2:

[input](https://drive.google.com/open?id=1haMDYvSQULgD9hTNFCJapZHN_s5sn3c0):

needle <-- chem

haystack <-- heartache

output:

-1

**Possible LeetCode Substitutions (25 points each)**

**Important Notes:**

* You may only substitute 50pts-worth of LeetCode problems
* At least one of the LeetCode problems must be a String related problem

Possible LeetCode Problems:

* [Array Problems](https://drive.google.com/open?id=1WsAv6NXGCW0t9Ui0FnGXtwsm19D2L_TR)
* [String Problems (medium)](https://drive.google.com/open?id=1Gg9rnYt6-Q85Wad0BqVP0HSn-QCw0yp1)
* [String Problems (hard)](https://drive.google.com/open?id=1WDS7DN6o0QEnTV2kVI0imJQKnx1eJ0RD)