

Assignment 1

Due Sunday, October 16, 2022 at 11:59pm.

A late penalty of 10% per day is assessed until Friday, October 21, 2022.

Part A: Crosswords (40 marks)

Background

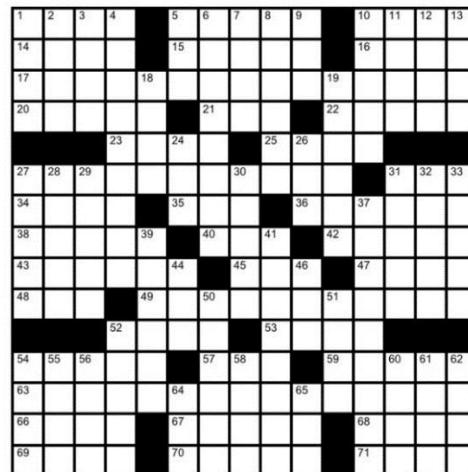
A crossword like the New York Times is a two-dimensional grid that is populated with answers to clues. An Across answer only begins at a white square when the square to its left is either black or a boundary. A Down answer only begins at a white square when the square above it is either black or a boundary. For example, the answer to clue 71-across "Summers in Québec" is ETES and is placed in the four squares from left to right beginning at 71. You will note that the square to the left of 71 is black.

The New York Times Tuesday Crossword Puzzle

Ed Early / Will Shortz ©The New York Times

Across

1. 10K, e.g.
5. Wheedler's tactic
10. Jungle crushers
14. ___ Bator
15. Land of a billion
16. Basilica area
17. Start of an Oscar Wilde quote
20. Revolutionary Allen
21. Comics shriek
22. Out of bed
23. Bakers' wares
25. Strange sightings
27. Quote, par2
31. Cost-controlling W.W. II agcy.
34. Jacob's twin
35. Et ___ (and the following)
36. Cozy spots
38. "I cannot ___ lie"
40. Make a knight, e.g.
42. Utter disorder
43. See 61-Down



45. Dr. Seuss's Sam ___
47. "Rule Britannia" composer
48. Spain's Juan Carlos, for one
49. Quote, par3
52. ___ Enlai
53. Slinky's shape
54. Bawdyhouse manager
57. Bleachers cry
59. ___ Jean Baker (Marilyn Monroe)
63. End of the quote
66. Excursion
67. Met offering
68. Civil wrong

69. Coin flip
70. Theroux's "endless night"
71. Summers in Québec

Down

1. Deserving a slap, maybe
2. Touched down
3. Country singer Johnny
4. Summarize
5. Tonic's partner
6. Brand-new
7. ___ fixe (obsession)
8. Meeting of spacecraft
9. "Mangia!"
10. Groundwork
11. Chooses, with "for"
12. 1975 Wimbledon winner
13. Perceived
18. "Sleep ___"
19. Like many an O. Henry story
24. Pothook shape
26. Half a sawbuck
27. Awful smell
28. Grenoble's river
29. Come from behind
30. Furnish with gear
31. Midwest air hub
32. Hacienda drudges
33. Pack animals
37. A Brontë sister
39. Cause of wheezing
41. Graph with rectangular areas
44. "___ 'nuff!"
46. Meadow call
50. The Continent
51. Actress Lollobrigida
52. Roughs it
54. Feminist Lucretia
55. Michael Jackson's old do
56. Honored guest's spot
58. Neighborhood
60. Kneeslapper
61. With 43-Across, approximately
62. Little scurriers
64. Auction assent
65. "Uh-uh!"

🔑 Solution to Crossword
on Page 22

One-letter answers, however, do not have clues and hence the grid is numbered as shown below. You will also note that a New York Times crossword has no answer less than 3 letters.

1		2			3	4	5
	■		■	■	6		
	■		■	■		■	
7			■	■	8		
■	■		■	9	■	■	■
10	11	■	12		■	■	13
■		■	14				
15					■	■	

Overview of Requirements for Part A

- 1) Initialize an NxN crossword grid with white squares.
- 2) Randomly populate the crossword grid with M black squares. The grid does not need to be symmetric like the New York Times crossword.
- 3) Number the grid in the same manner as the two crosswords above.
- 4) Print out the numbers in sequence for the Across and Down clues (without the clues of course).
- 5) Print out the grid including the black squares and clue numbers.
- 6) Check whether the grid is symmetric.

Class Outlines (Square and Puzzle)

```

public enum TColor {WHITE, BLACK};
public class Square
{
    public TColor Color { set; get; } // Either WHITE or BLACK
    public int Number { set; get; } // Either a clue number or -1 (Note: A BLACK square is always -1)

    // Initialize a square to WHITE and its clue number to -1 (2 marks)
    public Square ( ) { ... }
}

```

```

public class Puzzle
{
    private Square[ , ] grid;
    private int N;

    // Create an NxN crossword grid of WHITE squares (4 marks)
    public Puzzle (int N) { ... }

    // Randomly initialize a crossword grid with M black squares (5 marks)
    public void Initialize (int M) { ... }

    // Number the crossword grid (6 marks)
    // public void Number ( ) { ... }

    // Print out the numbers for the Across and Down clues (in order) (4 marks)
    public void PrintClues ( ) { ... }

    // Print out the crossword grid including the BLACK squares and clue numbers (5 marks)
    public void PrintGrid ( ) { ... }

    // Return true if the grid is symmetric (à la New York Times); false otherwise (4 marks)
    public bool Symmetric ( ) { ... }
}

```

Mark Breakdown for Part A

Square Class (Constructor)	2
Puzzle Class	28
Testing	5
Source Code Documentation	5

Part B: Strings

Background

The string in C# language is a standard reference type where each instance of string is a sequence of characters beginning at position 0. In most languages, the string is implemented as a linear array, but for this assignment, the string will be (re-)implemented as a singly-linked list of characters.

Class Outline

```
public class MyString
{
    private class Node {
        public char item;
        public Node next;

        // Constructor (2 marks)
        public Node ( ... ) { ... }
    }

    private Node front;    // Reference to the first (header) node
    private int length;    // Number of characters in MyString

    // Initialize with a header node an instance of MyString to the given character array A (4 marks)
    public MyString (char[ ] A) { ... }

    // Using a stack, reverse this instance of MyString (6 marks)
    public void Reverse ( ) { Stack<char> S; ... }

    // Return the index of the first occurrence of c in this instance; otherwise -1 (4 marks)
    public int IndexOf(char c) { ... }

    // Remove all occurrences of c from this instance (4 marks)
    public void Remove (char c) { ... }

    // Return true if obj is both of type MyString and the same as this instance;
    // otherwise false (6 marks)
    public override bool Equals (object obj) { ... }

    // Print out this instance of MyString (3 marks)
    public void Print( ) { ... }
}
```

Overview of Requirements for Part B

- 1) Design, implement, and test each of the above methods of your string class.
- 2) Implement a main program as well that creates a menu of options to test your methods. In order to display and allow the user to choose among instances of MyString, store the instances of MyString in a linear array.

Mark Breakdown for Part B

Node (Constructor)	2
MyString Methods	29
Main Program	14
Testing	10
Source Code Documentation	5

Hints

1. Form your team quickly. Individual assignments will **not** be accepted.
2. Work together as a team.
3. Begin the assignment ASAP. Even setting up the classes as presented in this assignment is a good way to get started.
4. Draw diagrams on a separate sheet of paper to help you design each of the algorithms.
5. Compile and test your methods incrementally (one at a time).
6. Develop test cases even before you begin to program.
7. Document as you program. It helps your team members to read your code.

Deliverables

Hand in all source code, executable files, and tests cases (screen shots) online at Blackboard.

Happy Programming!