COMP 141

2-D Lists

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Announcements

Reminder:

- Program 7 due tomorrow by 11:55pm

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Two-Dimensional Lists

- **Two-dimensional list:** a list that contains other lists as its elements
  - Also known as nested list
  - Common to think of two-dimensional lists as having rows and columns
  - Useful for working with multiple sets of data
- To process data in a two-dimensional list need to use two indexes
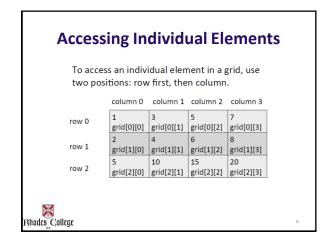- Typically use nested loops to process

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Creating Two-Dimensional Lists

grid = [[1, 3, 5, 7], [2, 4, 6, 8], [5, 10, 15, 20]]

grid[0] →	1	3	5	7
grid[1] →	2	4	6	8
grid[2] →	5	10	15	20

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Accessing Individual Elements

grid = [[1, 3, 5, 7], [2, 4, 6, 8], [5, 10, 15, 20]]

grid[0] →	1 grid[0][0]	3 grid[0][1]	5 grid[0][2]	7 grid[0][3]
grid[1] →	2 grid[1][0]	4 grid[1][1]	6 grid[1][2]	8 grid[1][3]
grid[2] →	5 grid[2][0]	10 grid[2][1]	15 grid[2][2]	20 grid[2][3]

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Accessing Individual Elements

To access an individual element in a grid, use two positions: row first, then column.

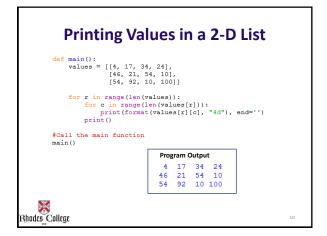|	column 0	column 1	column 2	column 3
row 0	1 grid[0][0]	3 grid[0][1]	5 grid[0][2]	7 grid[0][3]
row 1	2 grid[1][0]	4 grid[1][1]	6 grid[1][2]	8 grid[1][3]
row 2	5 grid[2][0]	10 grid[2][1]	15 grid[2][2]	20 grid[2][3]

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Computing Number of Rows/Columns

grid = [[1, 3, 5, 7], [2, 4, 6, 8], [5, 10, 15, 20]]

- How do we calculate the number of rows in a 2-D list?
  - `len(grid)` = # of rows

- How do we calculate the number of columns in a 2-D list?
  - `len(grid[rowid])`   #use rowid = 0 if you're unsure which row

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Assigning Values to a 2-D list

```
# This program assigns random numbers to
# a two-dimensional list.
import random

# Constants for rows and columns
ROWS = 3
COLS = 4

def main():
    # Create a two-dimensional list.
    values = [[0, 0, 0, 0],
              [0, 0, 0, 0],
              [0, 0, 0, 0]]

    # Fill the list with random numbers.
    for r in range(ROWS):
        for c in range(COLS):
            values[r][c] = random.randint(1, 100)

    # Display the random numbers.
    print(values)

# Call the main function.
main()
```

Program Output
[[99, 46, 8, 19], [1, 52, 38, 48], [55, 4, 88, 78]]

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Printing Values in a 2-D List

```python
def main():
    # Create a two-dimensional list.
    values = [[4, 17, 34, 24],
              [46, 21, 54, 10],
              [54, 92, 10, 100]]

    #Print the 2-D list, 1 value per line
    for r in range(len(values)):
        for c in range(len(values[r])):
            print(values[r][c])


# Call the main function.
main()
```

Output
4
17
34
24
46
21
54
10
54
92
10
100

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Printing Values in a 2-D List

```python
def main():
    values = [[4, 17, 34, 24],
              [46, 21, 54, 10],
              [54, 92, 10, 100]]

    for r in range(len(values)):
        for c in range(len(values[r])):
            print(format(values[r][c], "4d"), end='')
        print()

#Call the main function
main()
```

Program Output
4 17 34 24
46 21 54 10
54 92 10 100

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Sum of Rows

- Write a function to print the sum of each row in your table.

Practice

Using Nov15.py from my Box.com directory, fill in the code for the 3 functions listed:

– sumAll – **returns** the sum of all elements in the 2-D list

– sumColumns – **prints** out the sums of each column

– maxRow – compute the sum of each row and **return** the index and sum of the maximum row

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Tic-Tac-Toe

- Two player game, *X* and *O*

- Take turns marking the spaces in a 3×3 grid.

- The player who succeeds in placing three respective marks in a horizontal, vertical, or diagonal row wins the game

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