Carnegie Mellon University
Computer Science Academy

CS1: Unit 11 Review

2D Lists

Creating and Using 2D Lists

	column 0	column 1	column 2	column 3
row 0	2	4	6	8
row 1	1	3	5	9

- A two-dimensional list, or 2D list, is a list of lists
- 2D lists are used to store values as they would be stored in a table
    - Ex. a 2D list representing the table on the right would be written as
      `L = [ [2, 4, 6, 8],`
      `[1, 3, 5, 9] ]`
- We can index into 2D lists just like in one-dimensional lists, except with 2 indexes: first the row, and then the column
    - Ex. `app.states = [ ['Pennsylvania', 'Alaska', 'Colorado'],`
      `['New Jersey', 'Oregon', 'California'] ]` , here `app.states[0][1]` is `'Alaska'`
- We can also loop over 2D lists, but this time we need two `for` loops instead of just one
    - Ex. In the following code, `state` will take each of the values in `app.states`

```
for row in range(2):
    for col in range(3):
        state = app.states[row][col]
```

- We can also make lists by using the `makeList` function included in CMU Graphics
    - Ex. `L = makeList(4, 2)` will create a list with 4 rows and 2 columns
    - Then, we need to load `L` with the desired values using 2 `for` loops

More with 2D Lists

- We can store the number of rows and columns as variables that we want to use in the future
    - Ex. After we set `app.rows = 3`, `app.cols = 2`, we can use them in a `for` loop or a call to `makeList`
- If we don't already know the number of rows and columns of a 2D list, L, we can get them by using: `rows = len(L)` and `cols = len(L[0])`
- We can also return 2D lists using functions that return values that we learned about in unit 10
- We can perform hit testing with 2D lists
    - We first loop over the rows and then the columns
    - Then we can use the function `shape.hits(x, y)` for individual shapes in the 2D list

Board Games

Writing Board Games

- 2D lists are especially helpful when writing board games
    - We often use a 2D list for storing a grid of shapes that functions as a board
    - Writing board games, or large projects in general, is much easier when you break it into chunks
- When writing board games, here are some things that are helpful to remember to do
    - Set up the board
    - Allow the player to interact with the board/game, often by making moves

- Change the board according the moves
- Check for a win or loss of the game