CMSC 131
Object-Oriented Programming I

Two-Dim Arrays II

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This material is based on material provided by Ben Bederson, Bonnie Dorr, Fawzi Emad, David Mount, Jan Plane

Announcements

- Do not post any messages in Piazza under the Annoucements folder or the clarifications folder for a project. Thanks

About Arrays

- Zero-size arrays
  - What space do they occupy?
  - Advantages/disadvantages when compare with null
    - By returning an array of zero size you can iterate through it
- Visualization of arrays through the debugger
  - Let's see an array through the debugger

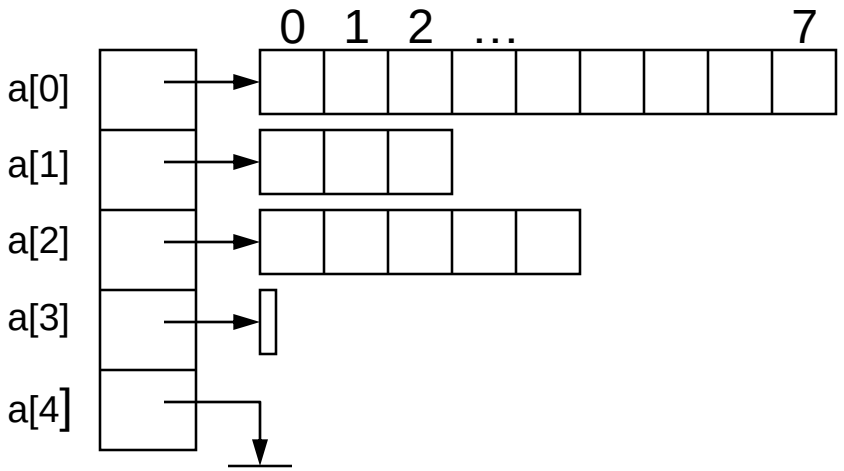
Announcement

- Site with Java examples - http://www.java2s.com/

Ragged Arrays

- When you allocate an array of arrays, do all the arrays have to be of the **same size**?
- **No**. When the arrays have different sizes, it is called a **ragged array**. You can specify their sizes individually.

```
char[ ][ ] a = new char[5][ ];
a[0] = new char[8];
a[1] = new char[3];
a[2] = new char[5];
a[3] = new char[0];
a[4] = null;
```

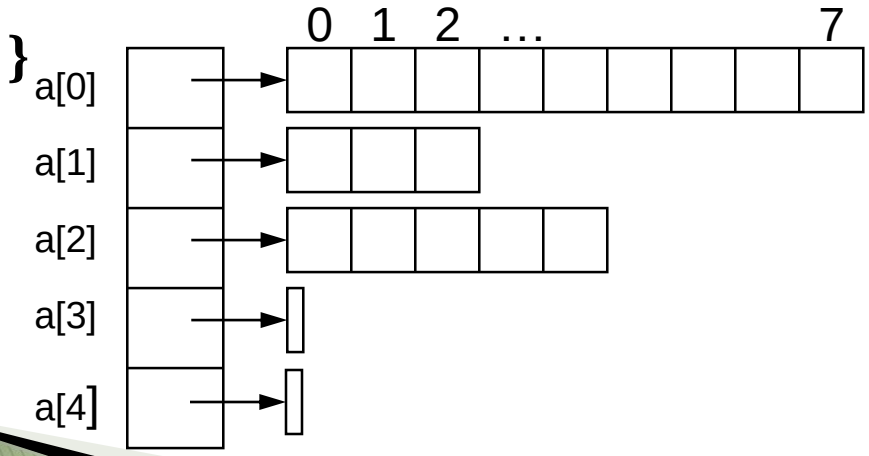


Two-Dimensional Arrays and Loops

- Nested loops go hand in hand with two-dimensional arrays
- The following is the standard nested loop to go row by row in a two-dimensional array

```
for (int row = 0; row < a.length; row++) {
    for (int col = 0; col < a[row].length; col++) {
        a[row][col] = ' ';
    }
}
```

When all rows have the same length we could use a[0].length



Would the above nested loop work when a[4] is null?

Multidimensional Initializers

- **1-dim Initializer**: recall

```
int[ ] quizScoresOne = { 90, 82, 75, 66 };
```

- **2-dimensional Initializer**:

```
int[ ][ ] quizScoresTwo = { { 90, 82, 75, 66 },
                            { 85 },
                            { 45, 77, 99 } };
```

Note: The size of the array is determined by the initializer.

This allocates and initializes a **ragged array** with 3 rows.

- **Example (Initializers.java):** Print the array.

```
for ( int row = 0; row < quizScores.length; row++ ) {
    System.out.print( "Scores for student " + row+ ":");
    for ( int col = 0; col < quizScores[row].length; col++ ) {
        System.out.print( " " + quizScores[row][col] );
    }
    System.out.println( );
}
```

Output:

```
Scores for student 0: 90 82 75 66
Scores for student 1: 85
Scores for student 2: 45 77 99
```

Multidimensional Arrays of Objects

- We have discussed the notion of two-dimensional arrays of primitives:

char[ ] [ ] page = new char[50][100];

- Can we have multidimensional arrays of objects? **Yes!**
- Multidimensional arrays of objects behave exactly as multidimensional arrays of primitives except for one main difference: When you define the array:

ObjectType[][] var = new **ObjectType**[MAXROW][MAXCOL]

you are actually creating a two-dimensional array of references to objects; those objects don't exist yet!

- **Example:** TwoDimArrayObjects.java
- **Example:** PassingArrays.java
  Notice that we use pass by value to pass two-dimensional arrays
  Notice we can pass a row of a two-dimensional array
- Let's see a two-dimensional array through the debugger

Miscellaneous

- In our examples, we have processed the two-dimensional array row by row but we could also process it column by column
- Notice that we can have sharing of objects by several array entries and sharing of rows
- Two-dimensional arrays examples online

  http://www.java2s.com/Tutorial/Java/0140__Collections/0060__Multidimensional-Arrays.htm