

SchoolNova

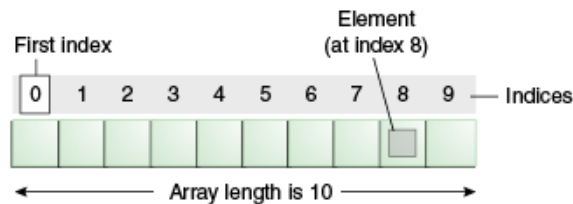


IT101

Java Arrays (refresher)

Arrays

- Java array is a container object that holds a fixed number of values of a single type. The length of an array is established when the array is created. After creation, its length is fixed.
- You have learned about arrays already in the first semester (remember JavaScript?). This class discusses Java arrays in greater detail.
- When you use “new” to create an array, Java reserves space in memory for it (and initializes the values). This process is called memory allocation.



- What differences do you see between Java and JavaScript arrays?

```
// Array initialization
String[] suit = { "Clubs", "Diamonds", "Hearts", "Spades" };
String[] rank = { "2", "3", "4", "5", "6", "7", "8", "9", "10",
                 "Jack", "Queen", "King", "Ace"
                }
```

```
// Array initialization
String suit [] = new String [4];
String rank [] = new String [13];
suit[0] = "Clubs";
suit[1] = "Diamonds";
// etc.
```

Two-Dimensional Arrays

- In many applications, a natural way to organize information is to use a table of numbers organized in a rectangle and to refer to rows and columns in the table. The mathematical abstraction corresponding to such tables is a matrix; the corresponding Java construct is a two-dimensional array.
- To refer to the element in row i and column j of a two-dimensional array $a[][]$, we use the notation $a[i][j]$; to declare a two-dimensional array, we add another pair of brackets; to create the array, we specify the number of rows followed by the number of columns after the type name (both within brackets), as follows:

	99	85	98
row 1 →	98	57	78
	92	77	76
	94	32	11
	99	34	22
	90	46	54
	76	59	88
	92	66	89
	97	71	24
	89	29	38

Anatomy of a two-dimensional array

- `double[][] a = new double[10][3];`
- We refer to such an array as an M-by-N array. By convention, the first dimension is the number of rows and the second dimension is the number of columns. As with one-dimensional arrays, Java initializes all entries in arrays of numbers to 0 and in arrays of booleans to false.
- Multidimensional arrays: The same notation extends to arrays that have any number of dimensions. For instance, we can declare and initialize a three-dimensional array with the code
- `double[][][] a = new double[M][N][N];`

```
// To access each of the elements in a two-dimensional array
// we need nested loops.
int[][] a = new int[10][3];
for (int i = 0; i < a.length; i++) {
    for (int j = 0; j < a[i].length; j++) {
        a[i][j] = (i+j) * 10;
        System.out.println("Current value " + a[i][j]);
    }
}
```

Example

```
package cards;
import java.util.Scanner;
public class Cards {
    public final int CARDS_PER_PLAYER = 5;
    public final String[] SUIT = {"Clubs", "Diamonds", "Hearts", "Spades"};
    public final String[] RANK = {"2", "3", "4", "5", "6", "7", "8", "9", "10", "Jack", "Queen", "King", "Ace"};
    public final int SUITS = SUIT.length;
    public final int RANKS = RANK.length;
    public final int CARDS = SUITS * RANKS;
    private String[] deck;
    private String[] PLAYERS;

    // constructor
    public Cards(String[] players) {
        PLAYERS = players;
        if (CARDS_PER_PLAYER * PLAYERS.length > CARDS) {
            throw new RuntimeException("Too many players");
        }
        // initialize the deck
        deck = new String[CARDS];
        for (int i = 0; i < RANKS; i++) {
            for (int j = 0; j < SUITS; j++) {
                deck[SUITS*i + j] = RANK[i] + " of " + SUIT[j];
            }
        }
    }
    public void shuffle () {
        for (int i = 0; i < CARDS; i++) {
            int r = i + (int) (Math.random() * (CARDS-i));
            String t = deck[r];
            deck[r] = deck[i];
            deck[i] = t;
        }
    }
    public void hand() {
        for (int i = 0, n = 0; i < PLAYERS.length * CARDS_PER_PLAYER; i++) {
            if (i % CARDS_PER_PLAYER == 0) {
                System.out.println(PLAYERS[n]);
                n++;
            }
            System.out.println(deck[i]);
        }
    }
    // main method
    public static void main(String[] args) {
        String [] p = {"John", "Tom", "Jerry"};
        Cards c = new Cards(p);
        c.shuffle();
        c.hand();
    }
}
```

Lab / Homework

- Read the code of the Card game and explain what it does.
- Implement and run the game as shown in the code.
- Modify the game such that instead of the number of players it asks for their names, and then prints out the cards for each player. Hints (not instructions):
 - ◆ The PLAYERS variable should become a String array, not int
 - ◆ Use the String.split method to convert Scanner input into a String array

```
Cards c = new Cards(input.nextLine().split(" "));
```

- ◆ Make the necessary changes in the hand() method.

```
Welcome to the SchoolNova poker club!  
Please enter the names of players: Isai Alex Marina  
---  
Isai  
---  
Jack of Spades  
Queen of Diamonds  
10 of Clubs  
King of Diamonds  
Queen of Hearts  
---  
Alex  
---  
6 of Spades  
6 of Hearts  
5 of Spades  
4 of Clubs  
4 of Diamonds  
---  
Marina  
---  
7 of Hearts  
Queen of Clubs  
10 of Spades  
4 of Spades  
2 of Diamonds
```