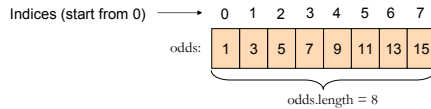


Arrays

- **Array:** A fixed-length data structure for storing multiple values of the same type
- **Example:** An array of odd numbers:



The type of all elements is int
The value of the element at index 4 is 9: odds[4] == 9

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Software 1

Recitation No. 2 Arrays and Control Structures

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Array Creation and Initialization

- What is the output of the following code:

```
int[] odds = new int[8];
for (int i=0 ; i < odds.length ; i++) {
    System.out.print(odds[i] + " ");
    odds[i] = 2*i+1;
    System.out.print(odds[i] + " ");
}
```

- Output: ?

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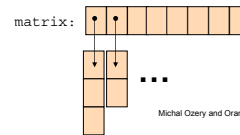
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Array Declaration

- An array is denoted by the [] notation

- Examples:

- int[] odds;
- int odds[]; // legal but discouraged
- String[] names;
- int[][] matrix; // an array of arrays



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Loop through Arrays

- By promoting the array's index:

```
for (int i=0 ; i < months.length ; i++) {
    System.out.println(months[i]);
}
```

- In Java 5.0:

```
for (String month: months) {
    System.out.println(month);
}
```

The variable month is assigned the next element in each iteration

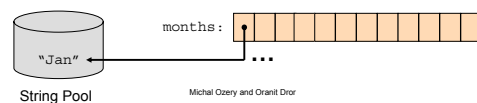
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Array Creation and Initialization

- Creating and initializing small arrays with *a-priori* known values:

- int[] odds = {1,3,5,7,9,11,13,15};
- String months[] = {"Jan", "Feb", "Mar", "Apr", "May", "Jun", "July", "Aug", "Sep", "Oct", "Nov", "Dec"};

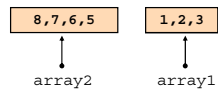


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Copying Arrays

- In the `java.lang.System` class:
 - `public static void arraycopy(Object src, int srcPos, Object dest, int destPos, int length)`
- `System.arraycopy(array2, 0, array1, 0, 2);`



- Details: <http://java.sun.com/j2se/1.5.0/docs/>

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Copying Arrays

- Assume:

```
int array1[] = {1, 2, 3};
int array2[] = {8, 7, 6, 5};
```

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Other Manipulations on Arrays

- The `java.util.Arrays` class has methods for sorting and searching, assigning arrays e.g.
 - `public static void sort(int[] a)`
 - `public static int binarySearch(int[] a, int key)`
 - `public static void fill(long[] a, long val)`
- More details in JDK 5.0 documentation <http://java.sun.com/j2se/1.5.0/docs/>

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Copying Arrays

- What is the output of the following code:

```
int[] odds = {1, 3, 5, 7, 9, 11, 13, 15};
int[] newOdds = new int[8];
System.arraycopy(odds, 1, newOdds, 1, 7);
for (int odd: odds) {
    System.out.print(odd + " ");
}
```
- Output: ?

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2D Arrays

```
int[][] table = new int[10][10];
for (int i = 0 ; i < 10 ; i++) {
    for (int j = 0 ; j < 10 ; j++) {
        table[i][j] = (i+1) * (j+1);
    }
}
```

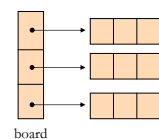
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2D Arrays

- There are no 2D arrays in Java but ...
- you can build array of arrays:

```
char[][] board = new char[3][3];
for (int i = 0; i < 3; i++)
    board[i] = new char[3];
```



Or equivalently:
`char[] board[] = new char[3][3];`

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Switch Statement

```
public static int computeElement(int n) {
    switch(n) {
        case 0:
            return 1;
        case 1:
            return 1;
            break;
        default:
            return computeElement(n-1) + computeElement(n-2);
    }
}
```

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Switch Statement

```
static int computeElement(int n) {
    switch(n) {
        case 0:
            return 1;
        case 1:
            return 1;
        default:
            return computeElement(n-1) + computeElement(n-2);
    }
}
```

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נתונים במקום חישוב

- בתרגום רקורסיה ללולאה אנו משתמשים במשתני עזר לשמירת המצב `prev` ו-`curr`
- הלולאה "זוכרת" את הנקודה שבה אנו נמצאים בתהליך החישוב
- דיון: יעילות לעומת פשטות.
- עיקרון ה-KISS (keep it short and simple)
- תרגיל: כתבו את השירות `computeElement` בעזרת `prev` ו-`prevPrev` בלבד (ללא `curr`)

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For Loop

- A loop instead of a recursion

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for vs. while

- The following two statements are equivalent:

```
for(int i = 0 ; i < n ; i++)
    System.out.println(computeElement(i));

int i=0;
while (i < n) {
    System.out.println(computeElement(i));
    i++;
}
```

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For Loop

- Printing the first n elements:

```
public class Fibonacci {
    public static int computeElement(int n) {
        ...
    }

    public static void main(String[] args) {
        for(int i = 0 ; i < 10 ; i++)
            System.out.println(computeElement(i));
    }
}
```

It is better to use args[0]

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while vs. do while

- The following two statements are equivalent:

```
int i=0;
while (i < n) {
    System.out.println(computeElement(i));
    i++;
}
```

```
int i=0;
do {
    System.out.println(computeElement(i));
    i++;
} while (i<n);
```

works since $n \geq 1$