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# ARRAYS

# Objectives

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Arrays

- ▶ Declare and create arrays of primitive, class, or array types
- ▶ Explain why elements of an array are initialized
- ▶ Given an array definition, initialize the elements of an array
- ▶ Determine the number of elements in an array
- ▶ Create a multidimensional array
- ▶ Write code to copy array values from one array type to another

# Declaring Arrays

- Group data objects of the same type
- Declare arrays of primitive or class types

```
char s[];
```

```
Point p[];
```

```
char [] s;
```

```
Point [] p;
```

- Create space for a reference
- An array is an object; it is created with **new**.

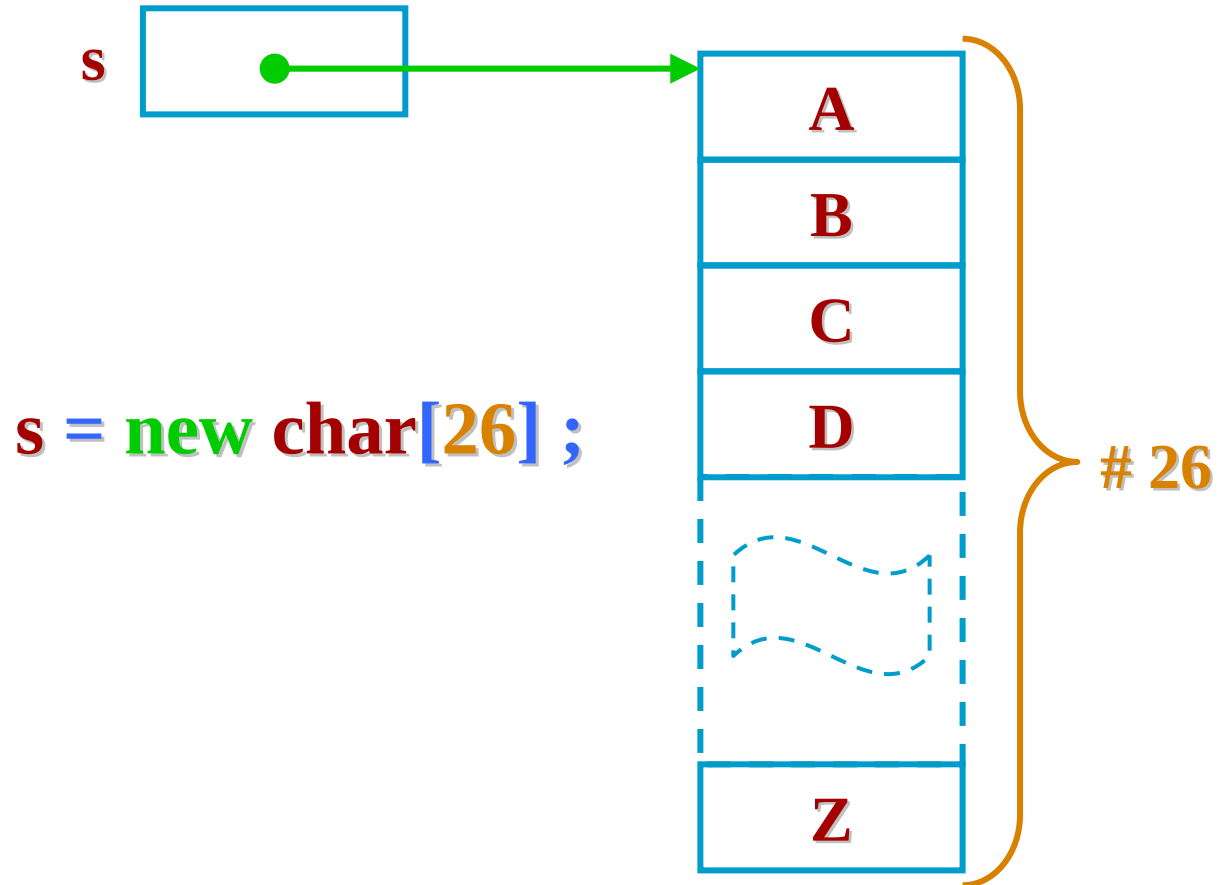
# Creating Arrays

1

Use the **new** keyword to create an array object.

For example, a primitive (char) array:

```
public char[] createArray() {  
    char[] s;  
    s = new char[26] ;  
    for (int i=0; i<26; i++){  
        s[i] = (char) ('A'+i) ;  
    }  
}
```

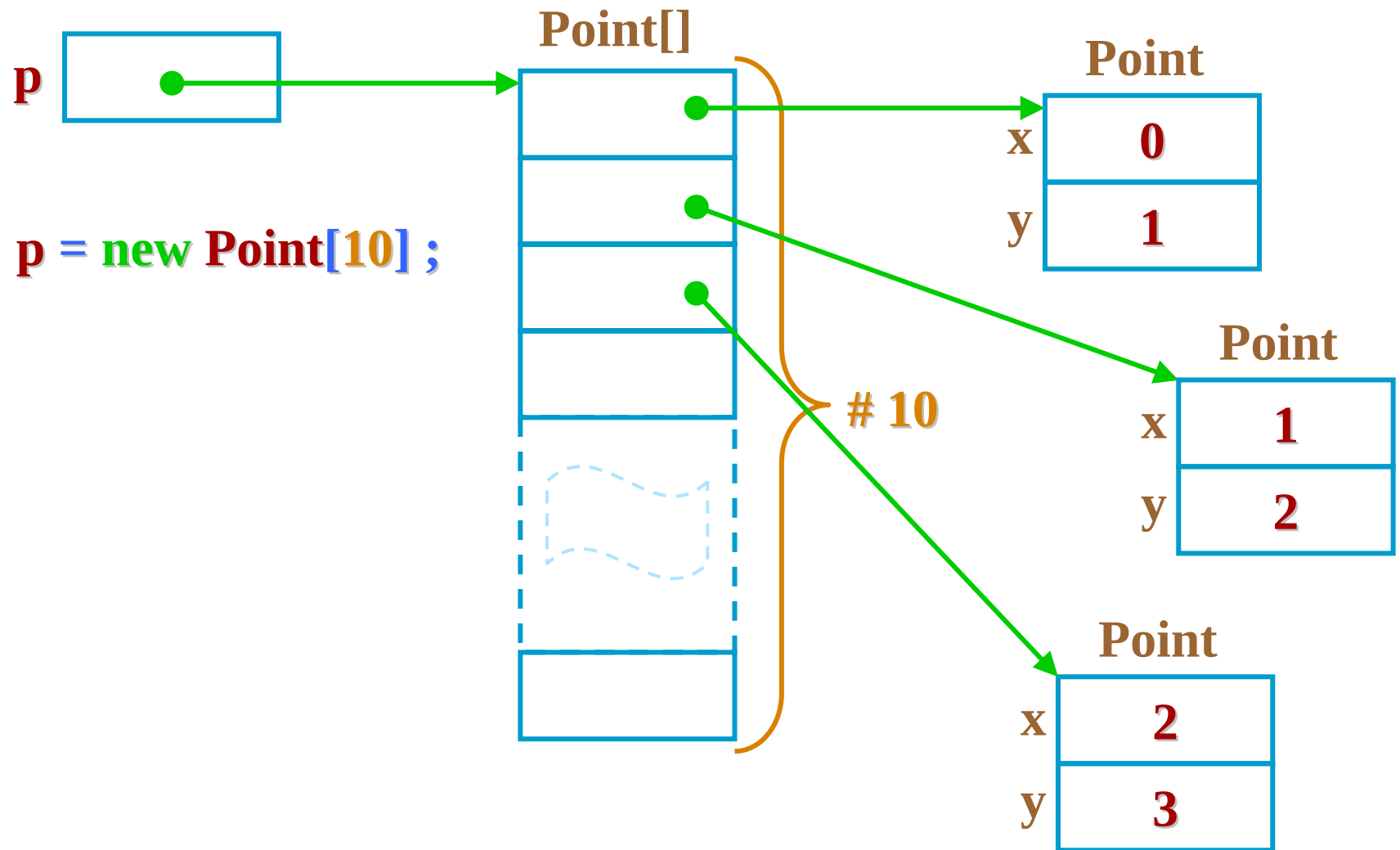


# Creating Arrays

2

Another example, an object array:

```
public Point[] createArray() {  
    Point[] s;  
    p = new Point[10] ;  
    for (int i=0; i<10; i++){  
        p[i] = new Point(i,i+1) ;  
    }  
}
```



# Initializing Arrays

- ▶ Initialize an array element
- ▶ Create an array with initial values :

```
String names[] ;  
names = new String[3] ;  
names[0]="Georgianna";  
names[1]="Jen";  
names[2]="Simon";
```

①

```
String names[] = {  
    "Georgianna",  
    "Jen",  
    "Simon"  
};
```

②

```
MyDate dates[] ;  
dates = new MyDate[3] ;  
dates[0]= new MyDate(22,7,1964);  
dates[1]= new MyDate(1,1,2000);  
dates[2]= new MyDate(22,12,1964);
```

1

```
MyDate dates[]= {  
    new MyDate(22,7,1964),  
    new MyDate(22,1,1964),  
    new MyDate(1,7,2000)  
};
```

2

# Multidimensional Arrays

## ► Arrays of arrays

```
int twoDim [][] = new int [4][];
```

```
twoDim[0] = new int[5];
```

```
twoDim[1] = new int[5];
```

rectangular array

```
int twoDim [][] = new int [][][4];
```

illegal

# Multidimensional Arrays

- ▶ Non-rectangular arrays of arrays

```
twoDim[0] = new int[2];
```

```
twoDim[1] = new int[4];
```

```
twoDim[2] = new int[6];
```

```
twoDim[3] = new int[8];
```

- ▶ Array of four arrays of five integers each

```
int twoDim[][] = new int[4][5];
```

## Array Bounds

All array subscripts begin at 0 :

```
int list[] = new int [10];  
for (int i = 0; i < list.length; i++){  
    System.out.println(list[i]);  
}
```

# Array Resizing

- ▶ Cannot resize an array
- ▶ Can use the same reference variable to refer to an entirely new array

```
int elements[] = new int[6];  
elements = new int[10];
```

# Copying Arrays

The `System.arraycopy()` method

//original array

```
int elements[] = { 1, 2, 3, 4, 5, 6 };
```

:

// new larger array

```
int hold[] = { 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 };
```

// copy all of the elements array to the hold

// array, starting with the 0th index

```
System.arraycopy(elements, 0, hold, 0, elements.length);
```

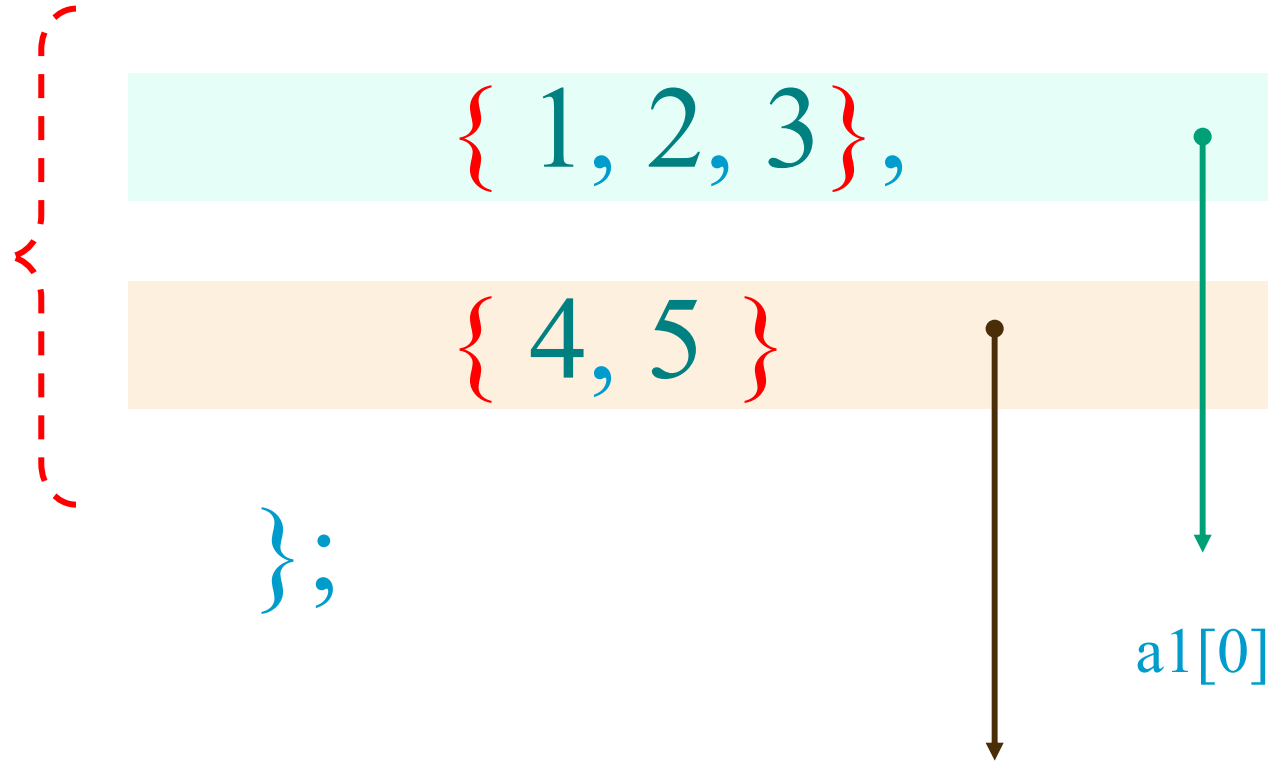
```
public class Arrays {  
    public static void main(String[] args) {  
        int[] a1 = { 1, 2, 3, 4, 5 };  
        int[] a2;  
        a2 = a1;  
        for(int i = 0; i < a2.length; i++)  
            a2[i]++;  
        for(int i = 0; i < a1.length; i++)  
            prt("a1[" + i + "] = " + a1[i]);  
    }  
}
```

```
int[][] a1 = {
```

```
{ 1, 2, 3 },
```

```
{ 4, 5 };
```

a1.length



a1[0].length

a1[1].length

## 5# Arrays

- ▶ Exercise-1: “Manipulating Arrays”
- ▶ Exercise-2: “Using Arrays to Represent Multiplicity”



# Practice Session

5

Arrays

write a method

```
public static int[] ins(int[] a,int x)
```

which takes a sorted integer array, **a**, and an integer value **x**, and then returns another sorted array, which includes elements of **a** and **x**.

```
import java.io.* ;

public class Insert {
    public static int [] ins(int[] a,int x){
        int r[],i,p;
        r = new int[a.length+1] ;
        for(i=0;i<a.length;i++){
            if(a[i]>x)
                break;
            r[i] = a[i] ;
        }
        r[i] = x ;
        i++;
        for(;i<=a.length;i++)
            r[i] = a[i-1] ;
        return r ;
    }
}
```



```
public static void print(int a[]){
    System.out.print("\n"+a[0]);
    for(int i=1;i<a.length;i++)
        System.out.print(", "+a[i]);
}
public static void main(String[] args) throws IOException {
    int c[]={1,2,3,4,6,7,8,9};
    int[] d ;
    int e = 5 ;
    d = ins(c,e) ;
    print(c);
    print(d);
}
}
```