

1D Arrays

Collections of primitive data



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One-Dimensional Arrays



- A one-dimensional array is a collection of data elements of the same data type.
- Each data element is stored in an individual cell of the array.
- Each cell has an **index** or **subscript**.
 - The first subscript is 0 (of course).
- We will begin our study with arrays of primitive data values.

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Arrays in Java



```
int[] highTemp = new int[8];
highTemp[0] = 37;
highTemp[1] = 48;
highTemp[2] = 35;
highTemp[3] = 40;
highTemp[4] = 47;
highTemp[5] = 60;
highTemp[6] = 53;
highTemp[7] = 49;
```

High temperature readings
for 8 days.

0	1	2	3	4	5	6	7
37	48	35	40	47	60	53	49

highTemp

```
int[] highTemp = {37, 48, 35, 40, 47, 60, 53, 49};
```

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Arrays in Java



```
int sum = 0;
for (int i = 0; i < highTemp.length; i++)
{
    sum += highTemp[i];
}
System.out.print("The average temperature "
    + "for the period is ");
System.out.println(_____);
```

equals the number of cells in the array

Be careful! This is not a method call!

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ArrayIndexOutOfBoundsException



```
int sum = 0;
for (int i = 0; i <= highTemp.length; i++)
{
    sum += highTemp[i];
}
```

Since there is no index 8 in the array (recall the length of the array is 8), this will cause an **ArrayIndexOutOfBoundsException** when *i* reaches 8

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Example:

Finding the maximum value stored in an array



```
int max = highTemp[0];
for (int i = 1; i < highTemp.length; i++)
{
    if (highTemp[i] > max)
        max = highTemp[i];
}
```

THINK ABOUT IT:

- What happens if there are two or more of the same maximum value in the array?
- How do we modify this code to compute the index of the maximum temperature?

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Example: Fibonacci Numbers



0, 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

Neat facts about the Fibonacci number sequence:

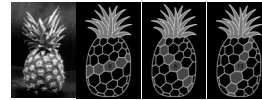
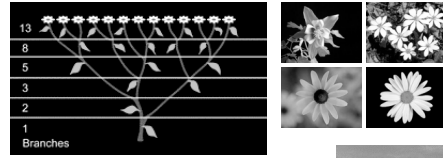
- The ratio of two adjacent Fibonacci numbers F_n/F_{n-1} approaches the golden ratio ϕ as $n \rightarrow \infty$, where $\phi = \frac{1}{2}(1 + \sqrt{5}) \approx 1.618$.
<http://educ.queensu.ca/~fmc/october2001/GoldenArc.htm>
- Fibonacci numbers occur in nature (plants, fruit):
<http://britton.disted.camosun.bc.ca/fibslide/jfbfslide.htm>
- Describes the population of multiplying rabbits:
<http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html#Rabbits>

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Example: Fibonacci Numbers



<http://britton.disted.camosun.bc.ca/fibslide/jfbfslide.htm>
<http://www.geom.uiuc.edu/~demo5337/s97b/art.htm>



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Example: Fibonacci Numbers



```
int[] fib = {0, 1, 1, 2, 3, 5, 8, 13, 21, 34};
```

OR

```
int[] fib = new int[10];
fib[0] = 0;
fib[1] = 1;
for (int i = 2; i < fib.length; i++)
{
    fib[i] = fib[i-1] + fib[i-2];
}
```

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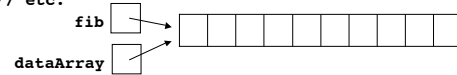
Arrays as Parameters



```
int[] fib = new int[10];
initialize(fib);
```

} in main, for example

```
public static void initialize(int[] dataArray)
{
    dataArray[0] = 0;
    dataArray[1] = 1;
    for (int i = 2; i < dataArray.length; i++)
        // etc.
}
```



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