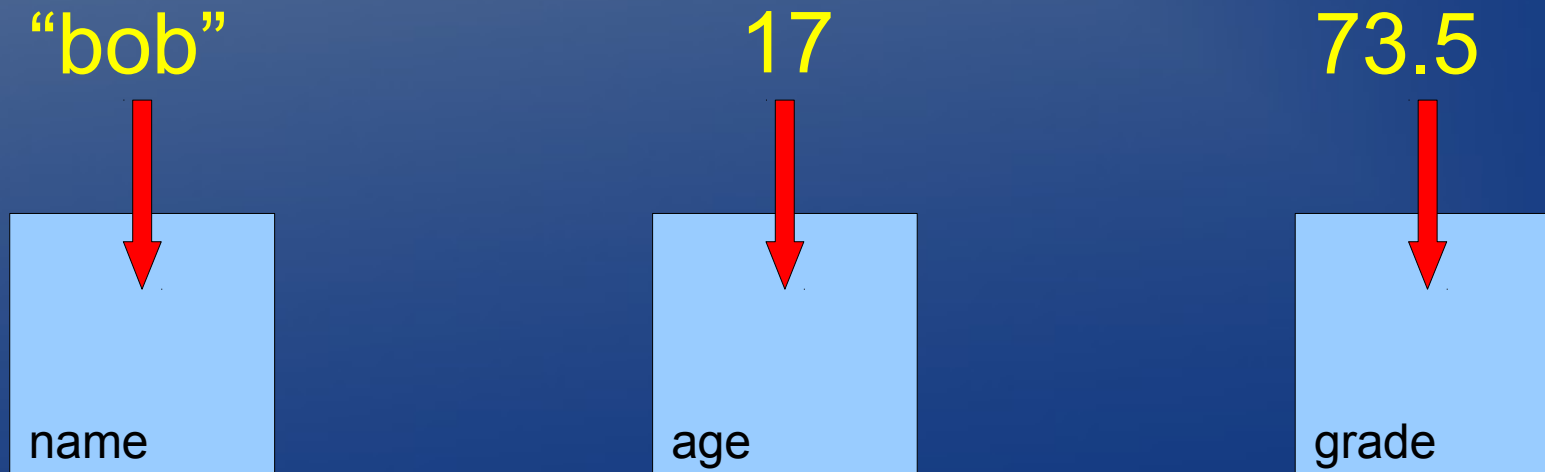# Introduction to Arrays

Recall – Variables

Each time we declare a variable, we are reserving a space in the memory of the computer. As the program runs (or executes), this space will be used to store useful information.

"bob"

17

73.5

name

age

grade

Limits on Variables

As programs gets larger and more complex, the number of variables also increases.

It is possible to <u>recycle variables</u>: When the variable is no longer used for one purpose, we can use it again for another purpose (with the same data type).

Even with recycling, the number of variables can get prohibitively large.

Collections of Data

One way to organize and simplify our programs is to make collections of <u>identical data types</u> that have the same description.

For example, suppose you were writing a grading program, but instead of a semester (4 grades), it was the entire set of grades for high school.

How many variables would you need?

Introducing the Array

The <u>array</u> is a special <u>data structure</u> that allows us to make large collections of data that:

(a) are of the same data type
    (i.e., int, real, string, etc...)

(b) will be used for the same purpose
    (e.g., grades, names, ages, addresses, etc...)

Arrays – a Collection of Variables

The common way to draw or visualize the array is using a group of connected boxes. Each box in the array has a position (1st, 2nd, 3rd, etc...).

Each box is called an element of the array, and the position of each element is the index.

1	2	3	4	5

an array with 5 elements

Arrays in Java

To declare an array in Java:

`dataType name[];`

name – the name of the array

dataType – `int`, `char`, `double`, `String`, etc...

Note: This creates the variable for the array, but it is not yet complete.

Arrays in Java

A full array declaration in Java:

```
dataType name[];
name = new dataType[size];
```

name – the name of the array
dataType – `int`, `char`, `double`, `String`, etc...

new – tells Java to create space in memory

size – the number of items, or elements, in array

Arrays in Java

An alternative way to declare arrays in one step:

```
dataType name[] = new dataType[size];
```

name – the name of the array

dataType – `int`, `char`, `double`, `String`, etc...

new – tells Java to create space in memory

size – the number of items, or <u>elements</u>, in array

Some Sample Array Declarations

```
// array of 10 student grades (integers)
int grades[];
grades = new int[10];

// average temperatures for each month
double avgTemp[];
avgTemp = new double[12];

// e-mail list for 100 members
String mailList = new String[100];
```