Arrays

Storing Multiple Values
Motels

If you have a room in a motel and they give you room 5, which room is it?
Hotels

- If you have room 1541 in the Deluxe Ritz Hilton, which floor would you find your room on?
Numbering Locations

- Motel Rooms are numbered in series - 1 through 6.
- Room 3 is the third room.
Numbering Computer Memory Locations

- A series of memory locations can be so numbered
- This series is called an array
- Arrays are referenced with a subscript.

Rooms

1 2 3 4 5 6 7 8 9 10 11
So if our array is called Room and we want location 3, we just say Room(3)
Declaring Arrays

- We need to declare arrays before we use them.
- Array name is given
- Then the length of the array in parenthesis
- Finally the type is given.
Example Declarations

- Dim Rooms(1 To 15) as Integer
- Dim Scores(15) As Single
  These are numbered zero to 14!
- Dim Locations(-5 to 20) as String
  They can start anywhere!
- Dim Fleebs(1 to 100000) as Long
  They can be large!
More Examples

- For holding the grades from a class:
  Dim grades(1 to 30) as Single

- For holding the season wins and losses for the Red Wings:
  Dim wins(1 to 50) as Integer

- For holding the names of everyone in class:
  Dim names(1 to 30) as String
Array Limitation

- Under VB 4.0 & 5.0

Arrays are limited by the available memory

Arrays that are larger than RAM will make your program slooooot

w!
Question:

- How would you declare an array called students with 30 elements all of type String?

A. Dim String of Students(1 to 30)
B. Dim Students as String(1 to 30)
C. Dim Students(1 to 30) as String
D. B or C
E. None of the above
Using an Array

- Arrays can be used just like other variables, as long as you include their subscript:
  
  name(2) = “Jeffrey Lockledge”
  grade(3) = grade(3) + 100
  result = grade(3) * grade(4) + 2
The Combination of Arrays and Loops

To zero out an array of grades:
Dim grades(1 to 10) as Single
Dim i as Integer
For i = 1 to 10
    grades(i) = 0
Next i
I want to set the value of each element of an array to its index (i.e. student(1) contains 1)

Dim Student(1 To 30) as Single

Dim k as Integer
For k = 1 to 30
‘What goes here?
Next k

A. student(k) = 0
B. student(0) = k
C. student(k) = student(k)
D. student(k) = k
E. None of the above
Just a Note

- Non-Array variables are called Scalar variables
  - Temp(5) is an array variable
  - Fleeb is a scalar
Sorting

- Putting numbers in order.
- Also allows us to put letters in order (alphabetize).
- Ascending, smallest first.
- Descending, largest first.
INTRODUCING!
The Sort

This is a thought area, do not enter without a functioning brain.
Pseudo Code

- **Pseudo Code for Sort:**
  - Find the smallest element.
  - Put it in the firstest place.
  - Repeat, ignoring the old firstest element.
Sorting Pseudo Code, Refined

- Find the smallest number:
  Assume the first number is the smallest. Compare it to each of the numbers remaining in the array.
  If any numbers are smaller than the first number, swap them with the first position.
  Now you know the smallest number is at the beginning of the array.
Now that you know the smallest number is at the beginning

Repeat this process ignoring elements you’ve already put in the proper place.

When you’ve done this with all the elements, the array is sorted.
Refining the Psuedo Code Again

- For each element in the array
  
  Compare each element in the array to the first element.
  
  - If the first element is bigger, swap the current element with the first element
<table>
<thead>
<tr>
<th></th>
<th>9 6 3 2 5</th>
<th>2 9 6 3 5</th>
<th>2 3 9 6 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 9 3 2 5</td>
<td>6 9 3 5</td>
<td>6 9 5</td>
<td></td>
</tr>
<tr>
<td>3 9 6 2 5</td>
<td>3 9 6 5</td>
<td>5 9 6</td>
<td></td>
</tr>
<tr>
<td>2 9 6 3 5</td>
<td>3 9 6 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 9 6 3 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 3 5 9 6</td>
<td>2 3 5 6 9</td>
<td>2 3 5 6 9</td>
</tr>
<tr>
<td>6 9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
for i = beginning to the end
    for j = i to end
        if (i’th > j’th) then
            swap the j’th and i’th
        endif
    next j
next i
VB Code for Sorting

For i = 1 To 10
    For j = i To 10
        If (arr(i) > arr(j)) Then
            temp = arr(I)
            arr(i) = arr(j)
            arr(j) = temp
        End If
    Next j
Next i
If I’m starting the insertion sort what would my array look like on the next value for i?

8 9 5 4 2 1 -> ?

A. 9 8 5 4 2 1
B. 1 9 5 4 2 8
C. 1 8 5 4 9 2
D. 1 2 4 5 8 9
E. None of the Above
Two Dimensional Arrays

- What if we wanted to hold a table of information?
- We can create arrays that form a grid of locations, something like a spreadsheet.
- These are also referred to as a Matrix
Matrix Illustration

1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
1 2 3 4 5 6
Declaring a Two Dimensional Array

- Syntax as a one dimensional array with additional term
  Dim grades(1 to 5, 1 to 6) as Single
- This declaration will give us 5 rows and 6 columns to keep data in. Each row might be a student, each column a grade.
# Grade 2D Array

<table>
<thead>
<tr>
<th>Grade</th>
<th>Grade</th>
<th>Grade</th>
<th>Grade</th>
<th>Grade</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Student</td>
<td>Student</td>
<td>Student</td>
<td>Student</td>
<td>Student</td>
<td>Student</td>
</tr>
</tbody>
</table>
Loops and Two Dimensional Arrays

Zeroing out a two dimensional array.

Dim grades(1 to 5, 1 to 6) as Single
Dim i as Integer, j as Integer
For i = 1 to 5
    For j = 1 to 6
        grades(i,j) = 0
    Next j
Next i
Question

- To display the values in the diagonal of a two dimensional array, which code could I use?

A. For k = 1 to 10
   For j = 1 to 10
     if(k = j) then
       MsgBox arr(j,k)
     end if
   next j
next k

B. For k = 1 to 10
   MsgBox arr(k,k)
   Next k

C. Either One

D. Neither One