ITC 5 – Web Programming

Chapter 4. Working with Arrays

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1.1. What is an Array?

- An array is a special type of variable.
  - can hold multiple data values
- A sequential array keeps track of these data items by using sequential numbers
  - (e.g., item 0, item 1, item 2, and so on)
- A nonsequential array or associative array keeps track of these data items by using character strings
  - (e.g., item meat, item poultry, item dairy, and so on)

1.2. Why Use Arrays?

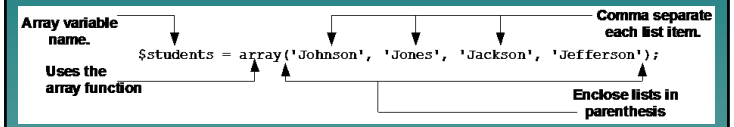
- *Include a flexible number of list items.*
- *Examine each item more concisely.*
- *Using Loops to Repeat Statements*
- *Use special array operators and functions.*

Content

1. Benefits of arrays
2. Sequential arrays
3. Non-sequential arrays
4. Multidimensional lists

2.1. Creating Sequential Arrays

- Use the array() function to create an array



- You could also create an array with numerical data
  - `$grades = array(66, 75, 85, 80);`

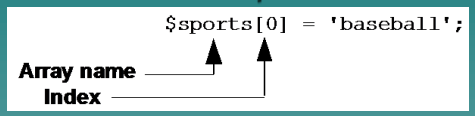
Another way to create an array

- You can also create an array by making individual value assignments into the array variable name.
- For example, `$students[] = 'Johnson';`

```
$students[] = 'Jones';
$students[] = 'Jackson';
$students[] = 'Jefferson';
```

2.2. Referencing Sequential Array Items

- To reference individual array items, use an *array name* and *index pair*



- Indices are referenced sequentially:
  - `$names = array('Denise', 'Christopher', 'Matthew', 'Bryant');`
  - `print ("$names[0], $names[1], $names[2], $names[3]");`
- Outputs names sequentially

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Warning: Indices starts with 0

- You might think the arrays in the preceding code would be numbered with indices 1 through 4.
  - By default sequential arrays start with index 0,
  - so the indices above are numbered from 0 to 3.
  - Avoid referencing an item past the end of your array (for example, using `$names[20]` in an array that contains only four items).

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More on Indices ...

- Array indices can be whole numbers or a variable.

```
$i=3;
$classes = array('Math', 'History', 'Science', 'Pottery');
$oneclass = $classes[$i-1];
print "$classes[$i] $oneclass $classes[1] $classes[0]";
```

- This code outputs the following:

  "Pottery Science History Math"

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2.3. Changing arrays values

- You can change values in an array as follows:

```
$scores = array(75, 65, 85, 90);
$scores[3] = 95;
$average = ($scores[0] + $scores[1] +
                $scores[2] + $scores[3]) / 4;
print "average=$average";
```

- The output of the above PHP segment is "average=80".

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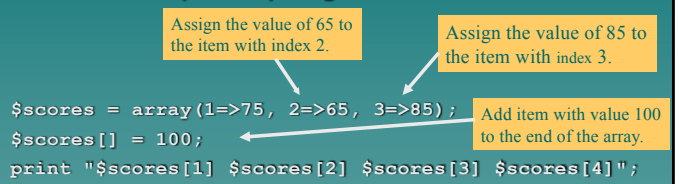
Explicitly Setting Index Values

- You can explicitly sign values to indices



- The above outputs "`75 65 85 100`".

2.4. Using Loops with Sequential Arrays

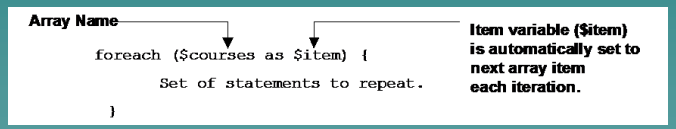
- Looping statements can be used to iterate through arrays

```
$courses = array ('Perl', 'PHP', 'C','Java', 'Pascal', 'Cobol',
   'Visual Basic');
for ($i=0; $i < count($courses); $i++) {
    print ("$courses[$i] ");
}
```

- The above repeats 7 times with $i equal to 0, 1, 2, 3, 4, 5, and 6.
- The above outputs: "`Perl PHP C Java Pascal Cobol Visual Basic`".

Using the foreach statement

- PHP supports the foreach statement as another way to iterate through arrays



foreach statement - example

- Example of foreach command

```
$courses = array('Perl', 'PHP', 'C', 'Java','Pascal',
   'Cobol', 'Visual Basic');
foreach ($courses as $item){
    print ("$item ");
}
```

- The above outputs "`Perl PHP C Java Pascal Cobol Visual Basic`".

Sorting data

- For example the following code segment outputs "1 11 55 91 99 119 911"

```
$courses = array (91, 55, 11, 1, 99, 911, 119);
sort($courses);
foreach ($courses as $item) {
    print "$item ";
}
```

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Sorting data functions

Effect	Ascending	Descending	User-defined order
Sort array by values, then reassign indices starting with 0	sort( )	rsort( )	usort( )
Sort array by values	asort( )	arsort( )	uasort( )
Sort array by keys	ksort( )	krsort( )	uksort( )

- User-defined ordering requires that you provide a function that takes two values and returns a value that specifies the order of the two values in the sorted array.
  - return 1 if the first value is greater than the second
  - -1 if the first value is less than the second
  - 0 if the values are the same for the purposes of your custom sort order

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A Full Script Example

- Consider an example script that enables end-user to select multiple items from a checklist.
  - A survey about menu preferences
  - Will look at how to send multiple items and how to receive them (later)

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A Full Example ...

```
1. <html><head><title> Tuna Cafe </title></head>
2. <body> <font size=4 color="blue">
3. Welcome to the Tuna Cafe Survey! </font>
4. <form action="http://webwizard.aw.com/~phppgm/C5/tunaresults.php"
   method=post>
5. <?php
6. $menu = array('Tuna Casserole', 'Tuna Sandwich', 'Tuna Pie', 'Grilled Tuna',
                                                        'Tuna Surprise');
7. $bestseller = 2;
8. print 'Please indicate all your favorite dishes.<br>';
9. for ($i=0; $i < count($menu); $i++) {
10.       print "<input type=\"checkbox\" name=\"prefer[]\" value=$i>
   $menu[$i]";
11.       if ($i == $bestseller) {
12.           print '<font color="red"> Our Best Seller!!! </font>';
13.       }
14.    print '<br>';
15. }
16. ?>
17. <input type="submit" value="Click To Submit">
18. <input type="reset" value="Erase and Restart">
19. </form></body></html>
```

Create a list of menu items.

This array will be available to the receiving script when the form is submitted.

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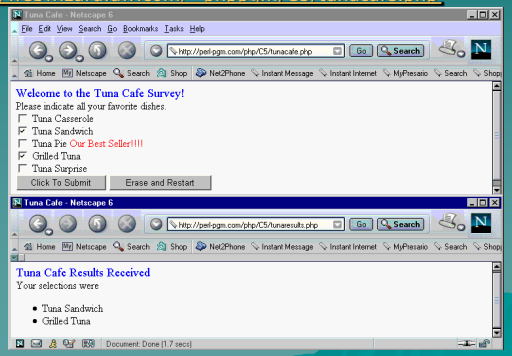
The Output ...

The previous code can be executed at
http://webwizard.aw.com/~phppgm/C5/tunacafe.php



Using Arrays to Receive Multiple Form Element Selections

- Suppose you want to receive these multiple items, set as:

```
print "<input type=\"checkbox\" name=\"prefer[]\"
  value=$i> $menu[$i]";
```

- If the user selects the first and third check box items shown then $prefer[] would be an array of two items:
  - $prefer[0], would have a value of 0, and $prefer[1] would be 2.

Receiving Script

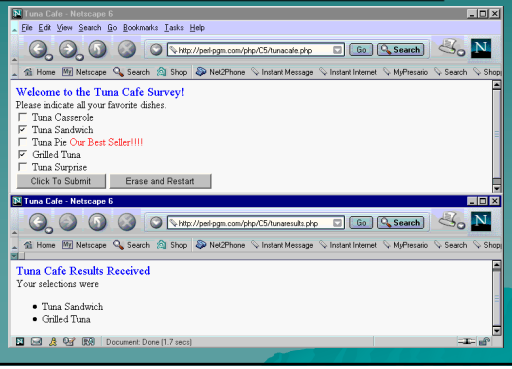
```
1. <html>
2. <head><title> Tuna Cafe </title></head>
3. <body>
4. <font size=4 color="blue"> Tuna Cafe Results Received </font>
5. <?php
6.       $menu = array('Tuna Casserole', 'Tuna Sandwich', 'Tuna Pie',
                       'Grilled Tuna', 'Tuna Surprise');
7.     if (count($prefer) == 0 ) {
8.         print 'Oh no! Please pick something as your favorite! ';
9.     } else {
10.      print '<br>Your selections were <ul>';
11.      foreach ($prefer as $item) {
12.          print "<li>$menu[$item]</li>";
13.     }
14.    print '</ul>';
15. }
16. ?>
17. </body></html>
```


Receiving Code with REGISTER_GLOBALS Off

```
1. <html>
2. <head><title> Tuna Cafe </title></head>
3. <body>
4. <font size=4 color="blue"> Tuna Cafe Results Received </font>
5. <?php
6.       $perfer = $_POST["prefer"];
7.       $menu = array('Tuna Casserole', 'Tuna Sandwich', 'Tuna Pie',
                                          'Grilled Tuna', 'Tuna Surprise');
8.     if (count($prefer) == 0 ) {
9.         print 'Oh no! Please pick something as your favorite! ';
10.    } else {
11.      print '<br>Your selections were <ul>';
12.      foreach ($prefer as $item) {
13.          print "<li>$menu[$item]</li>";
14.    }
15.    print '</ul>';
16. }
17. ?>
18. </body></html>
```

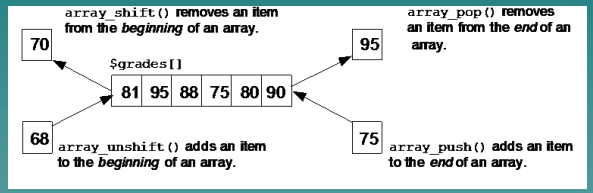
The Output ...

The previous code can be executed at
http://webwizard.aw.com/~phppgm/C5/tunacafe.php



2.5. More Arrays Operations

- Adding and Deleting Items



a. The `array_shift()` functions

- array_shift() accepts an array as an argument, removes the first item, and then returns the removed item.
- For example,

```
$work_week = array('Monday','Wednesday', 'Friday');
$day_off = array_shift($work_week);
print "Day off = $day_off Work week = ";
foreach ($work_week as $day) {
    print "$day ";
}
```

The above outputs:

"Day off = Monday Work week = Wednesday Friday"

b. The `array_unshift()` functions

- array_unshift() used to *add* an item to the *beginning* of the array.
- It accepts as arguments an array variable and an item to add. For example,

```
$work_week = array('Monday', 'Wednesday', 'Friday');
array_unshift($work_week, 'Sunday');
print 'Work week is now = ';
foreach ($work_week as $day) {
    print "$day ";
}
```

The above outputs:

```
"Work week is now = Sunday Monday Wednesday
Friday".
```

c. The `array_pop()` functions

- array_pop() accepts an array variable as an argument and returns an item it removed from the end of the array.
- For example,

```
$work_week = array('Monday', 'Wednesday', 'Friday');
$day_off = array_pop($work_week);
print "Day off = $day_off Work week = ";
foreach ($work_week as $day) {
    print "$day ";
}
```

The above outputs:

"Day off = Friday Work week = Monday Wednesday"

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d. The `array_push()` functions

- array_push() accepts an array variable and an item as arguments and adds the item to the end of an array.
- For example, the following code:

```
$work_week = array('Monday', 'Wednesday','Friday');
array_push($work_week, 'Saturday');
print 'Work week is now = ';
foreach ($work_week as $day) {
    print "$day ";
}
```

The above outputs:

"Work week is now = Monday Wednesday Friday Saturday"

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e. Additional Useful Array Functions

- Use `max()` and `min()` to find the largest and smallest number in an array.

```
$grades = array (99, 100, 55, 91, 65, 22, 16);
$big=max($grades);
$small=min($grades);
print "max=$big small=$small";
```

The above would output:

"max=100 small=16".

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e. Additional Useful Array Functions (2)

- Use array_sum() to return a sum of all numerical values.
- For example,

```
$grades = array (25, 100, 50, 'N/A');
$total=array_sum($grades);
print "Total=$total";
```

- The above would output:

"Total=175"

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Mixing Variable Types

- PHP will try to convert character to numerical values when it can. For example,

```
<?php
$grades = array ('2 nights', '3days', 50, '1 more day');
$total=array_sum($grades);
print "total=$total";
?>
```

- Instead of generating an error message, this code outputs "total=56".

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Content

1. Benefits of arrays
2. Sequential arrays
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3. Non-sequential arrays

- PHP also supports arrays with string-value indices called non-sequential/associative arrays.
  - String-value index is used to look up or provide a cross-reference to the data value
  - For example, the following code creates an associative array with three items

```
$instructor['Science'] = 'Smith';
$instructor['Math'] = 'Jones';
$instructor['English'] = 'Jackson';
```

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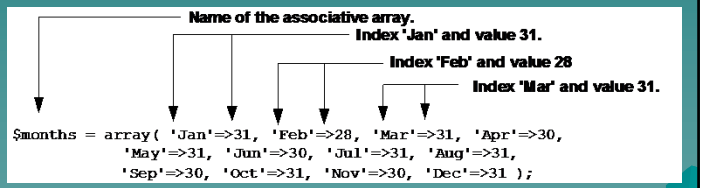
3.1. Creating Associative Arrays

- Use the array() function along with the => operator to create an associative array



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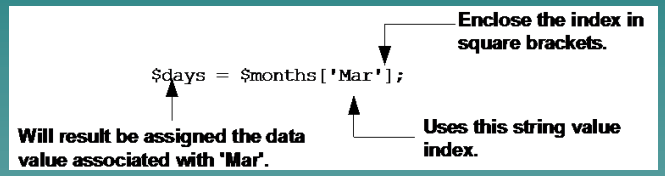
3.2. Accessing Associative Array Items

- Use a syntax similar to sequential arrays to access items



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WARNING You Cannot Fetch Indices by Using Data Values

- You might be tempted to use a data item to fetch an index from an associative array, as in the following example:
  - `$mon = $months[28];`
- This syntax is incorrect because associative arrays can fetch data values only by using indices (not the other way around)

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Consider the following example ...

- Consider an application that reports distance between Chicago and destination cities

```
<select name="destination" size=3>
<option> Boston </option>
<option> Dallas </option>
<option> Las Vegas </option>
<option> Miami </option>
<option> Nashville </option>
<option> Pittsburgh </option>
<option> San Francisco </option>
<option> Toronto </option>
<option> Washington, DC </option>
</select>
```

- When user selects destination city the application reports distance from Chicago

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Example script source

Associative array containing destination city and distance.

Check if the input destination city has a value in $cities[].

Round results to 2 digits to the right of the decimal point.

```
1. <html>
2. <head><title> Distance and Time Calculations </title></head>
3. <body>
4. <?php
5. $cities = array ('Dallas' => 803, 'Toronto' => 435, 'Boston' => 848, 'Nashville' =>
   406, 'Las Vegas' => 1526, 'San Francisco' => 1835, 'Washington, DC'=> 595,
   'Miami' => 1189, 'Pittsburgh' => 409);
6. if (isset($cities[$destination])) {
7.     $distance = $cities[$destination];
8.     $time = round( ($distance / 60), 2);
9.     $walktime = round( ($distance / 5), 2);
10.    print "The distance between Chicago and <i> $destination</i>
   miles.";
11.    print "<br>Driving at 60 miles per hour it would take $time hours.";
12.    print "<br>Walking at 5 miles per hour it would take $walktime hours.";
13. } else {
14.    print "Sorry, do not have destination information for $destination.";
15. } ?>
16. </body></html>
```

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Example script source with REGISTER_GLOBALS Off

```
1. <html>
2. <head><title> Distance and Time Calculations </title></head>
3. <body>
4. <?php
5.    $destination = $_POST["destination"];
6.    $cities = array ('Dallas' => 803, 'Toronto' => 435, 'Boston' => 848, 'Nashville' =>
      406, 'Las Vegas' => 1526, 'San Francisco' => 1835, 'Washington, DC'=> 595, 'Miami'
      => 1189, 'Pittsburgh' => 409);
7. if (isset($cities[$destination])) {
8.      $distance = $cities[$destination];
9.      $time = round( ($distance / 60), 2);
10.    $walktime = round( ($distance / 5), 2);
11.    print "The distance between Chicago and <i>$destination</i> is $distance miles.";
12.    print "<br>Driving at 60 miles per hour it would take $time hours.";
13.    print "<br>Walking at 5 miles per hour it would take $walktime hours.";
14. } else {
15.    print "Sorry, do not have destination information for $destination.";
16. } ?>
17. </body></html>
```

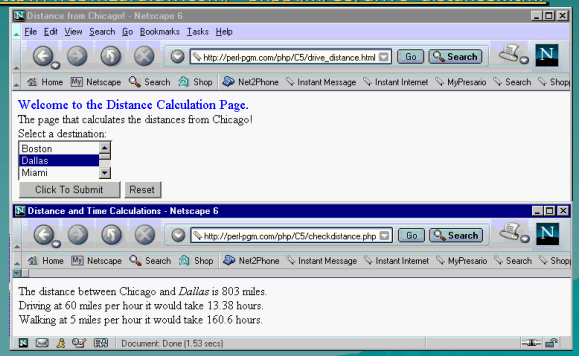
Associative array containing destination city and distance.

Check if the input destination city has a value in $cities[].

Round results to 2 digits to the right of the decimal point.

The Output ...

The previous code can be executed at
http://webwizard.aw.com/~phpgm/C5/drive_distance.html



3.3. Using foreach with associative arrays

- You can use foreach to access items from an associative array

```
Array Name
        foreach ($courses as $index => $item) {
                Set of statements to repeat.
        }
```

Index variable ($index) is automatically set to next array index each iteration.

Item variable ($item) is automatically set to next array value each iteration.

3.3. Using foreach with associative arrays (2)

- Consider the following:

```
$inventory = array('Nuts'=>33, 'Bolts'=>55, 'Screws'=>12);
foreach ($inventory as $index => $item) {
     print "Index is $index, value is $item<br> ";
}
```

- The above outputs:

```
Index is Nuts, value is 33
Index is Bolts, value is 55
Index is Screws, value is 12
```

3.4. Changing adding/deleting items

- You can change an item by giving it a new value:

```
$inventory = array('Nuts'=> 33, 'Bolts'=> 55,
  'Screws'=> 12);
$inventory['Nuts'] = 100;
```

- You can add an item as follows:

```
$inventory = array('Nuts'=>33, 'Bolts'=>55, 'Screws'=>12);
$inventory['Nails'] = 23;
```

- You can delete an item as follows:

```
$inventory = array('Nuts'=> 33, 'Bolts'=>55, 'Screws'=> 12);
unset($inventory['Nuts']);
```

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3.5. Verifying an items existance

- You can use the isset() function to verify if an item exists.

```
$inventory = array('Nuts'=> 33,'Bolts'=>55,'Screws'=> 12);
if (isset($inventory['Nuts'])) {
   print ('Nuts are in the list.');
} else {
   print ('No Nuts in this list.');
}
```

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Warning indices are case sensitive

- Examine the following lines:

```
$inventory = array( 'Nuts'=> 33,'Bolts'=>55,'Screws'=>12);
$inventory['nuts'] = 32;
```

- Results in items 'Nuts', 'Bolts', 'Screws', and 'nuts'

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A Full Application

- Consider an application using the following radio buttons:

```
<input type="radio" name="Action" value="Add" > Add
<input type="radio" name="Action" value="Unknown" > Unknown
<br>Enter Index: <input type="text" name="index" size=10>
Enter Value: <input type="text" name="value" size=10>
```

- It "simulates" adding an inventory item

  That is, it adds it to associative array but does not save to a file or database.

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PHP Source ...

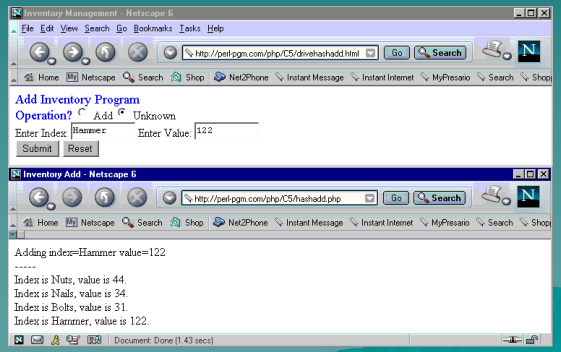
```
1. <html><head><title>Inventory Add </title>
2. </head><body>
3. <?php
4. $invent = array('Nuts'=>44, 'Nails'=>34, 'Bolts'=>31);
5. if ($Action == 'Add'){
6.    $item=$invent["$index"];
7.    if (isset($invent["$index"])) {
8.        print "Sorry, already exists $index <br>";
9.    } else {
10.       $invent["$index"] = $Value;
11.       print "Adding index=$index value=$Value <br>";
12.       print '-----<br>';
13.       foreach ($invent as $index => $item) {
14.           print "Index is $index, value is $item.<br> ";
15.       }
16.   }
17. } else { print "Sorry, no such action=$Action<br>"; }
18. ?></body></html>
```


PHP Source with REGISTER_GLOBALS Off...

```
1. <html><head><title>Inventory Add </title>
2. </head><body>
3. <?php   $index = $_POST["index"]; $Value = $_POST["Value"];
4. $invent = array('Nuts'=>44, 'Nails'=>34, 'Bolts'=>31);
5. if ($Action == 'Add'){
6.    $item=$invent["$index"];
7.    if (isset($invent["$index"])) {
8.        print "Sorry, already exists $index <br>";
9.    } else {
10.       $invent["$index"] = $Value;
11.       print "Adding index=$index value=$Value <br>";
12.       print '-----<br>';
13.       foreach ($invent as $index => $item) {
14.           print "Index is $index, value is $item.<br> ";
15.       }
16.   }
17. } else { print "Sorry, no such action=$Action<br>"; }
18. ?></body></html>
```


Would output the following:

The previous code can be executed at
http://webwizard.aw.com/~phppgm/C5/drivehashadd.html



3.6. Sorting Associative Arrays

- You can sort associative arrays by values or indices.
- Use asort() to sort by values:

```
$dest = array('Dallas' => 803, 'Toronto' => 435,
              'Boston' => 848, 'Nashville' => 406,
              'Las Vegas' => 1526);
asort($dest);
foreach ($dest as $index => $value) {
       print " $index = $value ";
}
```

- The above would output:

```
Nashville = 406  Toronto = 435  Dallas = 803  Boston = 848
Las Vegas = 1526
```

3.6. Sorting Associative Arrays (2)

- Use ksort() to sort by indices:

```
$dest = array ('Dallas' => 803, 'Toronto' => 435,
            'Boston' => 848, 'Nashville' => 406,
            'Las Vegas' => 1526);
      ksort($dest);
      foreach ($dest as $index => $value) {
            print " $index = $value ";
       }
```

- The above would output:

```
Boston = 848  Dallas = 803  Las Vegas = 1526  Nashville =
 406  Toronto = 435
```


Content

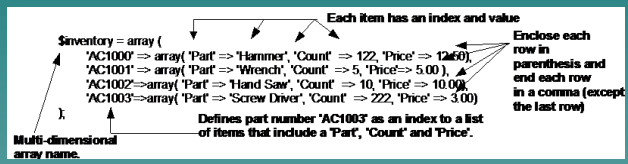
4. Multiple dimensional lists

- Some data is best represented using a list of list or a multi-dimensional list.
- For example:

Part Number	Part Name	Count	Price
AC1000	Hammer	122	12.50
AC1001	Wrench	5	5.00
AC1002	Handsaw	10	10.00
AC1003	Screwdriver	222	3.00

4.1. Creating Multidimensional Lists

- You can create multidimensional arrays with the array() function




```
$inventory['AC1000']['Part'] has the value Hammer,
$inventory['AC1001']['Count'] has the value 5, and
$inventory['AC1002']['Price'] has the value 10.00.
```

A Full Application

- Application that receives a part number and then returns information about the part
  - Uses the following HTML form:

```
<input type="radio" name="id" value="AC1000"> AC1000
<input type="radio" name="id" value="AC1001"> AC1001
<input type="radio" name="id" value="AC1002"> AC1002
<input type="radio" name="id" value="AC1003"> AC1003
```


PHP Script Source

```
1. <html><head><title>Inventory Information</title>
2. </head><body>
3. <?php
4.  $inventory = array (
    'AC1000'=>array('Part'=>'Hammer','Count'=>122, 'Price'=> 12.50 ),
    'AC1001' => array('Part' =>'Wrench','Count' =>5, 'Price'=>5.00 ),
    'AC1002'=>array('Part' =>'Handsaw','Count' =>10, 'Price'=>10.00 ),
    'AC1003'=>array('Part' =>'Screwdrivers','Count'=>222, 'Price'=>3.00)
      );
5. if (isset($inventory[$id])){
6.    print '<font size=4 color="blue"> ';
7.    print "Inventory Information for Part $id </font>";
8.    print '<table border=1> <th> ID <th> Part <th> Count <th> Price ';
9.    print "<tr> <td> $id </td>";
10.       print "<td> {$inventory[$id]['Part']} </td>";
11.       print "<td> {$inventory[$id]['Count']} </td>";
12.       print "<td> \${$inventory[$id]['Price']} </td></tr>";
13.    } else {
14.       print "Illegal part ID = $id ";
15.    }
16.?> </body></html>
```


PHP Script Source With REGISTER_GLOBALS Off

```
1. <html><head><title>Inventory Information</title>
2. </head><body>
3. <?php  $id = $_POST["id"];
4.  $inventory = array (
   'AC1000'=>array('Part'=>'Hammer','Count'=>122, 'Price'=> 12.50 ),
   'AC1001' => array('Part' =>'Wrench','Count' =>5, 'Price'=>5.00 ),
   'AC1002'=>array('Part' =>'Handsaw','Count' =>10, 'Price'=>10.00 ),
   'AC1003'=>array('Part' =>'Screwdrivers','Count'=>222, 'Price'=>3.00)
     );
5. if (isset($inventory[$id])){
6.   print '<font size=4 color="blue"> ';
7.   print "Inventory Information for Part $id </font>";
8.   print '<table border=1> <th> ID <th> Part <th> Count <th> Price ';
9.   print "<tr> <td> $id </td>";
10.  print "<td> {$inventory[$id]['Part']} </td>";
11.  print "<td> {$inventory[$id]['Count']} </td>";
12.  print "<td> \${$inventory[$id]['Price']} </td></tr>";
13. } else {
14.   print "Illegal part ID = $id ";
15. }
16.?> </body></html>
```


Would output the following ...

The previous code can be executed at
http://webwizard.aw.com/~phppgm/C5/drive_inventory.php