Lecture No: 3
Topic: Manipulating Strings

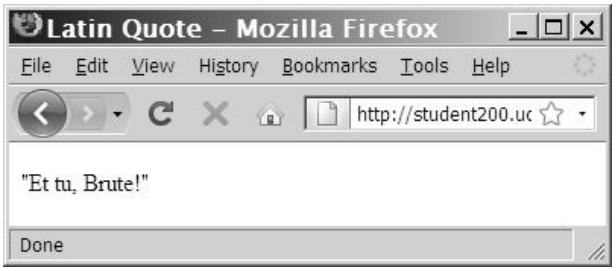
Objectives:
In this chapter, you will:
- Construct text strings
- Work with single strings
- Work with multiple strings and parse strings
- Compare strings
- Use regular expressions

Constructing Text Strings
- A text string contains zero or more characters surrounded by double or single quotation marks
- Text strings can be used as literal values or assigned to a variable

```
echo "<PHP literal text string</p>";
$StringVariable = "<p>PHP literal text string</p>";
echo $StringVariable;
```

- A string must begin and end with a matching quotation mark (single or double)
- To include a quoted string within a literal string surrounded by double quotation marks, you surround the quoted string with single quotation marks
- To include a quoted string within a literal string surrounded by single quotation marks, you surround the quoted string with double quotation marks:

```
$LatinQuote = '<p>"Et tu, Brute!"</p>';
echo $LatinQuote;
```



Working with String Operators
In PHP, you use two operators to combine strings:
- **Concatenation operator** (.) combines two strings and assigns the new value to a variable

```
$City = "Paris";
$Country = "France";
$Destination = <p>“ . $City . " is in "
                . $Country . ".</p>";
echo $Destination;
```

- You can also combine strings using the **concatenation assignment operator** (.=)

```
$Destination = "<p>Paris";
$Destination .= "is in France.</p>";
echo $Destination;
```

Adding Escape Characters and Sequences
- An **escape character** tells the compiler or interpreter that the character that follows it has a special purpose

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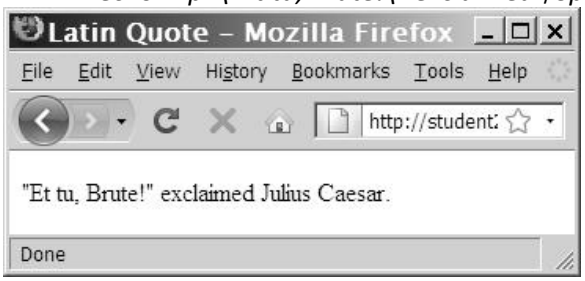
- In PHP, the escape character is the backslash (\)
  echo ' This code\'s going to work ';
- Do not add a backslash before an apostrophe if you surround the text string with double quotation marks
  echo " This code's going to work. ";
- The escape character combined with one or more other characters is an **escape sequence**

Escape Sequence	Description
\\	Inserts a backslash
\$	Inserts a dollar sign
\r	Inserts a carriage return
\f	Inserts a form feed
\"	Inserts a double quotation mark
\t	Inserts a horizontal tab
\v	Inserts a vertical tab
\n	Inserts a new line
\x*h*	Inserts a character whose hexadecimal value is *h*, where *h* is one or two hexadecimal digits (0-9, A-F), case insensitive
\o	Inserts a character whose octal value is *o*, where *o* is one, two, or three octal digits (0-7)

Table 3-1 PHP escape sequences within double quotation marks

```
$Speaker = "Julius Caesar";
        echo "<p>\"Et tu, Brute!\" exclaimed $Speaker.</p>";
```



Simple and Complex String Syntax

- **Simple string syntax** uses the value of a variable within a string by including the variable name inside a text string with double quotation marks

```
$Vegetable = "broccoli";
  echo "<p>Do you have any $Vegetable?</p>";
```

- When variables are placed within curly braces inside of a string, it is called **complex string syntax**

```
$Vegetable = "carrot";
  echo "<p>Do you have any {$Vegetable}s?</p>";
```

Working with a Single String

- PHP provides a number of functions for analyzing, altering, and parsing text strings including:

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- Counting characters and words
- Transposing, converting, and changing the case of text within a string

Counting Characters and Words in a String

- The most commonly used string counting function is the strlen() function, which returns the total number of characters in a string
- Escape sequences, such as \n, are counted as one character

```
$BookTitle = "The Cask of Amontillado";
   echo "<p>The book title contains " .
  strlen($BookTitle) . " characters.</p>";
```

- The str_word_count() function returns the number of words in a string
- Pass the str_word_count() function a literal string or the name of a string variable whose words you want to count

```
$BookTitle = "The Cask of Amontillado";
   echo "<p>The book title contains " .
  str_word_count($BookTitle). " words.</p>";
```

Modifying the Case of a String

- PHP provides several functions to manipulate the case of a string
  - The strtoupper()function converts all letters in a string to uppercase
  - The strtolower()function converts all letters in a string to lowercase
  - The ucfirst()function ensures that the first character of a word is uppercase
  - The lcfirst()function ensures that the first character of a word is lowercase
- Functions to manipulate the case of a string:
  - The ucwords()function changes the first character of each word
    - Use the strtolower()function on a string before using the ucfirst()and ucwords() to ensure that the remaining characters in a string are in lowercase
    - Use the strtoupper()function on a string before using the ucfirst() and ucwords() to ensure that the remaining characters in a string are in uppercase

Encoding and Decoding a String

- PHP has several built-in functions to use with Web pages:
- Some characters in XHTML have a special meaning and must be encoded using HTML entities in order to preserve that meaning
  - The htmlspecialchars()function converts special characters to HTML entities
  - The html_specialcharacters_decode() function converts HTML character entities into their equivalent characters
- The characters that are converted with the htmlspecialchars()function are:
  - '&' (ampersand) becomes '&'
  - '"' (double quote) becomes '"' when ENT_NOQUOTES is disabled.
  - ''' (single quote) becomes ''' only when ENT_QUOTES is enabled.
  - '<' (less than) becomes '<'
  - '>' (greater than) becomes '>'
- If ENT_QUOTES is enabled in the PHP configuration, both single and double quotes are converted
- If ENT_QUOTES is disabled in the PHP configuration, neither single nor double quotes are converted

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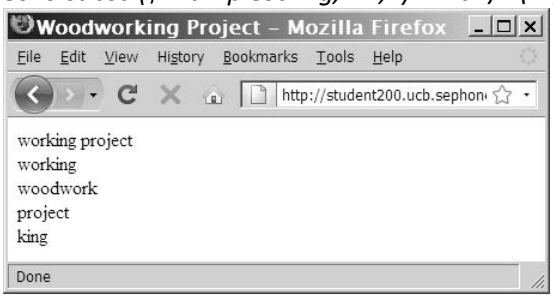
- The md5()function uses a strong encryption algorithm (called the Message-Digest Algorithm) to create a one-way hash
  - A **one-way hash** is a fixed-length string based on the entered text, from which it is nearly impossible to determine the original text
  - The md5() function does not have an equivalent decode function, which makes it a useful function for storing passwords in a database

Other Ways to Manipulate a String

- PHP provides three functions that remove leading or trailing spaces in a string
  - The trim()function will strip (remove) leading or trailing spaces in a string
  - The ltrim() function removes only the leading spaces
  - The rtrim() function removes only the trailing spaces
- The substr()function returns part of a string based on the values of the start and length parameters
- The syntax for the substr() function is:
  substr(*string, start, optional length);*
- A positive number in the start parameter indicates how many character to skip at the beginning of the string
- A negative number in the start parameter indicates how many characters to count in from the end of the string
- A positive value in the in the length parameter determines how many characters to return
- A negative value in the length parameter skip that many characters at the end of the string and returns the middle portion
- If the length is omitted or is greater than the remaining length of the string, the entire remainder of the string is returned

```
$ExampleString = "woodworking project";
echo substr($ExampleString,4) . "<br />\n";
echo substr($ExampleString,4,7) . "<br />\n";
echo substr($ExampleString,0,8) . "<br />\n";
echo substr($ExampleString,-7) . "<br />\n";
echo substr($ExampleString,-12,4) . "<br />\n";
```



Working with Multiple Strings

- **Parsing** is the act of dividing a string into logical component substrings or tokens
- When programming, parsing refers to the extraction of information from string literals and variables

Finding and Extracting Characters and Substrings

- There are two types of string search and extraction functions:
  - Functions that return a numeric position in a text string
  - Functions that return a character or substring
    - Both functions return a value of FALSE if the search string is not found

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- The strpos() function performs a case-sensitive search and returns the position of the first occurrence of one string in another string
- Pass two arguments to the strpos() function:
  - The first argument is the string you want to search
  - The second argument contains the characters for which you want to search
- If the search string is not found, the strpos() function returns a Boolean value of FALSE
- Pass to the strchr() and the strrchr() functions the string and the character for which you want to search
- Both functions return a substring from the specified characters to the end of the string
- strchr() function starts searching at the beginning of a string
- strrchr() function starts searching at the end of a string

Replacing Characters and Substrings

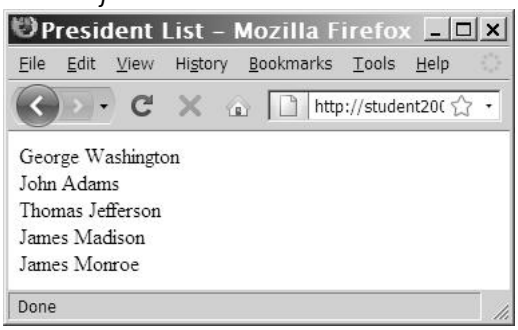
- The str_replace() and str_ireplace() functions both accept three arguments:
  - The string you want to search for
  - A replacement string
  - The string in which you want to replace characters

```
$Email = "president@whitehouse.gov";
$NewEmail = str_replace("president", "vice.president", $Email);
echo $NewEmail; // prints 'vice.president@whitehouse.gov'
```

Dividing Strings into Smaller Pieces

- Use the strtok() function to break a string into smaller strings, called **tokens**
- The syntax for the **strtok()** function is:
  $variable = strtok(*string, separators*);
- The strtok() function returns the entire string if:
  - An empty string is specified as the second argument of the strtok() function
  - The string does not contain any of the separators specified

```
$Presidents = " George Washington;John Thomas Jefferson;James Madison;James Monroe";
$President = strtok($Presidents, ";");
while ($President != NULL) {
        echo "$President<br />";
        $President = strtok(";");
}
```




```
$Presidents = " George Washington;John Adams;Thomas Jefferson;James Madison;James Monroe";
$President = strtok($Presidents, "; ");
while ($President != NULL) {
        echo "$President<br />";
        $President = strtok("; ");
```

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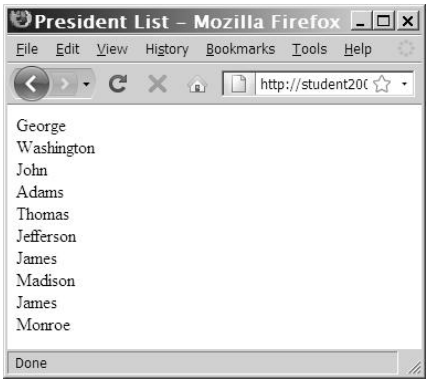
}



Converting between Strings and Arrays

- The str_split() and explode() functions split a string into an indexed array
- The str_split() function splits each character in a string into an array element using the syntax:
  $*array* = str_split(*string*[, *length*]);
- The *length* argument represents the number of characters you want assigned to each array element
- The explode() function splits a string into an indexed array at a specified separator
- The syntax for the explode() function is:
  $*array* = explode(*separators*, string);
- The order of the arguments for the explode() function is the reverse of the arguments for the strtok() function

```
$Presidents = "George Washington;JohnAdams; Thomas Jefferson;James Madison;James Monroe";
$PresidentArray = explode(";", $Presidents);
foreach ($PresidentArray as $President) {
        echo "$President<br />";
}
```

- If the string does not contain the specified separators, the entire string is assigned to the first element of the array
- The explode() function
  - Does not separate a string at each character that is included in the *separator* argument
  - Evaluates the characters in the *separator* argument as a substring
  - If you pass to the explode()function an empty string as the *separator* argument, the function returns a Boolean value of FALSE
- The implode()function combines an array's elements into a single string, separated by specified characters
- The syntax is:
  $*variable* = implode(*separators*, *array*);

```
$PresidentsArray = array("George Washington", "John Adams",
"Thomas Jefferson", "James Madison", "James Monroe");
$Presidents = implode(", ", $PresidentsArray);
echo $Presidents;
```

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Comparing Strings

- Comparison operators compare individual characters by their position in the **American Standard Code for Information Interchange** (ASCII), which are numeric representations of English characters

```
$FirstLetter = "A";
$SecondLetter = "B";
if ($SecondLetter > $FirstLetter)
                echo "<p>The second letter is higher in the alphabet
 than the first letter.</p>";
else
                echo "<p>The second letter is lower in the alphabet than
The first letter.</p>";
```

- American Standard Code for Information Interchange (ASCII) values range from 0 to 255
- Lowercase letters are represented by the values 97 (“a”) to 122 (“z”)
- Uppercase letters are represented by the values 65 (“A”) to 90 (“Z”)

String Comparison Functions

- The strcasecmp() function performs a case-insensitive comparison of strings
- The strcmp() function performs a case-sensitive comparison of strings
- Both functions accept two arguments representing the strings you want to compare
- Most string comparison functions compare strings based on their ASCII values

Determining the Similarity of Two Strings

- The similar_text() and levenshtein() functions are used to determine the similarity between two strings
- The similar_text() function returns the number of characters that two strings have in common
- The levenshtein() function returns the number of characters you need to change for two strings to be the same
- Both functions accept two string arguments representing the values you want to compare

```
$FirstName = "Don";
$SecondName = "Dan";
echo "<p>The names \"$FirstName\“ and \"$SecondName\“ have “ .
similar_text($FirstName, $SecondName) . “ characters in
common.</p>";
echo "<p>You must change “ . levenshtein($FirstName, $SecondName)
. “ character(s) to make the names \"$FirstName\“ and
\"$SecondName\“ the same.</p>";
```

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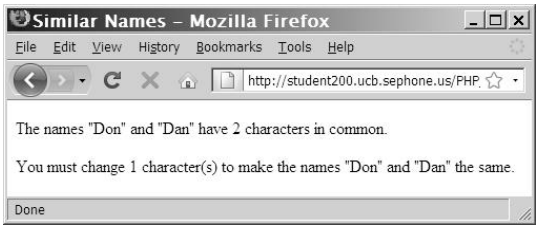

Determining if Words are Pronounced Similarly

- The soundex() and metaphone() functions determine whether two strings are pronounced similarly
- Both functions return a value representing how words sound
- The soundex() function returns a value representing a name's phonetic equivalent
- The metaphone() function returns a code representing an English word's approximate sound

```
$FirstName = "Gosselin";
$SecondName = "Gauselin";
$FirstNameSoundsLike = metaphone($FirstName);
$SecondNameSoundsLike = metaphone($SecondName);
if ($FirstNameSoundsLike == $SecondNameSoundsLike)
                echo "<p>The names are pronounced the same.</p>";
else
                echo "<p>The names are not pronounced the same.</p>";
```

Working with Regular Expressions

- **Regular Expressions** are patterns that are used for matching and manipulating strings according to specified rules
- PHP supports two types of regular expressions:
  - POSIX Extended
  - Perl Compatible Regular Expressions

Function	Description
preg_match(*pattern, string*)	Performs a search for a matching pattern
preg_match_all(*pattern, string*)	Performs a search for a matching pattern, returns the number of matches found
preg_replace(*pattern, replacement, string*[, *limit*])	Performs a replacement of a matching pattern
preg_split(*pattern, string* [, *limit*])	Divides an input string into an array of strings that are separated by a specified matching pattern
preg_grep(*pattern, array*)	Filters an input array and returns an array of those elements that match the specified pattern
preg_quote(*string*)	Returns a string that is the input string with any character that has special meaning for a PCRE preceded by the escape character (\)

Table 3-2 PCRE functions

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- Pass to the preg_match() the regular expression pattern as the first argument and a string containing the text you want to search as the second argument
  preg_match(*pattern, string);*

Writing Regular Expression Patterns

- A **regular expression pattern** is a special text string that describes a search pattern
- Regular expression patterns consist of literal characters and **metacharacters**, which are special characters that define the pattern-matching rules
- Regular expression patterns are enclosed in opening and closing **delimiters**
  - The most common character delimiter is the forward slash (/)

Metacharacter	Description
.	Matches any single character
\	Identifies the next character as a literal value
^	Anchors characters to the beginning of a string
$	Anchors characters to the end of a string
()	Specifies required characters to include in a pattern match
[]	Specifies alternate characters allowed in a pattern match
[^]	Specifies characters to exclude in a pattern match
-	Identifies a possible range of characters to match
|	Specifies alternate sets of characters to include in a pattern match

Table 3-3 PCRE metacharacters

Matching Any Character

- A period (.) in a regular expression pattern specifies that the pattern must contain a value at the location of the period
- A return value of 0 indicates that the string does not match the pattern and 1 if it does

```
$ZIP = "015";
preg_match("/...../", $ZIP); // returns 0
$ZIP = "01562";
preg_match("/...../", $ZIP); // returns 1
```

Matching Characters at the Beginning or End of a String

- An **anchor** specifies that the pattern must appear at a particular position in a string
- The ^ metacharacter anchors characters to the beginning of a string
- The $ metacharacter anchors characters to the end of a string

```
$URL = "http://www.dongosselin.com";
preg_match("/^http/", $URL); // returns 1
```

- To specify an anchor at the beginning of a string, the pattern must begin with a ^ metcharacter
  $URL = "http://www.dongosselin.com";

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preg_match("/^http/", $URL); // returns 1;

- To specify an anchor at the end of a line, the pattern must end with the $ metacharacter
  $Identifier = "http://www.dongosselin.com";
  preg_match("/com$/", $Identifier); // returns 1

Matching Special Characters

- To match any metacharacters as literal values in a regular expression, escape the character with a backslash
  (in the following example, the last four characters in the string must be '.com')
  $Identifier = http://www.dongosselin.com";
  preg_match("/gov$/", $Identifier);//returns 0

Specifying Quantity

- Metacharacters that specify the quantity of a match are called **quantifiers**

Quantifier	Description
?	Specifies that the preceding character is optional
+	Specifies that one or more of the preceding characters must match
*	Specifies that zero or more of the preceding characters can match
{n}	Specifies that the preceding character repeat exactly *n* times
{n,}	Specifies that the preceding character repeat at least *n* times
{,n}	Specifies that the preceding character repeat up to *n* times
{n1, n2}	Specifies that the preceding character repeat at least *n1* times but no more than *n2* times

Table 3-4 PCRE quantifiers

- A question mark (?) quantifier specifies that the preceding character in the pattern is optional
  (in the following example, the string must begin with 'http' or 'https')
  $URL = "http://www.dongosselin.com";
  preg_match("/^https?/", $URL); // returns 1
- The addition(+) quantifier specifies that one or more sequential occurrences of the preceding characters match
  (in the following example, the string must have at least one character)
  $Name = "Don";
  preg_match("/.+/", $Name); // returns 1
- A asterisk (*) quantifier specifies that zero or more sequential occurrences of the preceding characters match
  (in the following example, the string must begin with one or more leading zeros)
  NumberString = "00125";
  preg_match("/^0/", $NumberString);//returns 1*

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- The { } quantifiers specify the number of times that a character must repeat sequentially
  (in the following example, the string must contain at least five characters)
  preg_match("/ZIP: .{5}$/", " ZIP: 01562"); // returns 1
- The { } quantifiers can also specify the quantity as a range
  (in the following example, the string must contain between five and ten characters)
  preg_match("/(ZIP: .{5,10})$/", "ZIP: 01562-2607");// returns 1

Specifying Subexpressions

- When a set of characters enclosed in parentheses are treated as a group, they are referred to as a **subexpression** or **subpattern**
  (in the example below, the 1 and the area code are optional, but if included must be in the following format:)

  1 (707) 555-1234

  preg_match("/^(1)?(\(.{3}\))?(.{3})(\.{4})$/

Defining Character Classes

- **Character classes** in regular expressions treat multiple characters as a single item
- Characters enclosed with the ([]) metacharacters represent alternate characters that are allowed in a pattern match

preg_match("/analy[sz]e/", "analyse");//returns 1
preg_match("/analy[sz]e/", "analyze");//returns 1
preg_match("/analy[sz]e/", "analyce");//returns 0

- The hyphen metacharacter (-) specifies a range of values in a character class
  (the following example ensures that A, B, C, D, or F are the only values assigned to the *$LetterGrade variable)*
  $LetterGrade = "B";
  echo preg_match("/[A-DF]/", $LetterGrade); // returns true
- The ^ metacharacter (placed immediately after the opening bracket of a character class) specifies optional characters to exclude in a pattern match
  (the following example excludes the letter E and G-Z from an acceptable pattern match in the $LetterGrade variable)
  $LetterGrade = "A";
  Echo preg_match("/[^EG-Z]/", $LetterGrade); // returns true

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Escape Sequence	Description
\a	alarm (hex 07)
\cx	"control-x", where x is any character
\d	any decimal digit
\D	any character not in \d
\e	escape (hex 1B)
\f	formfeed (hex 0C)
\h	any horizontal whitespace character
\H	any character not in \h
\n	newline (hex 0A)
\r	carriage return (hex 0D)
\s	any whitespace character
\S	any character not in \s
\t	tab (hex 09)
\v	any vertical whitespace character
\V	any character not in \v
\w	any letter, number, or underscore character
\W	any character not in \w

Table 3-5 PCRE character types

Matching Multiple Pattern Choices

- The | metacharacter is used to specify an alternate set of patterns
  - The | metacharacter is essentially the same as using the OR operator to perform multiple evaluations in a conditional expression

Summary

- The **concatenation operator** (.) and the **concatenation assignment operator** (.=) can be used to combine two strings
- An **escape character** tells the compiler or interpreter that the character following the escape character has a special purpose. An escape character combined with one or more other characters is called an **escape sequence**
- **Simple string syntax** allows you to use the value of a variable within a string by including the variable name inside a text string with double quotation marks
- The type of structure in which variables are placed within curly braces inside of a string is called **complex string syntax**
- The most commonly used string-counting function is the strlen() function, which returns the total number of characters in a string
- The str_word_count()function returns the number of words in a string
- The strtoupper(), strtolower(), ucfirst(), lcfirst(), and ucwords() functions all change the case of characters in the string
- The substr() function returns the specified portion of a string
- When applied to text strings, **parsing** refers to the act of dividing a string into logical component substrings or **tokens**
- There are two types of string search and extraction functions: functions that return a numeric position in a text string and those that return a character or substring
- You use the str_replace(), str_ireplace(), and substr_replace() functions to replace text in strings
- The strtok()function breaks a string into smaller strings, called tokens

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- You use the str_split() or explode() function to split a string into an indexed array, in which each character in the string becomes a separate element in the array
- The implode() function combines an array's elements into a single string, separated by specified characters
- The strcasecmp() function performs a case-insensitive comparison of strings, whereas the strcmp()function performs a case-sensitive comparison of strings
- The similar_text() and levenshtein() functions are used to determine the similarity of two strings
- You can use the soundex() and metaphone() functions to determine whether two strings are pronounced similarly
- **Regular expressions** are a pattern of specially formatted strings that can be used to validate the structure of a string
- Regular expressions are made up of both literal characters and special characters, called **metacharacters**, which define the pattern-matching rules
- In a regular expression, a backslash character (\) is used to match metacharacters as literal values
- **Quantifiers** are metacharacters that specify the number of times a particular match may occur
- **Subexpressions** are characters contained in parentheses within a regular expression
- The format and quantity of the characters in the subexpression can be defined as a group
- A **character class** is multiple characters enclosed in square brackets ([]) that are treated as a single unit
- The | metacharacter allows a string to be comprised of an alternate set of substrings. The | metacharacter performs essentially the same function as the Or (||) operator in conditional expressions