**Automata Regular Expression Working Sheet**

 List of some common regular expression symbols and their functionalities, all of which are available in the regex tool at [www.regexr.com](http://www.regexr.com/):

* ‘**.**‘ : Matches any single character except newline.
* ‘**^**’ : Anchors the regex at the start of a line.
* ‘**$**’ : Anchors the regex at the end of a line.
* ‘**\***’ : Matches zero or more occurrences of the preceding character or group.
* ‘**+**’ : Matches one or more occurrences of the preceding character or group.
* ‘**{}**’ : Quantifier to specify exact repetitions or a range of repetitions
* ‘**[]**’ : Matches any single character within the brackets.
* ‘**|**’ : Acts as an OR operator, allowing alternative matches.
* ‘**()**’ : Groups expressions together, allowing for complex regex patterns
* ‘**\**’ : Escapes special characters, allowing them to be treated as literals.
* ‘**\b**’ : Matches a word boundary.
* ‘**\d**’ : Matches any digit (0-9).
* ‘**\w**’ : Matches any word character (alphanumeric character plus underscore).
* ‘**\s**’ : Matches any whitespace character.
* ‘**[xyz]**’ : Matches any single character from the specified set.
* ‘**[^xyz]**’ : Matches any single character not in the specified set.
* ‘**\d**’ : Matches any digit (equivalent to `[0-9]`).
* ‘**\D**’ : Matches any non-digit character (equivalent to `[^0-9]`).
* ‘**\w**’ : Matches any word character (equivalent to `[a-zA-Z0-9\_]`).
* ‘**\W**’ : Matches any non-word character (equivalent to `[^a-zA-Z0-9\_]`).

**Using '?' in Regular Expressions**

The '?' symbol in regular expressions is used to match zero or one occurrence of the preceding character or group. It makes the preceding element optional.

Examples:

**1. Matching Optional Characters:**

   - Regex: `colou?r`

   - Description: Matches both "color" and "colour" as the 'u' is optional.

**2. Matching Optional Groups:**

   - Regex: `www(\.)?example\.com`

   - Description: Matches both "[www.example.com](http://www.example.com/)" and "[example.com](http://example.com/)" as the 'www.' part is optional.

**3. Quantifying Optionality:**

   - Regex: `dogs?`

   - Description: Matches "dog" or "dogs" as the 's' is optional.

**Practice Questions:**

1. Write a regex pattern to match both "program" and "programme".

2. Create a regex to match email addresses where the domain part may or may not have the 'www' prefix.

3. Write a regex to validate phone numbers with an optional country code at the beginning.