Operators used to construct regular expressions

Regular expressions (RegEx) use **operators** to define patterns for matching text. These operators help in **string processing, searching, validation, and filtering** in various applications like **search engines, compilers, and data analysis**.

1. Basic Operators

These are fundamental symbols for matching individual characters in text.

Operator	Meaning	Example	Matches
.	Any single character except newline	c.t	"cat", "cut", "cot"
^	Start of string	^Hello	"Hello world", but not "world Hello"
$	End of string	end$	"This is the end"
\d	Any digit (0-9)	\d+	"123", "45"
\w	Any word character (a-z, A-Z, 0-9, _)	\w+	"hello", "user_123"
\s	Any whitespace	\s+	" " (space), " " (multiple spaces)

2. Quantifiers

Quantifiers specify how many times a character or group can appear.

Operator	Meaning	Example	Matches
*****	Zero or more occurrences	a*	"", "a", "aa", "aaa"
+	One or more occurrences	a+	"a", "aa", "aaa", but not ""
?	Zero or one occurrence	colou?r	"color" or "colour"
{n}	Exactly n occurrences	a{3}	"aaa"
{n,}	At least n occurrences	a{2,}	"aa", "aaa", "aaaa"
{n,m}	Between n and m occurrences	a{2,4}	"aa", "aaa", "aaaa"

3. Logical and Grouping Operators

These operators help in structuring expressions and applying logical conditions.

Operator	Meaning	Example	Matches		
`	`	OR operator	`cat	dog`	"cat" or "dog"
()	Grouping characters	(ab)+	"ab", "abab", "abababab"		
[]	Character sets	[abc]	"a", "b", "c"		
[a-z]	Character range	[a-z]	Any lowercase letter		
[A-Z]	Character range	[A-Z]	Any uppercase letter		
[^]	Negation (NOT)	[^aeiou]	Any consonant		

4. Escape Characters

Certain characters have special meanings in regular expressions. If you need to match them **literally**, you must **escape** them using \.

Operator	Meaning	Example	Matches
\.	Matches a literal .	file\.txt	"file.txt"
*****	Matches a literal *	data*	"data*"
\?	Matches a literal ?	question\?	"question?"

5. Applications of Regular Expression Operators

- **Text Searching** – Used in search engines and file search.
- **Pattern Matching** – Helps in **AI, chatbots, and data filtering**.
- **Lexical Analysis** – Used in **compilers and programming languages**.
- **Data Validation** – Ensures inputs like **emails, phone numbers, and passwords** are correct.

Regular expressions are **powerful tools for text processing**.