

Tutorial : 3

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1. Give a regular expression for the intersection, union, and concatenation respectively of the two languages:

$A = \{w \in \{0,1\}^* \mid w \text{ begins with } 11\}$ and $B = \{w \in \{0,1\}^* \mid w \text{ ends with } 00\}$

(a) $A \cap B = 11(1+0)^*00$

(b) $A \cup B = (11(1+0)^*) \cup ((1+0)^*00)$

2. For the alphabet $\Sigma = \{a,b\}$, give regular expression for the following language:

(a) $\{a+b\}^*$

(b) $\{a+b\}^+$

(c) $ab\{a+b\}^*$

(d) $\{a+b\}^*ab$

(e) $ab\{a+b\}^*ab$

(f) $ab\{a+b\}^* + \{a+b\}^*ab$

(g) $\{a+b\}^*ab\{a+b\}^*$

(h) $\{a+b\}^*ba\{a+b\}^*$

(i) $\{a+b\}^*ab\{a+b\}^* + \{a+b\}^*ba\{a+b\}^*$

(j) $\{b\}^*a\{b\}^*a\{b\}^*$

(k) $\{a+b\}^*a\{a+b\}^*a\{a+b\}^*$

3. Let L be the language over $\{0,1,2\}$ consisting of all strings of zero or more 0's followed by one or more 1's, followed by two or more 2's. For example, 001122, 122, and 0111122 are in L ; 012 (too few 2's), and 0112122 (a 2 precedes a 1) are not. Write a regular expression whose language is L .

$L = 0^*1^*22^*$

4. Give a regular expression that represents the described set

(a) The strings ~~of~~ ^{over} $\{a, b, c\}$ with length three

$$(a+b+c)(a+b+c)(a+b+c)$$

(b) The strings ~~of~~ ^{over} $\{a, b, c\}$ with length less than three

$$(\epsilon + a+b+c)(\epsilon + a+b+c)$$

(c) The set of strings over $\{a, b, c\}$ with length greater than three.

$$(a+b+c)(a+b+c)(a+b+c)(a+b+c)$$

5.

Languages	2 valid strings	2 invalid strings	Description
$ab(a+b)^*$	ab, aba, abb, abba, abbb	a, b, aa, ba	All strings that start with Ab
$(a+b)b(a+b)^*$	ab, bb, aba, bba, bbb	a, b, aa, ba, aab, bab	All strings with b as the second letter.
$(a(a+b)^*b) + (b(a+b)^*a)$	ab, ba, aab, baa, abb, bba	a, b, aa, bb, aba, bab	All strings that start and end with different letter

6. 1) 6

2) 11

3) 7

4) 13

5) 3

6) 14

7) 12

8) 10

9) 5

10) 15

11) 2

12) 8

13) 1

14) 9

15) 4