# Regular Expressions

## Find a regular expression to describe each of the following five languages

## Solution

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### Find a regular expression over the alphabet (0, 1) to describe the set of all binary numerals without leading zeros (except 0 itself). So, the language is the set (0, 1, 10, 11, 100, 101, 110, 111, ...).

## Solution

### Find a regular expression for each of the following languages over the alphabet (a,b).

## Solution

### d .

### Describe in English phrases the languages associated with the following regular expression:

## Solution

### Strings must include b.

### String’s length must be .

### String in which the letters b , a is never doubled , This means that no word contains the substring bb or aa .

### Construct a regular expression defining each of the following languages over the alphabet {a b}:

## Solution

### Describe (in English phrases) the languages associated with the following regular expressions:

## Solution

### Strings must include a and end with A or bbbb

### Strings may be empty or start with a, and end with a or bb

### Strings may be empty or start with a and have odd number of a’s and b’s

### Strings may be empty or have odd number of a’s and b’s

### Strings may be empty or consist of a’s only or b’s only or consist of a’s and b’s but occurrence of a’s and b’s is odd

### Strings may be empty or have even length and end with a

### Show that the following pairs of regular expressions define the same language over the alphabet {a,b}:

## Solution

### These regular expressions are equals and match the same strings that consist of ababab….aba , match with first regular expression as : (ab)(ab)(ab)….(ab)a , match with second regular expression as: a(ba)(ba)(b….a)(ba)

### These regular expressions are equals and match the same strings that consist of any number of a’s and b’s in any order as : aaabbaa match first regular expression as : (aaa)(b)(b)(aa)

### and match second regular expression as : (a)(a)(a)(b)(b)(a)(a)

### These regular expressions are equals and match the same strings that consist of any number of a’s and b’s in any order as : aaabbaa match first regular expression as : (aaa)(bb)(aa) and match second regular expression as : (a)(a)(a)(b)(b)(a)(a)

### These regular expressions are equals and match the same strings that consist of any number of a’s and followed by number of b’s divisible by 3 then followed by any number of a’s as : aaaabbbbbbaa match with first regular expression as : ((aaaa)bbb)(bbb)(aa) and match second regular expression as : (aaaa)(bbb)(bbb(aa))

# Finite Automata

### **DFA**

### Transform each of the following regular expressions into a DFA.

## Solution