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1.

Write a regular expression for the language L = {*w* ∈ {a, b, c}\* : *w* ends with a character that occurs no where else in it}.

This regex covers all three options for the language. It either has 0 or more a’s and b’s with an appended c at the end. It has 0 or more a’s and c’s with an appended b at the end or 0 or more b’s and c’s with an appended a. The union means that you can only pick one of these options.

**(((a∪b)\*c)∪((a∪c)\*b)∪((b∪c)\*a))**

2.

Write a regular expression for the language L = {*w* ∈ {a, b}\* : #a(*w*) ≡3= 0 (the count of as in *w* mod 3 equals 0)}.

Basically what this language is any number of b’s located anywhere in the string and a multiple of 3 a’s {0,aaa,aaaaaa,aaaaaaaaa,….}. We figured that the b’s could be anywhere in the string and there could be 0 or more of them. The simplest solution would be the following.

**b\*(b\*ab\*ab\*ab\*)\***

With this regex you can create any strange combination of b’s like bbbbabbabbbbba or just aaa if you want. You can also create strings with two a’s together like aabbbbbba. It also includes strings that are just b’s with b\* at the beginning of the string.

3.

Write a regular expression for the language L = {*w* ∈ {a, b}\* : *w* contains bba as a substring starting in an even numbered position,string positions are numbered starting at 1}.

There was a discrepancy with this question so I am going to post two different answers because it depends on what you considers an even position. The question asks for the string bba to begin at an even position, but what determines it to be even? We could say that {char}{char}bba is an even position because there are an even number of characters before the substring. You could also assume an even position is {char}{char}{char}bba because the b of the substring is in 4th position of the string. Therefore depending on what you consider the even position in the string there are two possible answers.

**(aa∪bb∪ba∪ab)\*bba(a∪b)\***

**or**

**(a∪b) (aa∪bb∪ba∪ab)\*bba(a∪b)\***