# CS 321, Assignment 3

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## 1

### a

$a^*(ba^*ba^*)^*$

### b

$b^*a^*$

### c

$b^*a^*((ab)b^*a^*(ab))^*b^*a^*$

### d

This was a particularlly tricky one. You need to handle all even numbered cases, and the case that you start with an a or b, then have a ton of stuff in the middle, then an a at the end. Here is my long regex to handle this problem. I use line breaks whenever there is an 'or' for ease of reading:
$(aa)^*(bb)^* +$
$((ab)(ab))^* +$
$((ab)(ba))^* +$
$((ba)(ab))^* +$
$((ba)(ba))^* +$
$a((aa)^*(bb)^*((ab)(ab))^*((ab)(ba))^*((ba)(ab))^*((ba)(ba))^*)a +$
$b((aa)^*(bb)^*((ab)(ab))^*((ab)(ba))^*((ba)(ab))^*((ba)(ba))^*)b$

## 2

Prove: Let $M(w)$ be the statement that, for any string $w \in \Sigma\{0,1\}^*$, a regular language, the string is a multiple of three if and only if its reverse , $rev(w)$, is also a multiple of three.

Initial Step: We must verify that the reversed form of binary 3, '11', is a multiple of three, $M(w)$ where $w = 11$:

$M(rev(11)) = M(11)$

Then the reversed binary form of 3 is equal to 3, which is a multiple of 3.

Inductive Step: Assume there is a string k that is representative of a value greater than or equal to zero, that is a multiple of 3. Prove that $M(k+3)$ is also a multiple of 3:

$M(k+3) = M(rev(k+3)) =$

**3**

**4**