

## Regular expressions - solution

1. Write a regular expression for the following sets of binary strings. Use only the basic operations:  $() | *$ .

a) All binary strings

$(0|1)^*$

b) All binary strings except empty string

$(0|1)(0|1)^*$

c) All binary strings that begin with 1 and end with 1

$1 | 1(0|1)^*1$

d) All binary strings that end with 00

$(0|1)^*00$

e) All binary strings that contain at least three 1's

$(0|1)^*1(0|1)^*1(0|1)^*1(0|1)^*$

2. Describe in words what the following regular expressions mean:

a)  $(0|1)^*1010(0|1)^*$

All binary strings containing the sequence 1010 somewhere.

b)  $a^*b^*c^*$

A string containing 0 or more a's, followed by 0 or more b's, followed by 0 or more c's.

c)  $aa^*bb^*cc^*$

A string containing 1 or more a's, followed by 1 or more b's, followed by 1 or more c's.

**3. Find all strings in the following regular expressions of length less than four.**

a)  $(1)(1|0)^*$

1  
11  
10  
110  
111  
101  
100

b)  $(a|b)^*b$

b  
bb  
bbb  
ab  
aab  
bab  
abb

**4. Give some examples of strings that match and do not match the following regular expressions:**

regular expression	matches	does not match
$[A-Z]{3,4}$	ACE ACED ZOO	ACE! HI FIVER
$[a-z0-9]{3,}$	foobar cu8r bobs1234567890youruncle	12 Foobar ain't
$[a-z']+\s[a-z']+$	ain't pretty 'twas the hello mom	ain't 'twas it? hello mom
$[aeiou]..$	abe eAR oh!	car oh Ear
$[^A-Za-z]^+$	98454 98706-2837 :-)	(empty string) abe Z
$(super)?(cool dumb evil)$	supercool cool superevil	supersupercool supergreat great
$[0-9]{5}-[0-9]{4}$	98454-1234 00000-0000 12345-9999	98454 00000-000 1234-9999