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Introduction to Computer Science, Winter Semester 2016
Practice Assignment 9

Discussion: 24.12.2016 - 29.12.2016

Exercise 9-1

Given a list of characters represented by their Unicode in decimal, write a Python program that produces the corresponding String by concatenating all characters of the list. Test your algorithm with the following input list:

65203	65248	65268	65250

Exercise 9-2

Given the following RGB representation of a color, represent its corresponding hexadecimal value.

R= 255
G= 197
B= 217

Exercise 9-3

Given a list of 1's and 0's representing one row in an image, write a Python program that stores the pixel's color in a list of Strings as black and white. Assume that black pixels are represented as 0's and white pixels as 1's.

Exercise 9-4

Given a list of 1's and 0's representing one row in an image, write a Python program that inverts the image, i.e. invert white pixels to black and vice versa. Assume that black pixels are represented as 0's and white pixels as 1's.

Exercise 9-5

Given the following truth table, where P, X, and Y are the input variables and S and C are the output variables:

P	X	Y	S	C
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

a) Use the sum-of-products-algorithm to determine the boolean expressions that correspond to the truth table.

Exercise 9-6

Using truth tables, show that:

$$X'Y + Y'Z + XZ' = XY' + YZ' + X'Z$$

Exercise 9-7

A circuit should be designed to perform the operation $(A - 1)$ where A represents a number in sign/magnitude notation consisting of 2 bits.

a) How many output variables are needed? Justify your answer.

b) Construct the truth table for this circuit.

c) Use the sum-of-products algorithm to find the boolean expressions that corresponds to the truth table.

Exercise 9-8

A circuit should be designed to perform the modulus operation of two numbers consisting of two bits each.

Assume that for any number N, $N\%0 = 3$.

a) How many input and output variables are needed?

b) Construct the truth table for this circuit

c) Using the sum-of-products method, find the Boolean expressions that correspond to the constructed truth table.