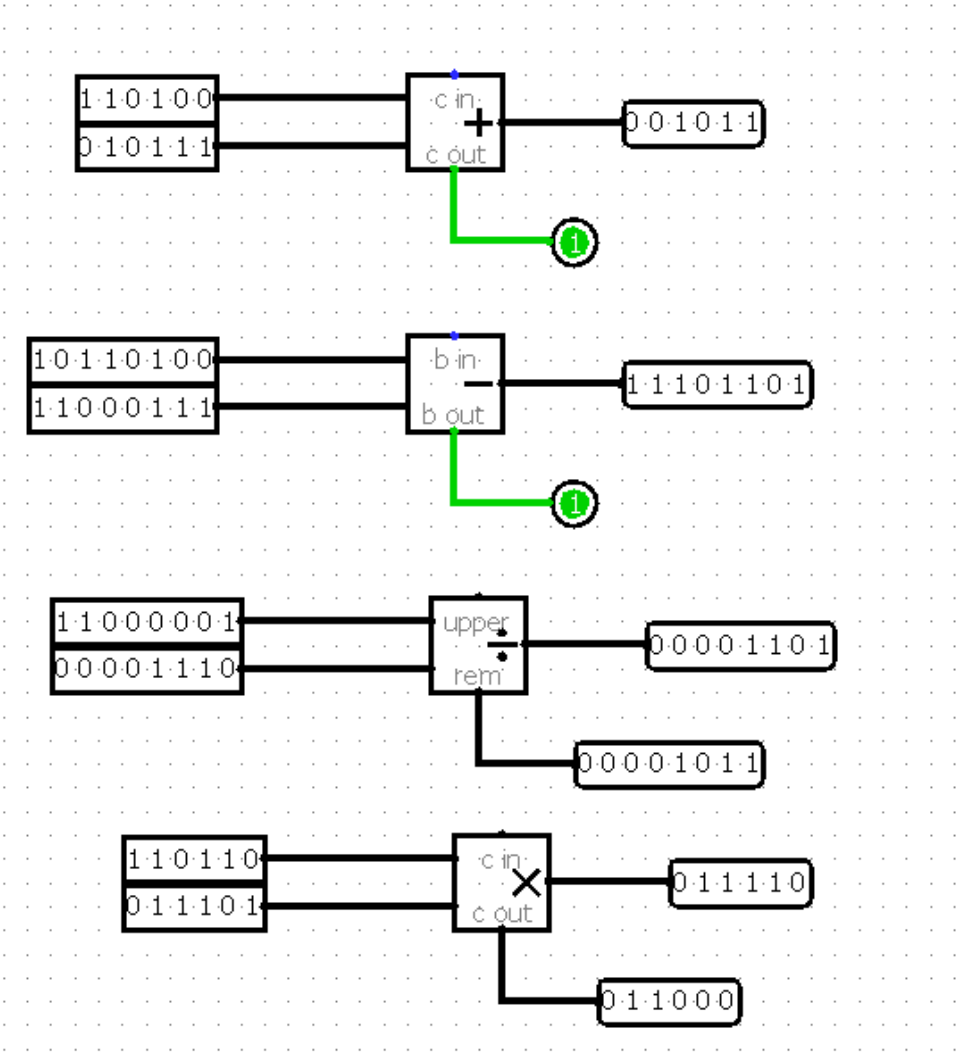
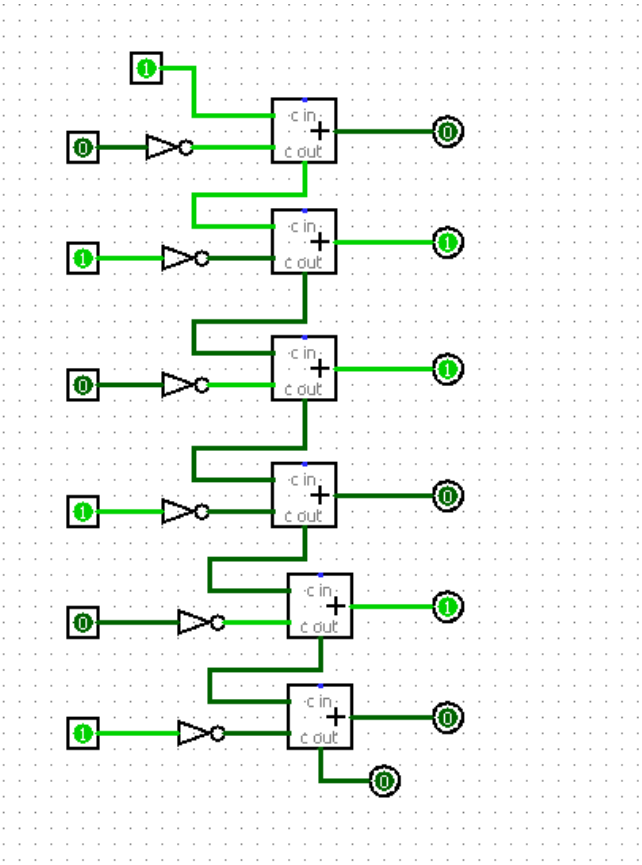
Logisim practical

1. Use Logisim to perform the following:
   a) $110100_2 + 10111_2$
   b) $10110100_2 - 11000111_2$
   c) $11000001_2 \div 1110_2$
   d) $110110_2 \times 11101_2$

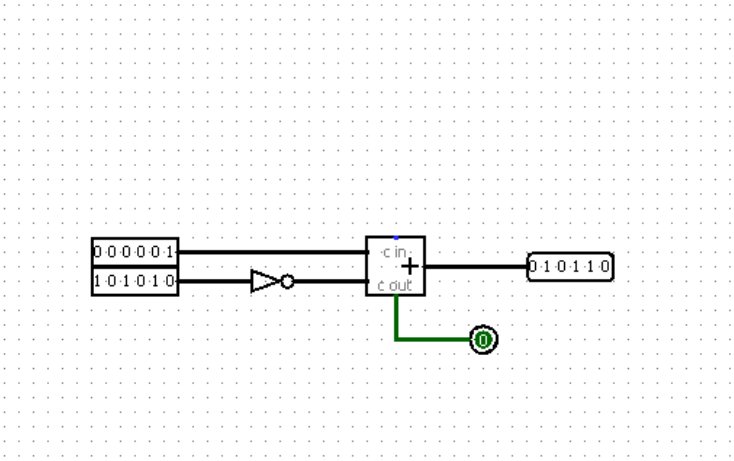
from the Arithmetic library



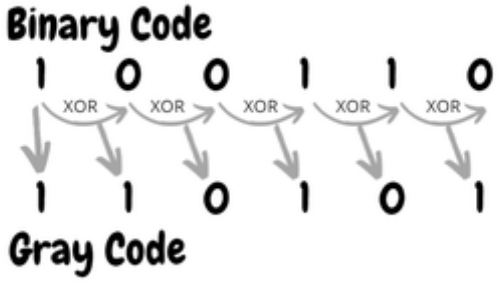
2. Use Logisim to build a circuit to find the 2's complement of a 6-bit binary number then test the circuit on the binary number 101010.



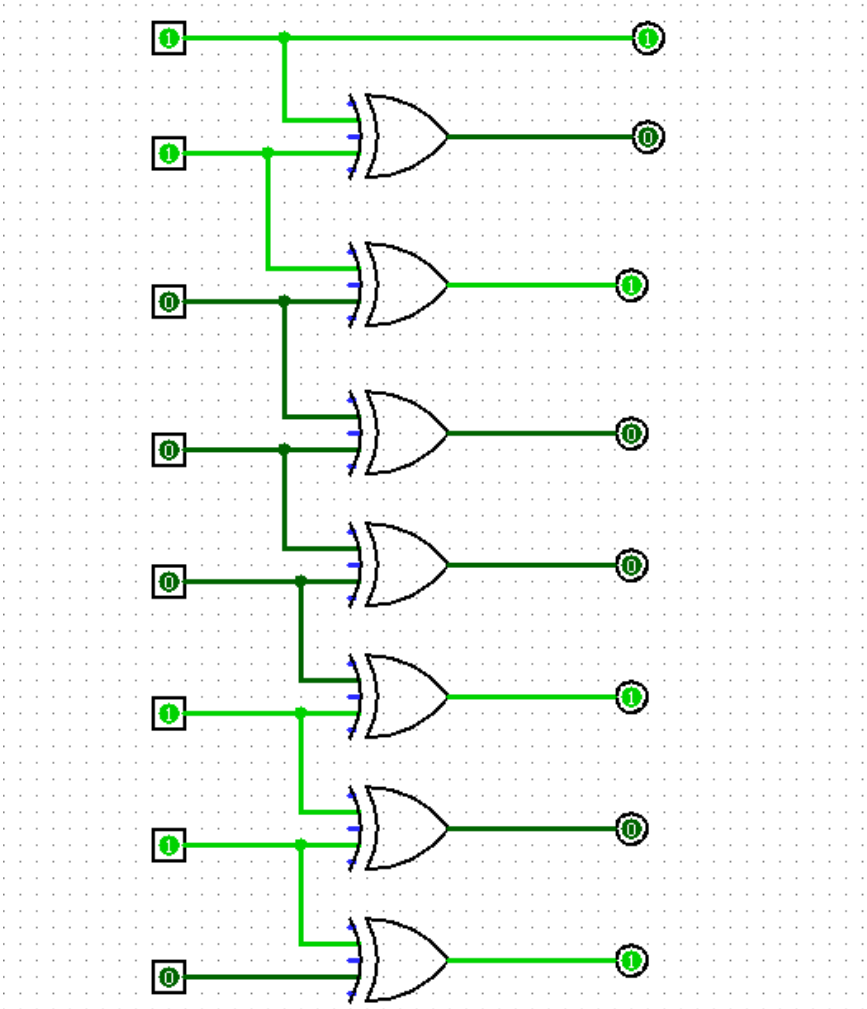
Another solution



Example on the Binary to Gray Code Conversion

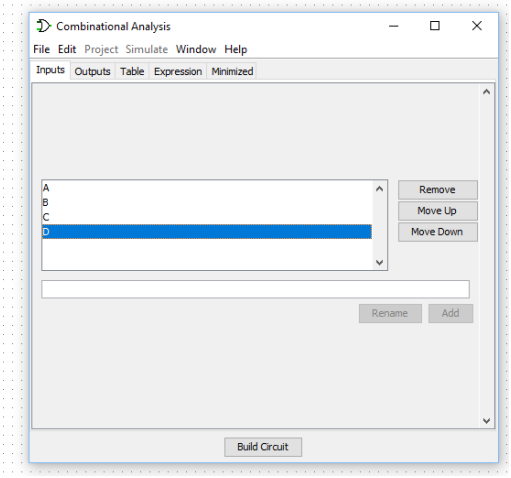


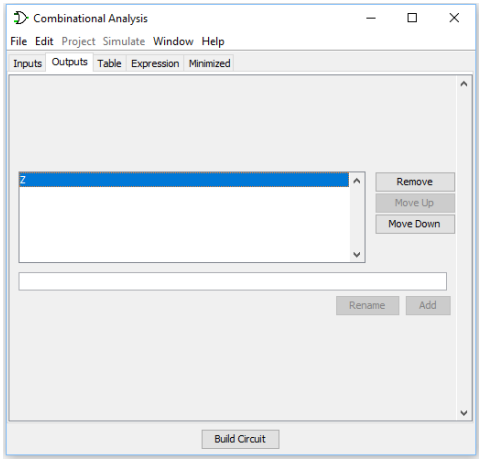
3. Use Logisim to build a circuit to convert a 8-bit binary number to the Gray code then test the circuit on binary number 11000110.

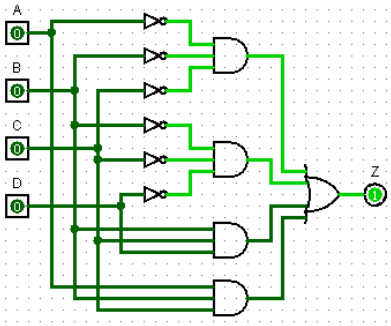


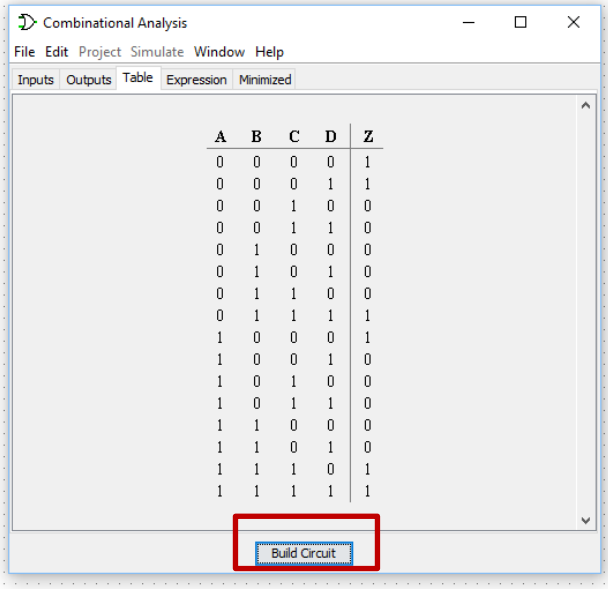
4. Use Logisim to design a combinational logic circuit with four inputs (A, B, C and D) and one output Z using one four-input OR gate and four three-input AND gates.
   The output is 1 if the input has three consecutive 0's or three consecutive 1's. For example, IF A = 1, B = 0, C = 0, and D = 0, then Z = 1, but if A=0, B = 1,
   C = 0, and D = 0. then Z = 0

From project: analyze circuit enter the inputs and outputs then go to the table tab and change the x to 0 or 1 according to the rule





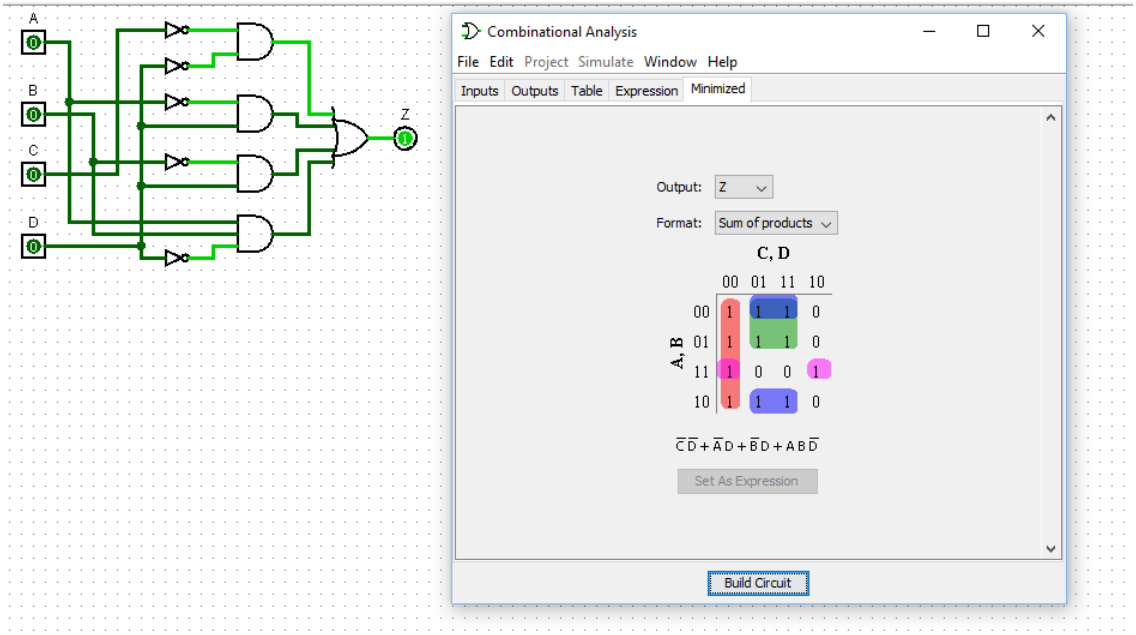




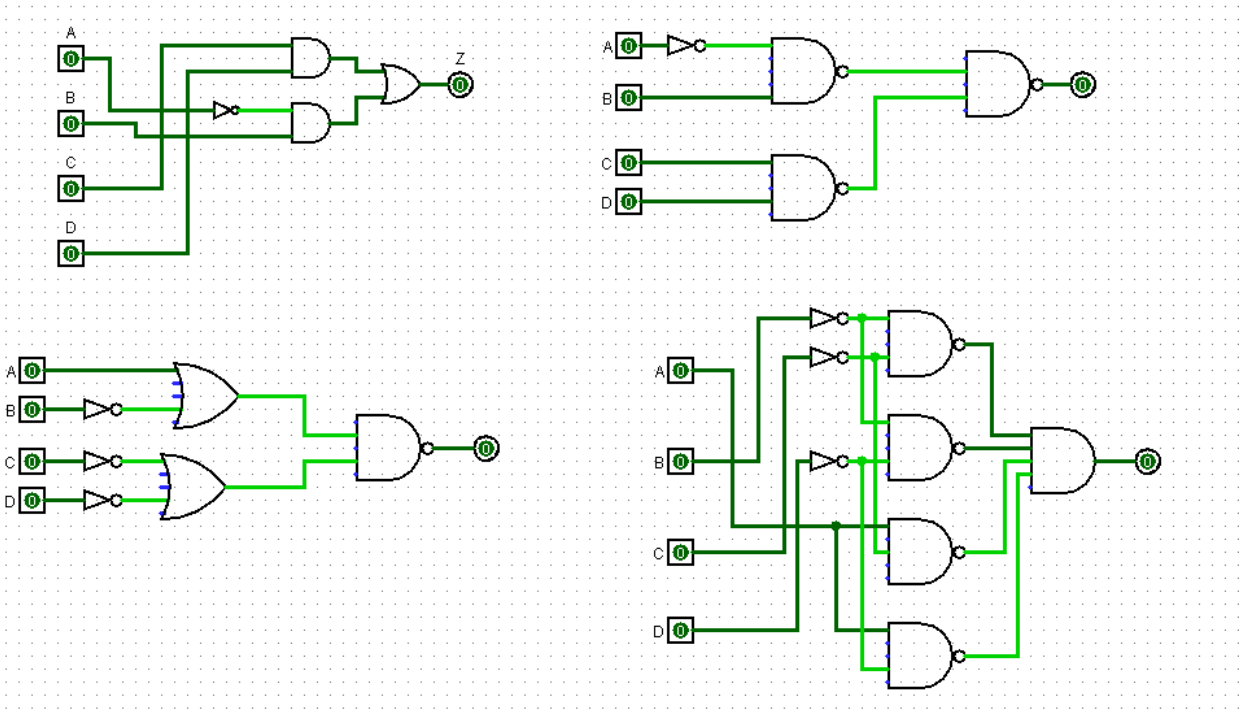
5. Use Logisim to simplify the following Karnaugh map then draw the logic circuit of the simplified form.

	$\bar{C}\bar{D}$	$\bar{C}D$	CD	$C\bar{D}$
$\bar{A}\bar{B}$	1	1	1	
$\bar{A}B$	1	1	1	
AB	1			1
$A\bar{B}$	1	1	1	

From project: analyze circuit enter the inputs and outputs then go to the Minimized tab and change the values of the Karnaugh map according to the question's table.

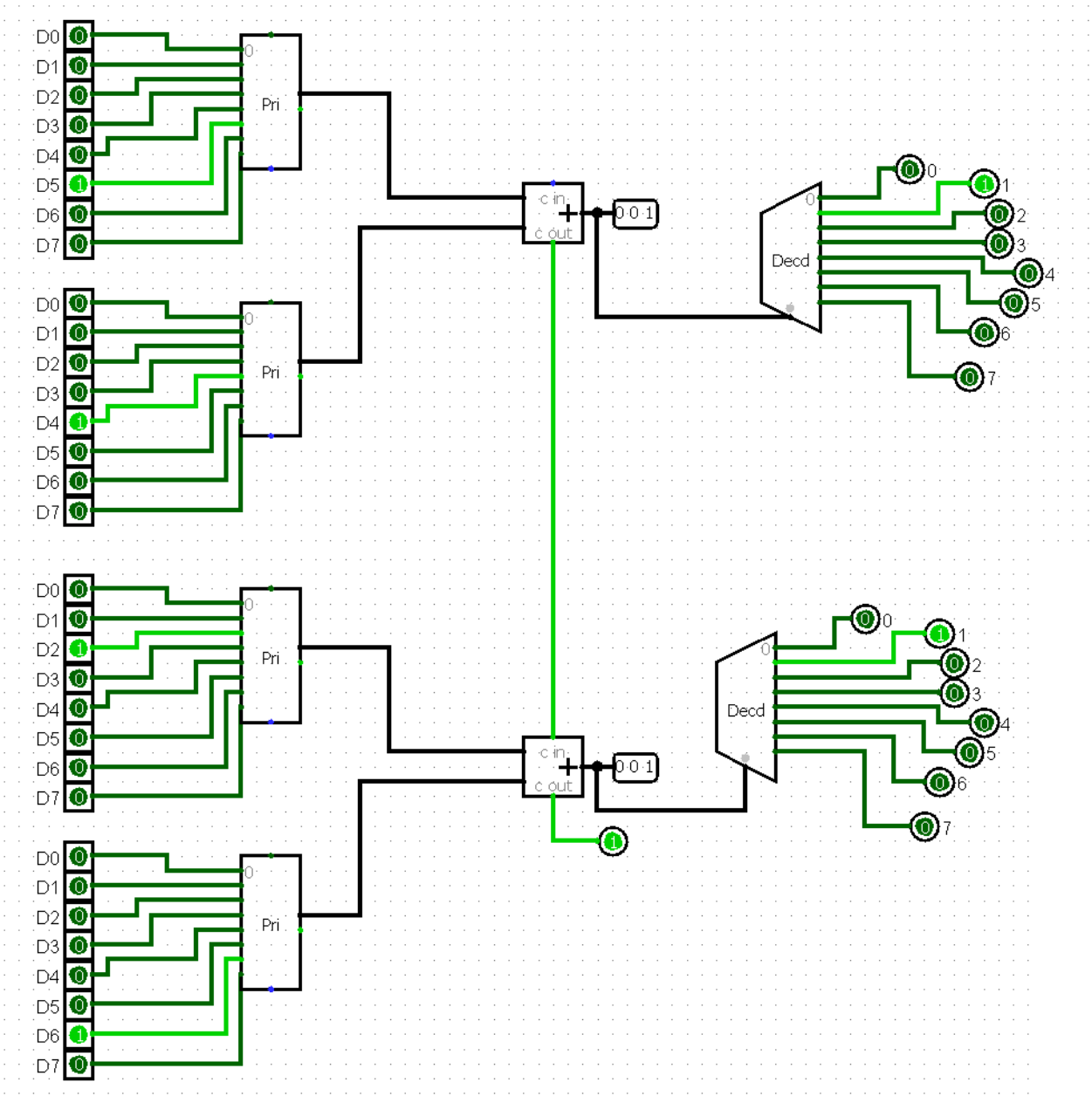


6. Use Logisim to implement f (a, b, c, d) = m (3, 4, 5, 6, 7, 11, 15) as a **two- level** gate circuit, using a minimum number of gates.
   a) Use AND gates and OR Gate.
   b) Use NAND gates only.
   c) Use OR gates and NAND gates.
   d) Use AND gates and NAND gates.



7. Use Logisim to build a circuit that sums two octal numbers, each number is two bits then tests the circuit on the $25_8 + 64_8$.

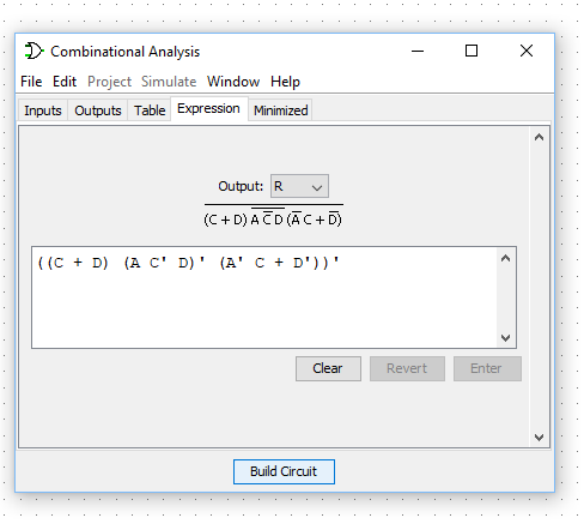
we will use two 8x3 encoders for each digit to convert from octal to binary and add the result using adder and convert the result to octal again using 3x8 decoder.

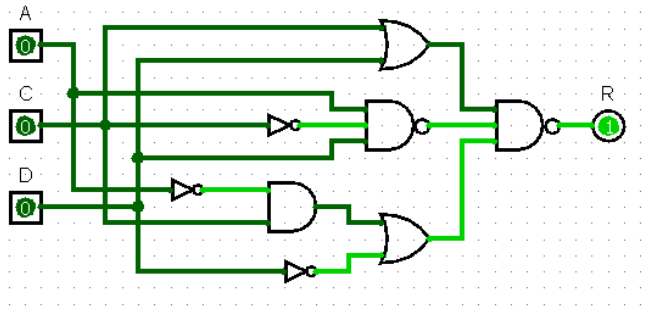


8. Use Logisim to draw the logic circuit for:

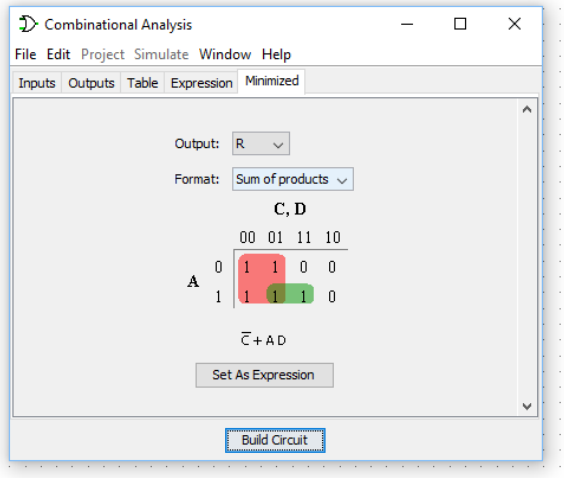
$$R = \overline{(C + D)\ A\ \overline{C}\ D\ (\overline{A}\ C + \overline{D})}$$

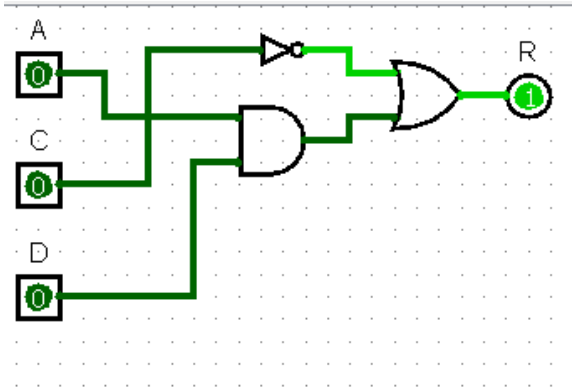
After that, draw the logic circuit of the simplified SOP and POS forms.



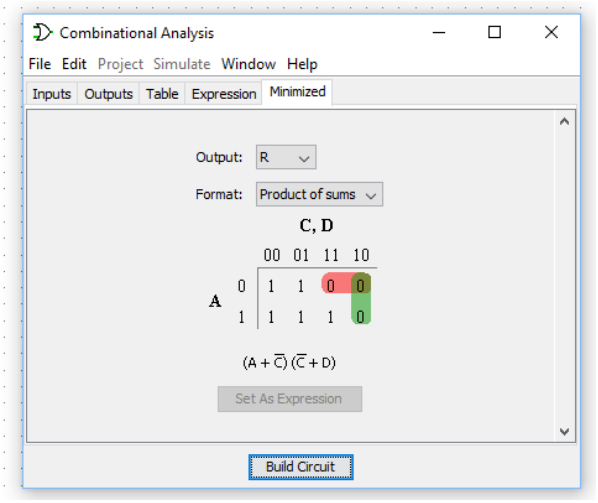


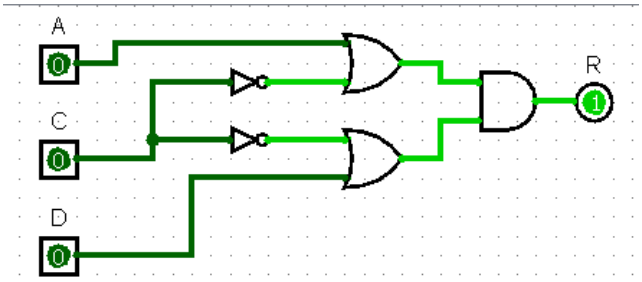
SOP





POS


Combinational Analysis
File Edit Project Simulate Window Help
Inputs Outputs Table Expression Minimized
Output: R
Format: Product of sums
C, D
00 01 11 10
A
0 1 1 0 0
1 1 1 1 0
(A + C̄) (C̄ + D)
Set As Expression
Build Circuit


A
C
D
R
0
0
0
1

9. Use Logisim to draw the logic diagram of a two-to-four- line decoder using **NOR** gates only. Include an enable input.

the truth table for the 2-4 decoder including the enable input.

Enable	INPUTS		OUTPUTS			
E	A	B	Y_3	Y_2	Y_1	Y_0
0	X	X	0	0	0	0
1	0	0	0	0	0	1
1	0	1	0	0	1	0
1	1	0	0	1	0	0
1	1	1	1	0	0	0

Get the SOP equation for each output and manipulate the equation to get the nor gate for example :

Output Y3 : $ABE = \overline{\overline{ABE}} = \overline{\bar{A} + \bar{B} + \bar{E}}$