Create a $2^2 \times 1$ MUX that implements the function $f(x,y,z) = x'y + y'z'$, using yz as control lines. Provide the MUX's output expression

1) Write the binary values possible for xyz

table 1

	x	y	z	row #
x'	0	0	0	0
	0	0	1	1
	0	1	0	2
	0	1	1	3
x	1	0	0	4
	1	0	1	5
	1	1	0	6
	1	1	1	7

2) Decompose $x'y + y'z'$ into their literal numeric values:

$$x'y + y'z'$$
$$0\ 1 \quad 0\ 0$$

find the rows in the table where:

x and y equal 01
y and z equal 00

3) Draw a table with headers for all the MUX inputs. Since the MUX is a 4×1 MUX, then it will have 4 inputs: $I_0 \cdots I_3$

table 2

	I_0	I_1	I_2	I_3	
x'	0	1	2	3	→ rows in table 1 where x is 0
x	4	5	6	7	→ rows in table 1 where x is 1

- According to the problem statement, y and z will be used for the select lines, so the remaining variables, x in this case, will be used for the inputs to the MUX.

  So if we take a look at table 1, we identify all the values where x is 0 and where x is 1

- When x is 0, we can represent it as x'

  When x is 1, we can represent it as just x

4) In table 2, circle all the row numbers that correspond to the numeric values that we determined in step 2.

	I_0	I_1	I_2	I_3
x'	0	1	2	3
x	4	5	6	7
	1	0	x'	x'

5) Designate a value for I_n depending on what is being circled:

- If all numbers in the column for I_n are circled, then:

  $I_n = 1$

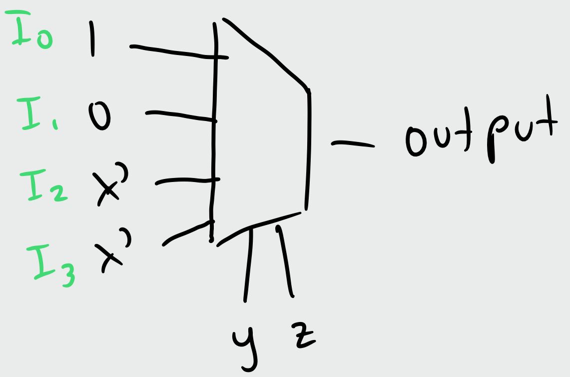
- If no numbers are circled:

  $I_n = 0$

- If only one or a few are circled, then I_n is assigned an expression that corresponds to the variable of the row in which the circled number is in:

  ↳ eg. in table 2, the number 2 is circled in row x', so $I_2 = x'$ and likewise, $I_3 = x'$

6) Draw the MUX:



7) Finally, we write the output expression of the MUX, which will be a sum of minterms, where each minterm will contain an I_n variable.

$$\underset{00}{I_0 yz} + \underset{01}{I_1 yz} + \underset{10}{I_2 yz} + \underset{11}{I_3 yz}$$

↳ This is just the skeleton of the expression. The numbers in green are designating numeric values to yz, counting upwards.

For the actual expression, we will negate y and z in accordance to these numbers.

$$\boxed{I_0 y'z' + I_1 y'z + I_2 yz' + I_3 yz}$$