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) Draw the binary table for xyz

Table 1

	x	y	z
0	0	0	0
1	0	0	1
2	0	1	0
3	0	1	1
4	1	0	0
5	1	0	1
6	1	1	0
7	1	1	1

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

$x'y + x'z'$

$\downarrow \downarrow \quad \downarrow \downarrow$

$0 \; 1 \quad 0 \; 0$ $\Rightarrow$ Find the rows in the table where:

x and y equal $\boxed{0\;1}$

y and z equal $\boxed{0\;0}$

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

Table 2

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

$\Rightarrow$ rows in table 1 where x is 0

$\Rightarrow$ 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 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 values that correspond to the numeric values 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:

  $I_n = 1$

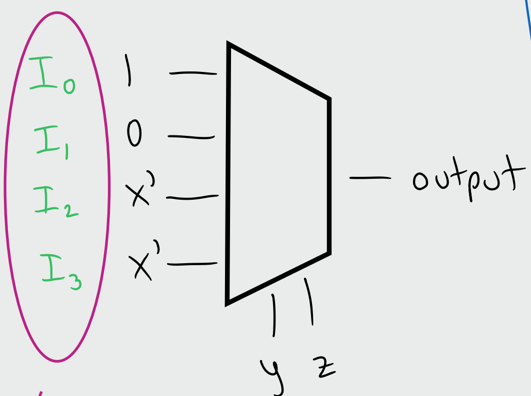
- If no numbers are circled:

  $I_n = 0$

- 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.

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

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:

$$I_0 y'z' + I_1 y'z + I_2 yz' + I_3 yz$$

Substitute the I_n terms with their corresponding value:

$$(1)y'z' + \cancel{(0)y'z} + x'yz' + x'yz = \boxed{y'z' + x'yz' + x'yz}$$