

Logic Gates

Name:

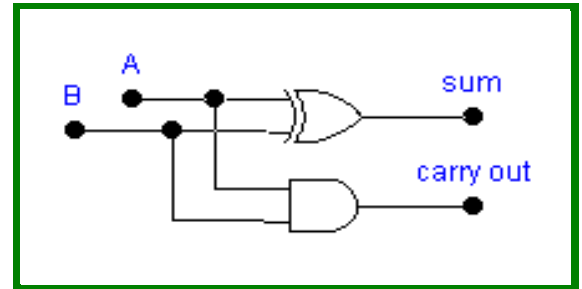


**USE THE LAB INSTRUCTIONS -
CONNECTING LOGIC GATE CIRCUITS TO
COMPLETE THIS LAB.**



VERY IMPORTANT: DISCONNECT THE
POWER SUPPLY FROM YOUR CIRCUIT WHEN
WIRING YOUR CIRCUITS.

Purpose: To study the operation of various logic gates.



Part A – Basic Gates

- Wire each of the following circuits in your breadboard. Complete the truth table for each circuit.

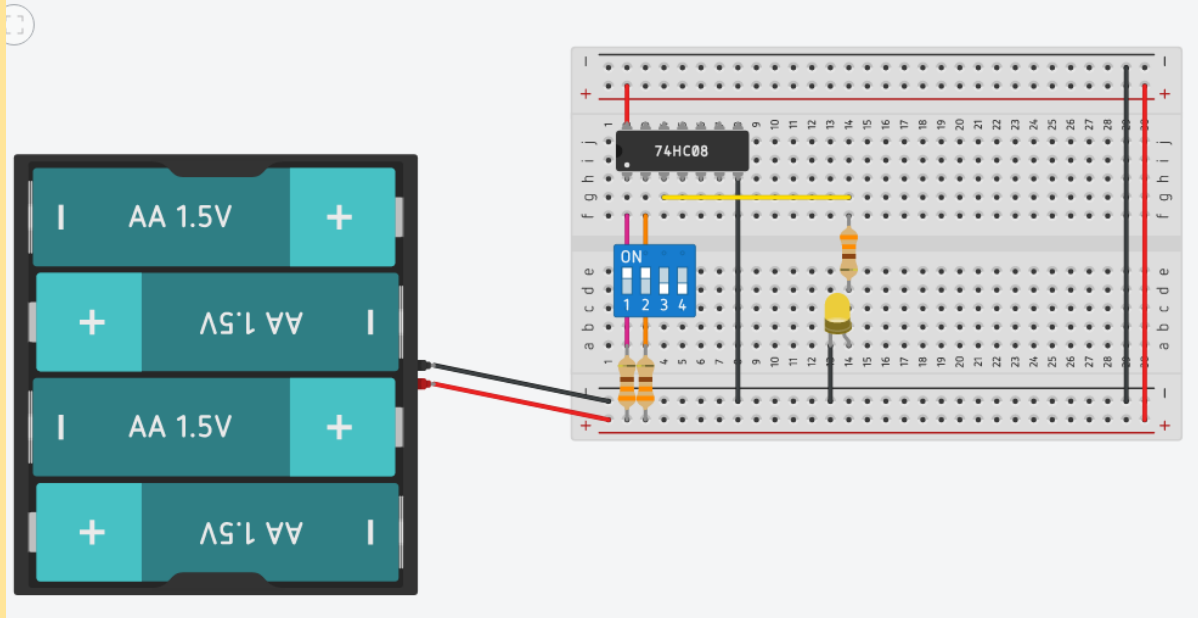
1. AND Gate

Input A (pin 1)	Input B (pin 2)	Output Y (pin 3)
0	0	0
0	1	0
1	0	0
1	1	1

**Take ONE screenshot of your circuit where the LED is ON.
Paste it in this box:**

Logic Gates

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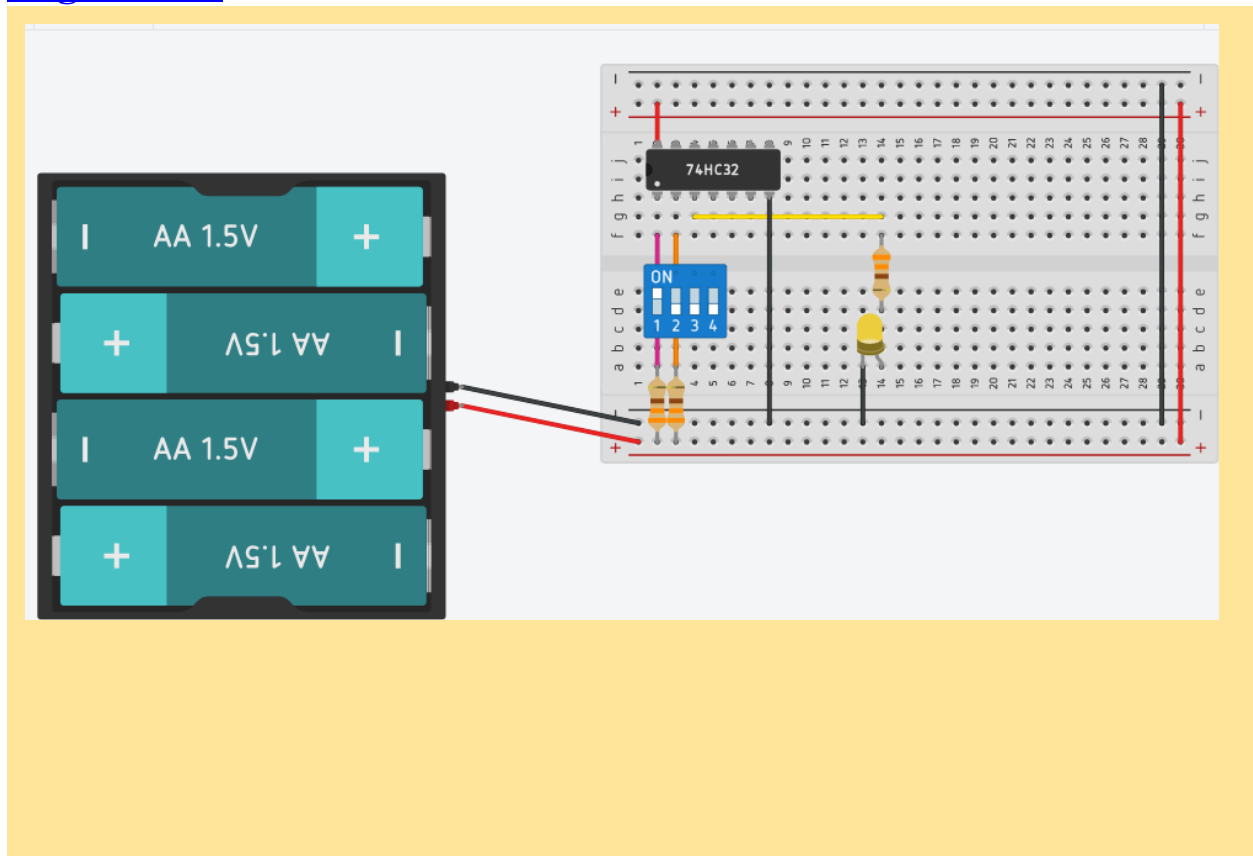
2. OR Gate

Input A (pin 1)	Input B (pin 2)	Output Y (pin 3)
0	0	0
0	1	1
1	0	1
1	1	1

Take ONE screenshot of your circuit where the LED is ON.
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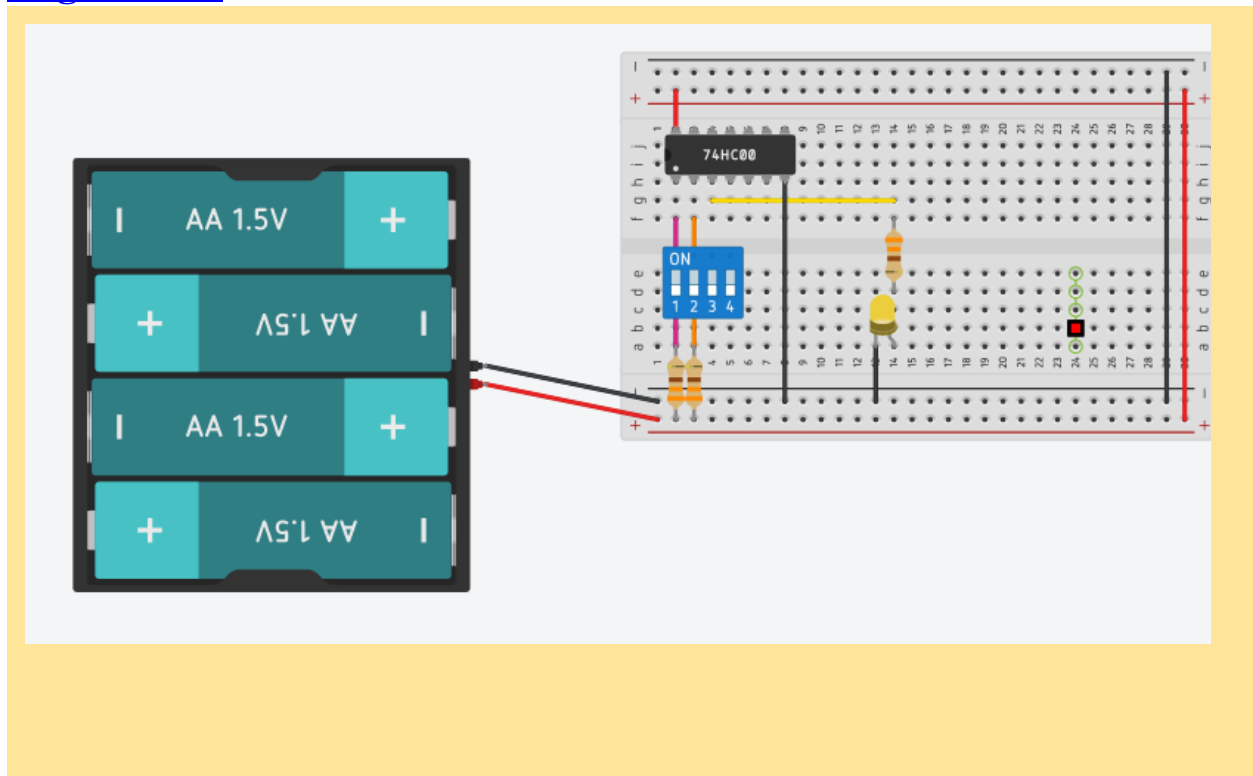
3. NAND Gate

Input A (pin 1)	Input B (pin 2)	Output Y (pin 3)
0	0	1
0	1	1
1	0	1
1	1	0

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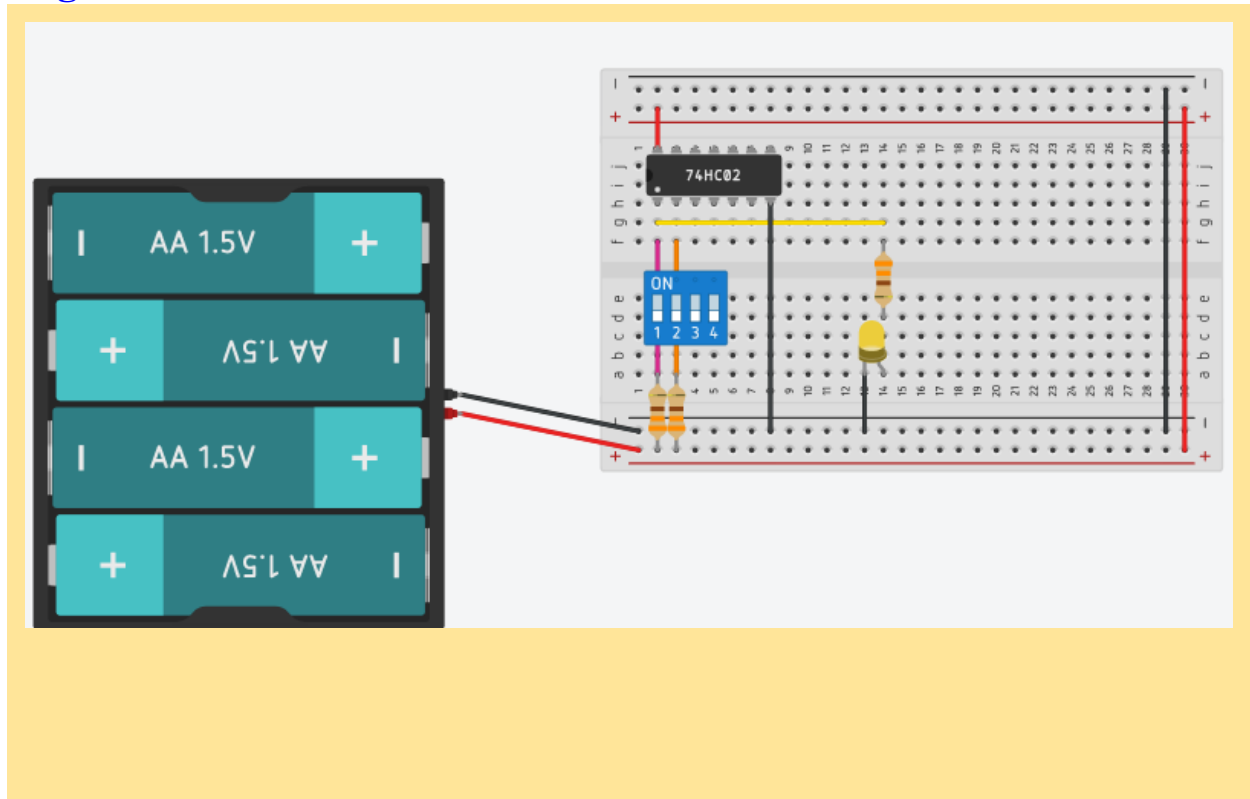
4. NOR Gate

Input A (pin 2)	Input B (pin 3)	Output Y (pin 1)
0	0	
0	1	
1	0	
1	1	

Take ONE screenshot of your circuit where the LED is ON.
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Logic Gates

Name:



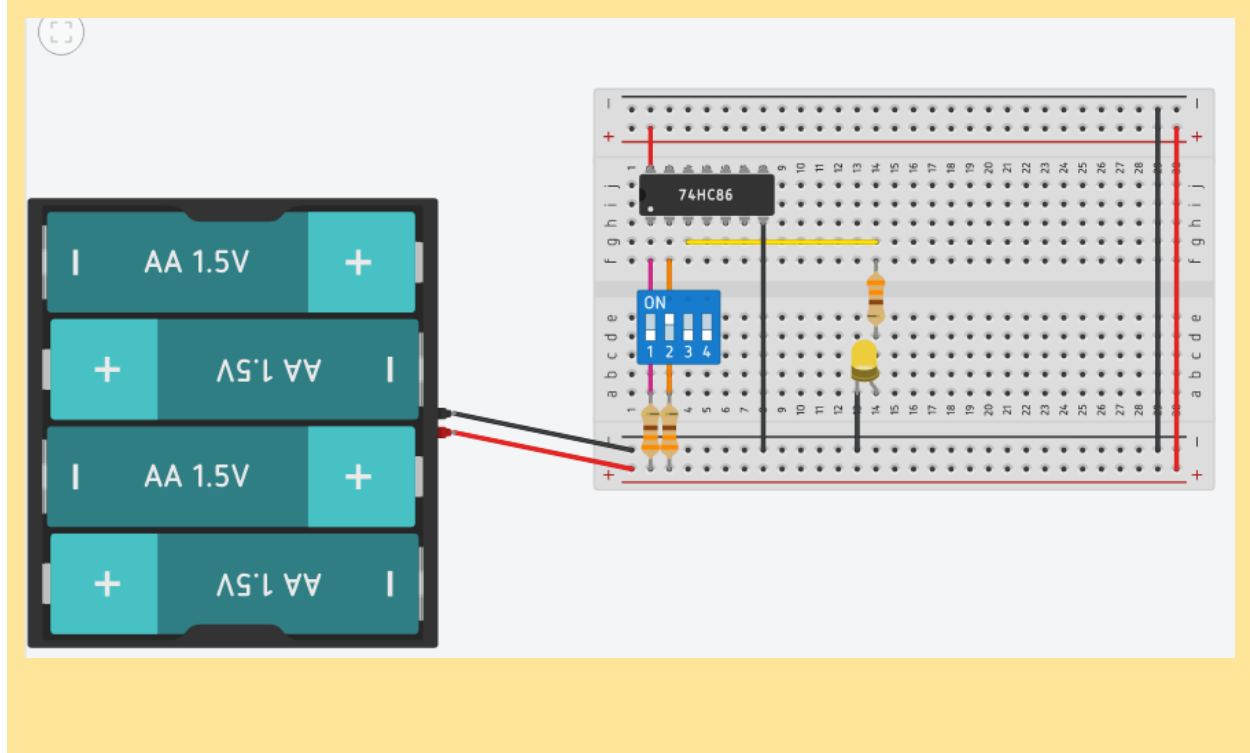
5. Exclusive OR (XOR) Gate

Input A (pin 1)	Input B (pin 2)	Output Y (pin 3)
0	0	0
0	1	1
1	0	1
1	1	0

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Part B – Combining Logic Gates

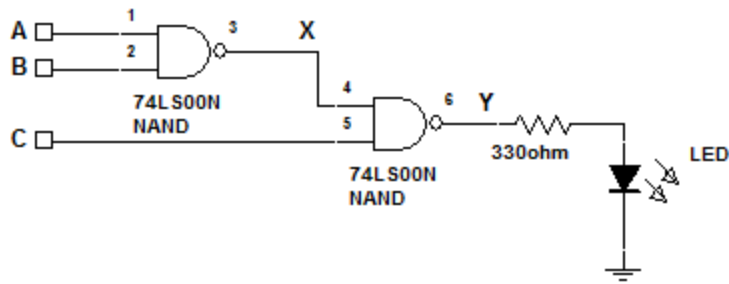
Purpose: To investigate two gates of a 74LS00 (NAND) chip to create a three input OR gate.

- Wire each of the following circuits in your breadboard. Complete the truth table for each circuit.
- **Note** that the output of one gate in one chip goes into the input of a second gate in the same chip.

1. Combining two NAND gates.

Logic Gates

Name:

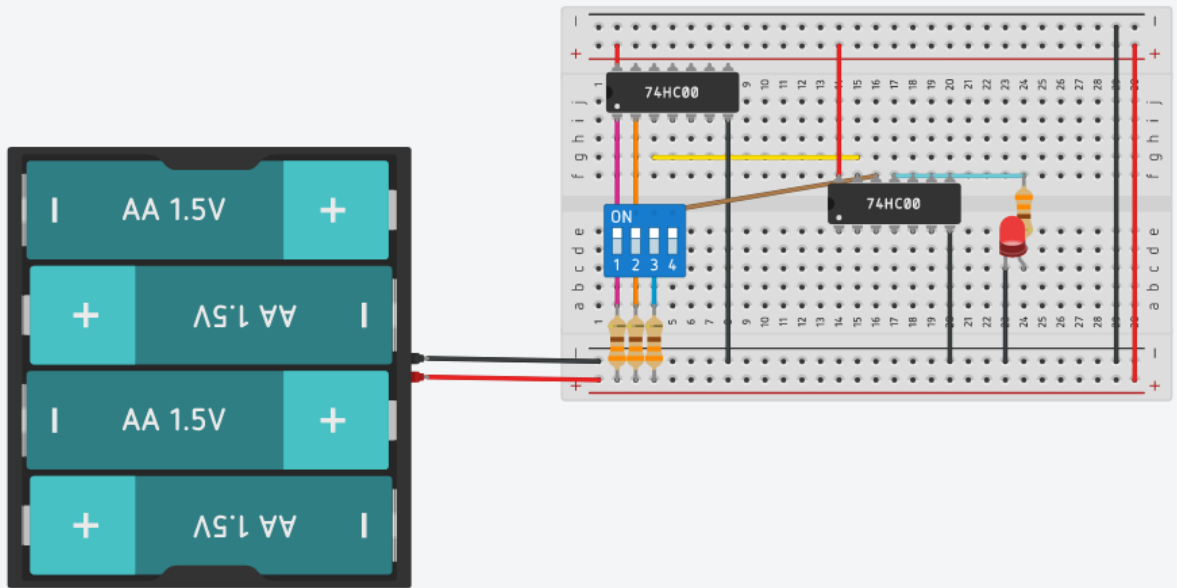


B	A	$A \cdot B$	$\overline{A \cdot B} = X$	C	$C \cdot X$	$\overline{C \cdot X} = Y$
0	0	0	1	1	1	0
0	1	0	1	1	1	0
1	0	0	1	1	1	0
1	1	1	0	1	0	1
0	0	0	1	0	0	1
0	1	0	1	0	0	1
1	0	0	1	0	0	1
1	1	1	0	0	0	1

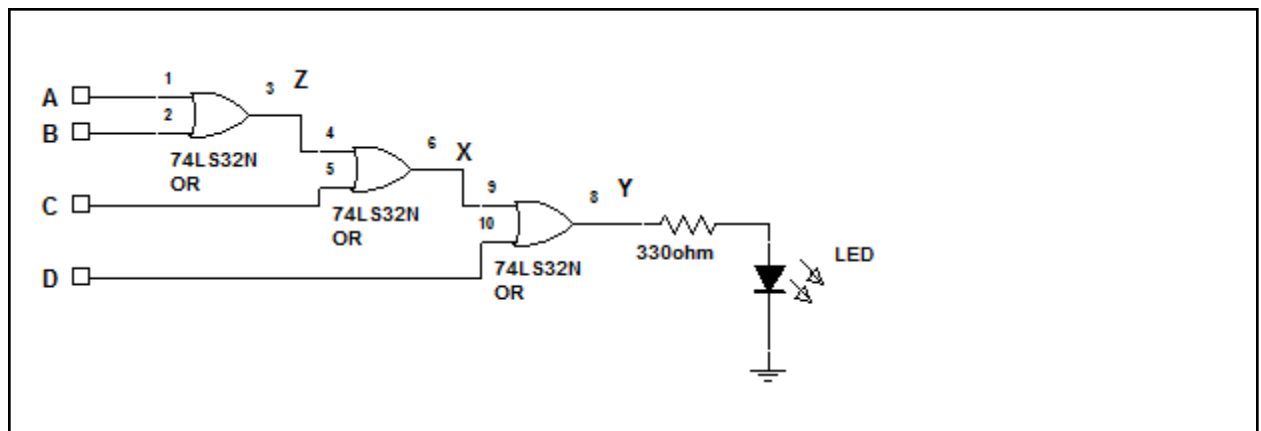
Take ONE screenshot of your circuit where the LED is ON.
Paste it in this box:

Logic Gates

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2. Combining three OR gates.



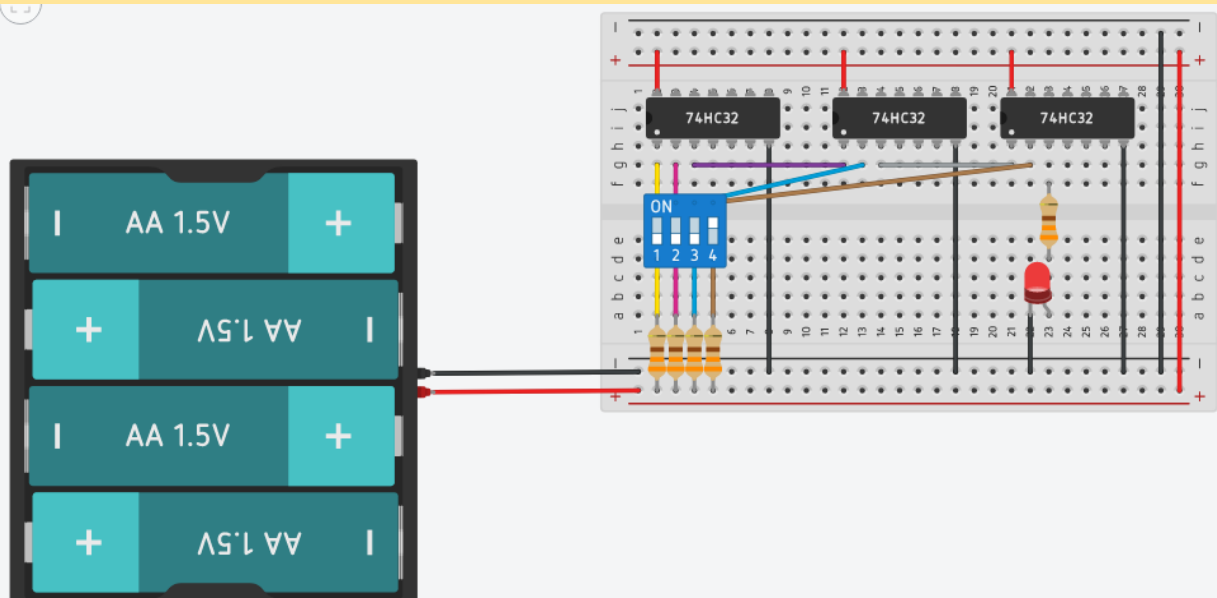
Logic Gates

Name:

D	C	B	A	$A+B = Z$	$Z+C = X$	$D+X = Y$
0	0	0	0	0	0	0
0	0	0	1	1	1	1
0	0	1	0	1	1	1
0	0	1	1	1	1	1
0	1	0	0	0	1	1
0	1	0	1	1	1	1
0	1	1	0	1	1	1
0	1	1	1	1	1	1
1	0	0	0	0	0	1
1	0	0	1	1	1	1
1	0	1	0	1	1	1
1	0	1	1	1	1	1
1	1	0	0	0	1	1
1	1	0	1	1	1	1
1	1	1	0	1	1	1
1	1	1	1	1	1	1

Take ONE screenshot of your circuit where the LED is ON.

Paste it in this box:



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Questions:

1. Given your knowledge of **AND** gates,
 - a. What would be the output of a three input AND gate circuit if the inputs were low, high, low (0 1 0)?
The output would be 0 or Low.
 - b. What three inputs would produce a high output?
The three input that would produce a high output are (1, 1, 1),
2. Given what you know about **NAND** gates, create the truth table of a **three** input NAND gate.

Input A	Input B	Input C	Output X
0	0	0	1
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

3. Given your knowledge of **XOR** gates, create the truth table of a **three** input XOR gate.

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Input A	Input B	Input C	Output X
0	0	0	0
0	1	0	1
0	0	1	1
0	1	1	0
1	0	0	1
1	1	0	0
1	0	1	0
1	1	1	1

4. Complete the sentence with the correct gate:

Circuit 2 in part B above, is a four input _____ **OR** _____ (*AND, OR, NAND, NOR, XOR*) gate.