

Date \_\_\_\_\_ Student Name \_\_\_\_\_ Period \_\_\_\_\_

# STUDENT WORKBOOK

## Mr Circuit Lab 3

# “DIGITAL LOGIC GATES”

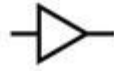


**(#1301-P)**

**contains the printed Lessons, the printed Workbook,  
Solderless Circuit Board and experiment parts.**

## 1. The 'YES' Digital Logic Gate

Here is the 'YES' Logic Gate symbol



Rule for 'YES' Logic Gate: The OUTPUT is TRUE only if the INPUT is TRUE.

Using this rule, complete the Truth Table below:

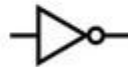
Truth Table for the 'YES' Gate	
Input	Output
A	Q
0	
1	



Copy the 'YES' Logic Gate Symbol into this box.

## 2. The 'NOT' Digital Logic Gate

Here is the 'NOT' Logic Gate symbol



Rule for 'NOT' Logic Gate: The OUTPUT is FALSE only if the INPUT is TRUE.

Using this rule, complete the Truth Table below:

Truth Table for the 'NOT' Gate	
Input	Output
A	Q
0	
1	



Copy the 'NOT' Logic Gate Symbol into this box.

### 3. The 'AND' Digital Logic Gate

Here is the 'AND' Logic Gate symbol



Rule for 'AND' Logic Gate: The OUTPUT is TRUE only if both INPUTS are TRUE.

Using this rule, complete the Truth Table below:

Truth Table for the 'AND' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'AND' Logic Gate Symbol into this box.

### 4. The 'NAND' Digital Logic Gate

Here is the 'NAND' Logic Gate symbol



Rule for 'NAND' Logic Gate: The OUTPUT is FALSE only if both INPUTS are TRUE.

Using this rule, complete the Truth Table below:

Truth Table for the 'NAND' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'NAND' Logic Gate Symbol into this box.

## 5. The 'OR' Digital Logic Gate

Here is the 'OR' Logic Gate symbol



Rule for 'OR' Logic Gate: The OUTPUT is TRUE if either or both INPUTS are TRUE.

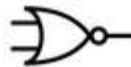
Using this rule, complete the Truth Table below:

Truth Table for the 'OR' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'OR' Logic Gate Symbol into this box.

## 6. The 'NOR' Digital Logic Gate

Here is the 'NOR' Logic Gate symbol



Rule for 'NOR' Logic Gate: The OUTPUT is FALSE if either or both INPUTS are TRUE.

Using this rule, complete the Truth Table below:

Truth Table for the 'NOR' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'NOR' Logic Gate Symbol into this box.

## 7. The 'XOR' Digital Logic Gate

Here is the 'XOR' Logic Gate symbol



Rule for 'XOR' Logic Gate: The OUTPUT is TRUE if either but not both INPUTS are TRUE.

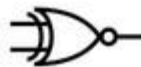
Using this rule, complete the Truth Table below:

Truth Table for the 'XOR' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'XOR' Logic Gate Symbol into this box.

## 8. The 'XNOR' Digital Logic Gate

Here is the 'XNOR' Logic Gate symbol



Rule for 'XNOR' Logic Gate: The OUTPUT is FALSE if either but not both INPUTS are TRUE.

Using this rule, complete the Truth Table below:

Truth Table for the 'XNOR' Gate		
Input A	Input B	Output Q
0	0	
0	1	
1	0	
1	1	

Copy the 'XNOR' Logic Gate Symbol into this box.

## Fill-in the missing words in the Rules for Logic Gates

1. **Rule for 'YES' Logic Gate:** The OUTPUT is \_\_\_\_\_ only if the INPUT is \_\_\_\_\_
2. **Rule for 'NOT' Logic Gate:** The OUTPUT is \_\_\_\_\_ only if the INPUT is \_\_\_\_\_.
3. **Rule for 'AND' Logic Gate:** The OUTPUT is \_\_\_\_\_ only if both INPUTS are \_\_\_\_\_.
4. **Rule for 'NAND' Logic Gate:** The OUTPUT is \_\_\_\_\_ only if both INPUTS are \_\_\_\_\_.
5. **Rule for 'OR' Logic Gate:** The OUTPUT is \_\_\_\_\_ if either or both INPUTS are \_\_\_\_\_.
6. **Rule for 'NOR' Logic Gate:** The OUTPUT is \_\_\_\_\_ if either or both INPUTS are \_\_\_\_\_.
7. **Rule for 'XOR' Logic Gate:** The OUTPUT is \_\_\_\_\_ if either but not both INPUTS are \_\_\_\_\_.
8. **Rule for 'XNOR' Logic Gate:** The OUTPUT is \_\_\_\_\_ if either but not both INPUTS are \_\_\_\_\_.

You should notice that the Rule for the NOT, NAND, NOR, and XNOR all start with the phrase "The OUTPUT is FALSE . . . . ."

For all the other Logic Gates, (i.e. YES, AND, OR and XOR) The Rule starts with the phrase "The OUTPUT is TRUE . . . . ."

The last two Logic Gates (XOR and XNOR) use a phrase "either but not both".

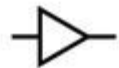
Do you see any other patterns to help you memorize the facts about Logic Gates?

Here are the Logic Gate Symbols. Can you match them to their names? Draw a line connecting the symbol with its name.

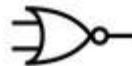
YES Gate



NOT Gate



AND Gate



NAND Gate



OR Gate



NOR Gate



XOR Gate



XNOR Gate

