Names (pair) _____ Date _____

Logic Gates and Circuits

Remember

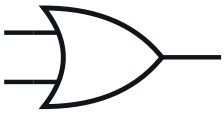
Logic gates are electronic circuits that carry out logical operations. The inputs and output are voltages: high voltage is 1 and low is 0. Connecting gates makes **logic circuits**, and a processor is built from them.

1 ON YOUR OWN Write the expression for each gate. Hint: a small circle at the output means negation.



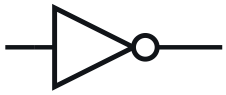
AND

$Y =$ ☐



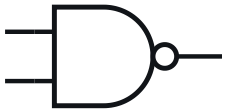
OR

$Y =$ ☐



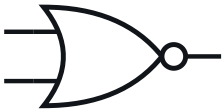
NOT

$Y =$ ☐



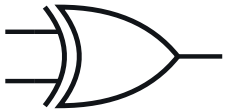
NAND

$Y =$ ☐



NOR

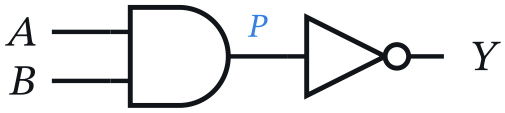
$Y =$ ☐



XOR

$Y =$ ☐

2 IN PAIRS Follow the signals through the circuit and complete the table. Which single gate could replace this circuit?

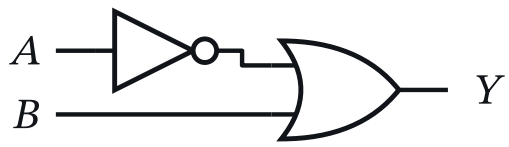


A	B	P	Y
0	0	☐	☐
0	1	☐	☐
1	0	☐	☐
1	1	☐	☐

This is the gate ☐

Names (group) _____ Date _____

3 ON YOUR OWN Write the expression for the output Y and complete the table.



A	B	$\neg A$	Y
0	0		
0	1		
1	0		
1	1		

$Y =$ ____

4 IN A GROUP **A staircase light.** There is a switch at the bottom and at the top of the stairs (A and B). The light is on when **exactly one** switch is on. Complete the table, write an expression using only ∧, ∨ and ¬, and draw the circuit.

A	B	Y
0	0	
0	1	
1	0	
1	1	

$Y =$ ____

The Logic Gates app · otooly.com/logic-gates

Build your circuit from task 4 and test it; under **Load an example...** choose **A light with two switches**.

★ ON YOUR OWN **Exit card.** A NOR gate gives 1 only when $A =$ ____ and $B =$ ____