

Name: _____
 Teacher: _____

Date: _____
 Period: _____

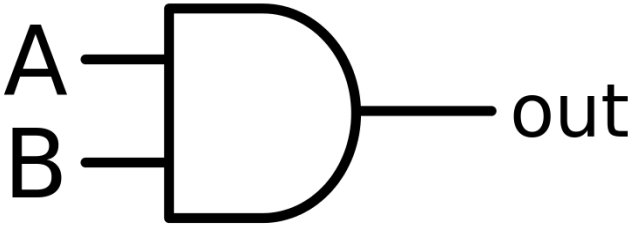
Logic circuits

Even though computers can do everything from fly spaceships to play the latest Youtube videos, they are not very smart. Computers are only able to very simple operations millions or billions of times a second, which is fast enough to combine these many operations to do complex things.

The basic way in which computers look at data are called logical circuits. Logical circuits are a type of **boolean expression**, meaning that they produce one of two values; such as true/false, yes/no, or 1/0. Each logical gate takes two boolean values as an input, and will produce a boolean value as an output which corresponds to the type of logical gate and the supplied input.

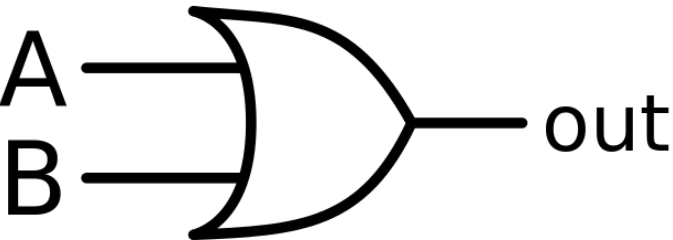
An **And Gate** outputs “True” only if both the A and B inputs are also “True”, else outputting “False.” This can be represented using the following table.

Input		Output
A	B	
False	False	False
False	True	False
True	False	False
True	True	True



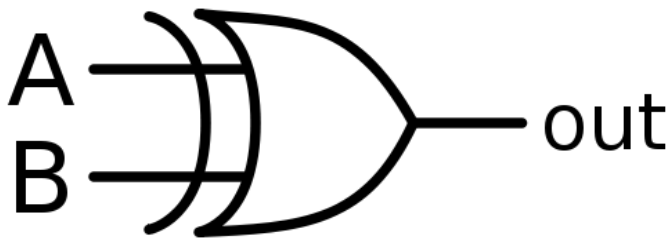
An **OR Gate** outputs “True” if either of its inputs is true.

Input		Output
A	B	
False	False	False
False	True	True
True	False	True
True	True	True



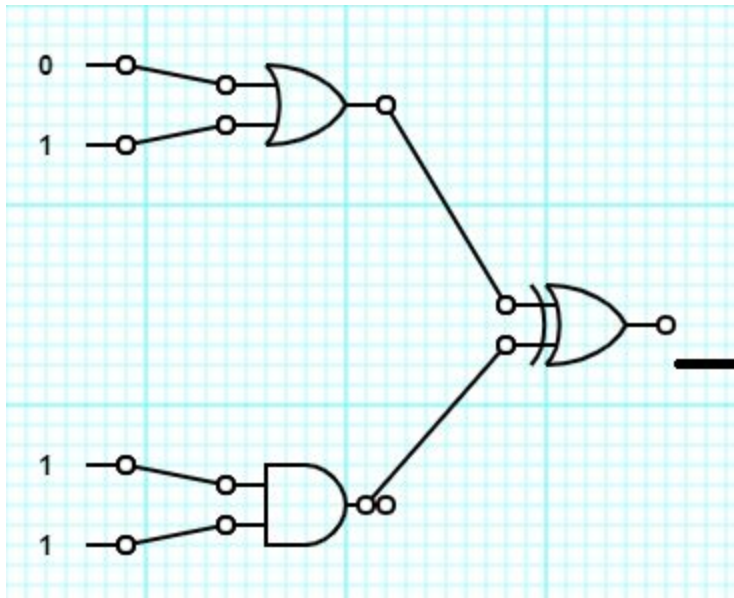
Exclusive-Or Gate:

An **Exclusive-Or Gate** outputs “True” if either of its inputs is true, but not if both inputs are “True.”

Input		Output	
A	B		
False	False	False	
False	True	True	
True	False	True	
True	True	False	

Questions:

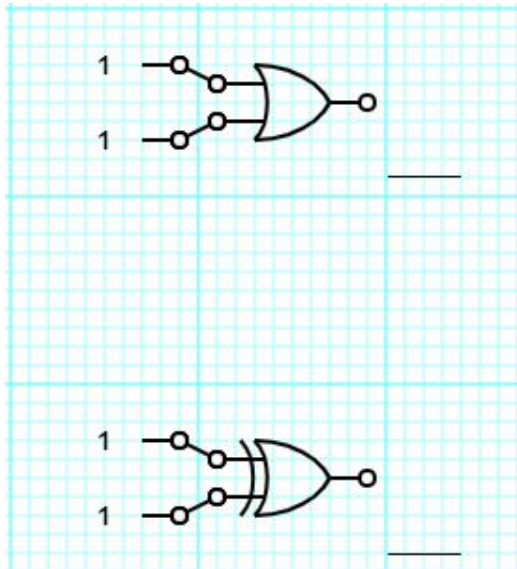
Example:



The above series of logic circuits outputs the value of 0. The **OR Gate** at the top outputs 1, and the **AND Gate** outputs 1. Using these values as the input to the **Exclusive-OR Gate** outputs 0.

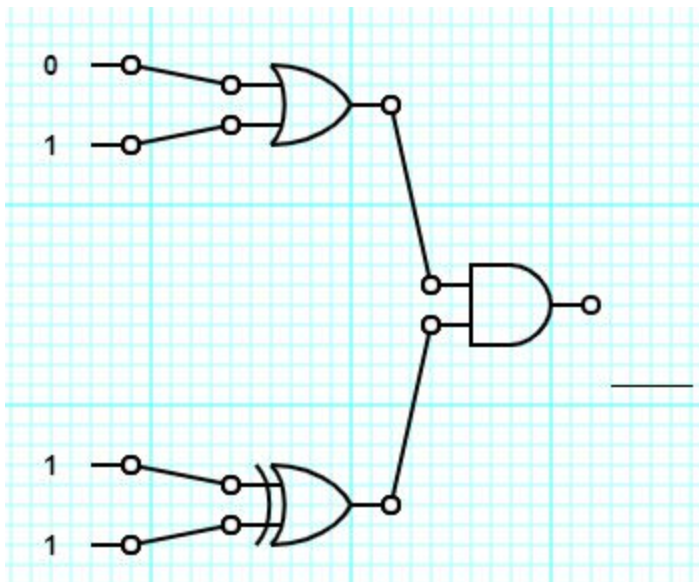
#1)

Do the two logic circuits shown below output the same value? Use a full sentence to explain your answer.



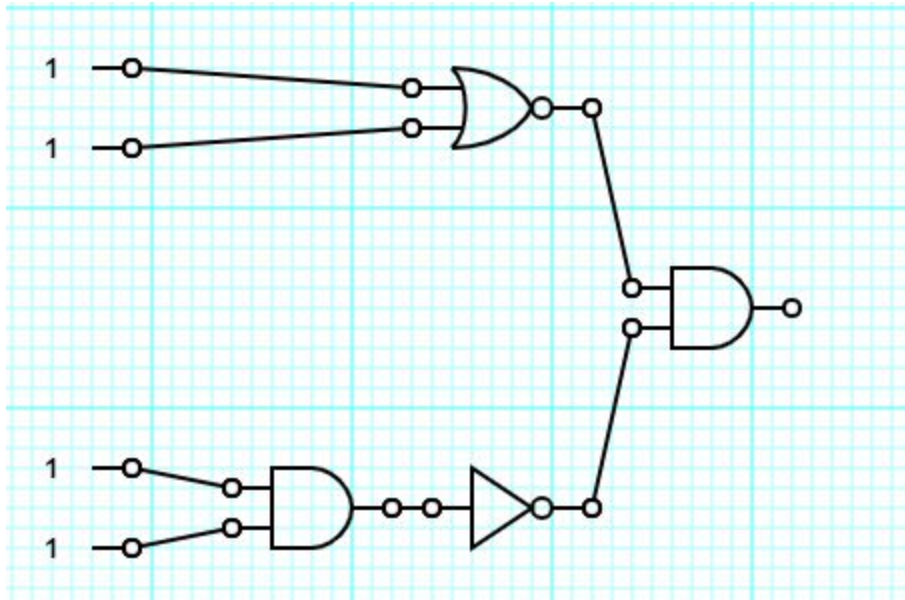
#2)

Write the output for this series of logical circuits.



#3)

Write the output for this series of logical circuits. The new symbol switches the charge on the wire, true becomes false and vice versa. The circle placed in front of the other gate has the same function.



Teacher Instructions

Estimated Time: N/A

Purpose: This worksheet will give students a basic overview of logic circuits, which are a portion of the 6-8.DI.4 standard.

Instructions:

The activity gives a basic explanation of how logic circuits work and the teacher should read over it to familiarize themselves. The following links also explain the concept of logic circuits in greater detail.

<http://www.ee.surrey.ac.uk/Projects/CAL/digital-logic/gatesfunc/>

<https://whatis.techtarget.com/definition/logic-gate-AND-OR-XOR-NOT-NAND-NOR-and-XNOR>

Answers:

#1) False

#2) The two logic circuits return a different value, because an OR Gate is true when both inputs are true while an Exclusive-OR Gate is false.

#3) False