Logic Gates

A logic gate is a way for programmers to visually figure out how the ORs, ANDs, and NOTs of a program are going to work out.

All logic gates are about true and false, at the end of the gate the final result is either true or false.

During the gate, you follow a path that may change the value of true and false.

**NOT** – when you reach a NOT the value is change, true becomes false, and false becomes true.

Examples: NOT false = true; NOT true = false

**AND** – 2 values can only result in true when combined with an AND if BOTH values start as true. Otherwise the AND results in a false value.

For example, if I say “If you are in 11th grade AND have a drivers’ license, then come to the cafeteria for a meeting”, you only go to the cafeteria if you are both in 11th grade and have a license. If you only meet one of these conditions, you do not go.

Examples: false AND true = false; true AND true = true

**OR** – 2 values result in true when combined with an OR as long as at least one of them is true. The result is only false when both are false.

For example, using the statement above you would go to the cafeteria if you are in 11th grade, or have a license, or both.

Examples: false OR true = true; false OR false = false

An example of what a logic gate looks like is on the next page: I have solved this logic gate as an example, my work is typed beside each step, and the steps I took are written below for you.

Given that input A is false, and input B is true, what is the resulting value (true or false) of the output:
1. Fill in A and B according to the starting conditions: in this example they tell us A starts as false and B starts as true.

2. Determine the value of the OR block: since A is false and B is true this block reads “false OR true”. An OR is true as long as one part is true, so the result is true.

3. The current result is true from the last step. A NOT block reverses the value, NOT true = false.

4. So the final result for this logic gate would be false. *When solving these on your own I encourage you to write the result of each step next to the image as I did (if possible).

**ASSIGNMENT**: Solve the logic gates below

1. Given that A is false and B is false, what is the resulting value?

![AND gate diagram]

2. Given that A is false and B is true, what is the resulting value?

![OR gate diagram]

3.
4. Given that A is true and B is false, what is the resulting value?

5. Given that A is false, B is false, and C is false, what is the resulting value?

6. Given that A is true, B is false, and C is true, what is the resulting value?
7. Given that A is false, B is true, and C is true, what is the resulting value?

8. Given that A is true, B is true, and C is true, what is the resulting value?