

Logic Gate Simulator

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/logic-gate-simulator/>

Name: _____ Date: _____

Learning objectives

- Identify the basic logic gates and their symbols.
- Build truth tables for each gate.
- Combine gates to make a simple circuit.

Variables to change

- Gate type (AND, OR, NOT, NAND, NOR, XOR)
- Input values (0/1)

Procedure

1. Select each gate and toggle its inputs through all combinations.
2. Record the output for every input combination (its truth table).
3. Wire two gates together and predict, then check, the output.

Observations

Fill in a truth table for each gate you test.

Questions

1. When is an AND gate's output 1?
2. When is an OR gate's output 1?
3. What does a NOT gate do?
4. How does XOR differ from OR?

5. Why are NAND and NOR called universal gates?

Answer key (instructors)

- **1.** Only when all inputs are 1.
- **2.** When at least one input is 1.
- **3.** Inverts its input: 0 becomes 1 and 1 becomes 0.
- **4.** XOR outputs 1 only when the inputs differ; it is 0 when both are 1.
- **5.** Any logic function can be built entirely from NAND gates alone (or NOR gates alone).

Logic gates output a 1 or 0 from their inputs by fixed rules: AND needs all inputs true, OR any, NOT inverts, XOR needs them different. Their truth tables fully define them, and NAND or NOR alone can build any digital circuit.