

Name:

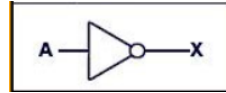
Date:

Class:

## Beyond Binary Quiz **Answer Key**

**Instructions:** Fill in the blanks with the logic gate type that is represented in the image. Your choices are AND, NOT, or OR.

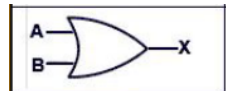
1. \_\_\_\_\_ **NOT** \_\_\_\_\_



2. \_\_\_\_\_ **AND** \_\_\_\_\_



3. \_\_\_\_\_ **OR** \_\_\_\_\_



4. \_\_\_\_\_ **OR** \_\_\_\_\_

Input A	Input B	Output
0	0	0
1	0	1
0	1	1
1	1	1

5. \_\_\_\_\_ **AND** \_\_\_\_\_

Input A	Input B	Output
0	0	0
1	0	0
0	1	0
1	1	1

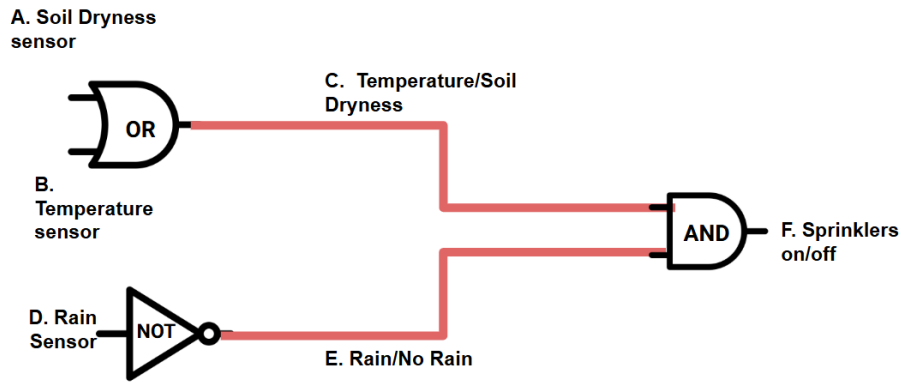
6. \_\_\_\_\_ **NOT** \_\_\_\_\_

Input	Output
0	1
1	0

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7. The following is a set of logic gates that create a smart control for a sprinkler system. Create a set of truth tables for **each gate** using words (not 1s and 0s), and then write a statement that explains all of the conditions that must be true for the sprinkler system to automatically turn on.

### Lawn Sprinkler System-Integration Diagram



#### OR Gate

Input A	Input B	Output C
Sensor reads below acceptable soil moisture (high input)	Sensor reads high temperature (high input)	High (on) signal sent to AND gate
Sensor reads below acceptable soil moisture (high input)	Sensor reads low temperature (low input)	High (on) signal sent to AND gate
Sensor reads soil moisture levels in acceptable range (low input)	Sensor reads high temperature (high input)	High (on) signal sent to AND gate
Sensor reads soil moisture levels in acceptable range (low input)	Sensor reads low temperature (low input)	Low (off) signal sent to AND gate

#### NOT Gate

Input D	Output E
Sensor detects that it is raining (high input)	Low (off) signal sent to AND gate
Sensor does not detect rain (low input))	High (on) signal sent to AND gate

#### AND Gate

Input C	Input E	Output F
High signal means either high temp or dry soil	High signal means it is not raining	High (on) signal sent to turn the sprinkler system on
High signal means either high temp or dry soil	Low signal means it is raining	Low (off); sprinkler system remains off

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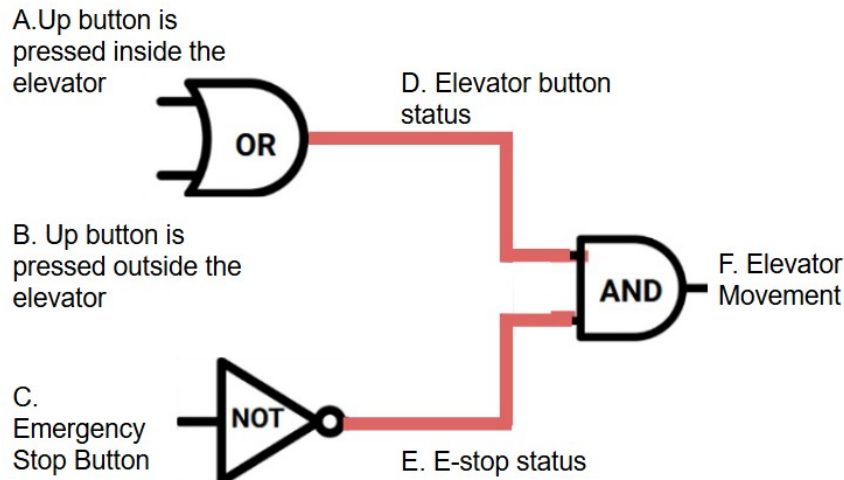
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Input C	Input E	Output F
Low signal means soil is both moist and cool	High signal means it is not raining	Low (off); sprinkler system remains off
Low signal means soil is both moist and cool	Low signal means it is raining	Low (off); sprinkler system remains off

8. **Choose one** of the two scenarios below. Sketch the logic gate integrated circuit described by the scenario. Then create truth tables using words, not 1s and 0s, to describe how each gate functions and integrates with the others to complete the task.

<p><b>Elevator Control:</b> An elevator moves up when either the up button is pressed inside the elevator or the up button is pressed outside the elevator, but not when the emergency stop button has been pressed.</p>	<p><b>Secure Building Access:</b> A user can gain access when both the correct username and password are entered or a valid biometric scan occurs, but not if the building is on lockdown.</p>
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**OR Gate**

Input A	Input B	Output D
Sensor reads pushed button inside elevator (high input)	Sensor reads pushed button outside elevator (high input)	High (on) signal sent to AND gate
Sensor reads pushed button inside elevator (high input)	Sensor does not read pushed button outside elevator (low input)	High (on) signal sent to AND gate
Sensor does not read pushed button inside elevator (low input)	Sensor reads pushed button outside elevator (high input)	High (on) signal sent to AND gate
Sensor does not read pushed button inside elevator (low input)	Sensor does not read pushed button outside elevator (low input)	Low (off) signal sent to AND gate

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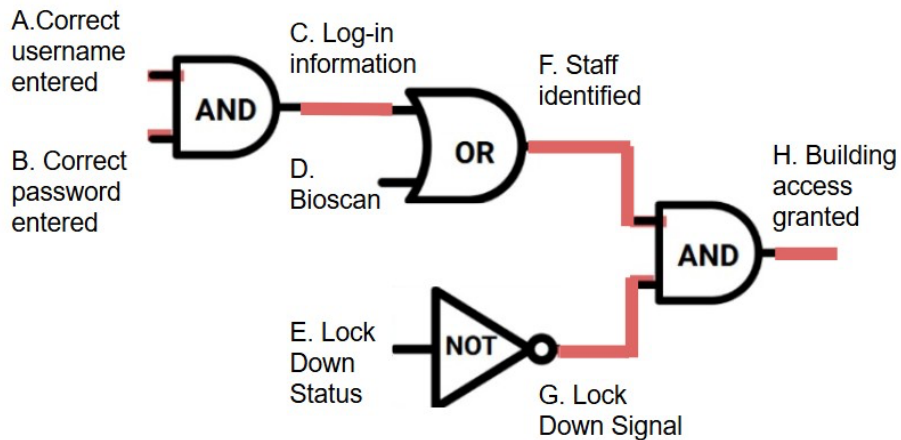
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NOT gate

Input C	Output E
Sensor detects that the emergency stop button has been pushed (high input)	Low (off) signal sent to AND gate
Sensor detects that the emergency stop button has not been pushed (low input)	High (on) signal sent to AND gate

AND Gate

Input D	Input E	Output F
High (on) signal sent from elevator button push	Low (off) signal sent representing emergency stop is pushed	Low (off); elevator will not move
High (on) signal sent from elevator button push	High (on) signal sent representing emergency stop is not pushed	High (on); elevator set to move
Low (off) signal sent from elevator button	Low (off) signal sent representing emergency stop pushed	Low (off); elevator will not move
Low (off) signal sent from elevator button	High (on) signal sent representing emergency stop is not pushed	Low (off); elevator will not move



AND Gate

Input A	Input B	Output C
High (on) signal sent representing correct username	Low (off) signal sent representing incorrect password	Low (off); Log-in information not confirmed
High (on) signal sent representing correct username	High (on) signal sent representing correct password	High (on); Log-in information confirmed

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Input A	Input B	Output C
Low (off) signal sent representing incorrect username	Low (off) signal sent representing incorrect password	Low (off); Log-in information not confirmed
Low (off) signal sent representing incorrect username	High (on) signal sent representing correct password	Low (off); Log-in information not confirmed

OR Gate

Input C	Input D	Output F
High (on); Log-in information confirmed	Bioscan confirms identity; high (on)	High (on) signal sent to AND gate
High (on); Log-in information confirmed	Bioscan denies identity; low (off)	High (on) signal sent to AND gate
Low (off); Log-in information not confirmed	Bioscan confirms identity; high (on)	High (on) signal sent to AND gate
Low (off); Log-in information not confirmed	Bioscan denies identity; low (off)	Low (off) signal sent to AND gate

NOT gate

Input E	Output G
Building is in lockdown; high (on)	Low (off) signal sent to AND gate
Building is not in lockdown; low (off)	High (on) signal sent to AND gate

AND Gate

Input F	Input G	Output H
High (on) signal sent to AND gate from identification sensors	Low (off) signal sent to AND gate representing building is in lockdown	Low (off); Building access not granted
High (on) signal sent to AND gate from identification sensors	High (on) signal sent to AND gate representing building is not in lockdown	High (on); Building access granted
Low (off) signal sent to AND gate from identification sensors	Low (off) signal sent to AND gate representing building is in lockdown	Low (off); Building access not granted
Low (off) signal sent to AND gate from identification sensors	High (on) signal sent to AND gate representing building is not in lockdown	Low (off); Building access not granted

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