



F9.1 Logic gates and truth tables

Logic and computer systems · GCSE · OCR J277 2.4.1, AQA 8525 3.4.2,
Edexcel 1CP2 1.3.1 · about 15 min

Name _____

Class _____

Date _____

What this lesson is about

AND, OR and NOT, their symbols and truth tables, and a robot decision as a circuit.

- AND, OR and NOT
- Truth tables
- A robot decision as a circuit
- Three inputs

Questions

6 marks in all

1. When does an AND gate output 1? [1 mark]

- ☐ A Only when both inputs are 1
- ☐ B When at least one input is 1
- ☐ C When the inputs are different
- ☐ D When both inputs are 0

2. When does an OR gate output 0? [1 mark]

- ☐ A Only when both inputs are 0
- ☐ B When at least one input is 0
- ☐ C When the inputs are different
- ☐ D Never

3. How many rows does a truth table for 3 inputs have? [1 mark]

_____ [1 mark]

4. A is 1 and B is 1. What is A AND (NOT B)? [1 mark]

_____ [1 mark]

5. What does this program print? [1 mark]

```
def AND(a, b): return 1 if a and b else 0
def NOT(a): return 1 - a
print(AND(1, NOT(0)), NOT(AND(1, 1)))
```

6. Which gate has only one input? [1 mark]

- ☐ A NOT
- ☐ B AND
- ☐ C OR
- ☐ D XOR

The task: truth tables

Write `AND(a, b)`, `OR(a, b)` and `NOT(a)` as functions that take and return 0 or 1. Print the truth table for `A AND (NOT B)`, one row per line in the form `A=0 B=1 Q=0`, trying every combination with loops.

```
# the two lines every program starts with: the commands, then the robot
from bugbot import *
connect()

def AND(a, b):
    return 0
```

Plan your program here, then type it in and press Run.



Do it on the robot

www.bugbotlab.com/learn/f9-1-logic-gates-and-truth-tables/

The simulator checks it and tells you when it passes. Nothing to install, no account.

Challenges

1. Print the truth table for `NOT (A OR B)`. Which gate does it match the opposite of?
2. Make the robot's circuit also require that it has not just bumped into something, using `bumped()`.
3. How many rows does a truth table for 5 inputs have? Check by printing it.