AND, OR and NOT gates

LEARNING INTENTION

We are learning what AND, OR and NOT logic gates do and how to draw their symbols.

SUCCESS CRITERIA – I CAN

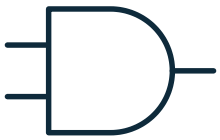
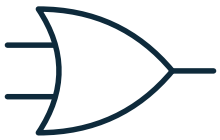
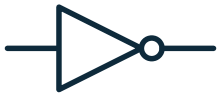
- ☐ state what 0 and 1 mean in a digital system
- ☐ draw and name the AND, OR and NOT symbols
- ☐ state the output of each gate for given inputs
- ☐ choose a gate to meet a simple description

Digital signals

A **digital** signal has only two states: **1** (high, on, true, about the supply voltage) and **0** (low, off, false, 0 V).

Logic gates are processes that make decisions using these states.

The three gates

Gate	Symbol	Output is 1 when...	Boolean
AND		**all** inputs are 1	Z = A • B
OR		**any** input is 1	Z = A + B
NOT		the input is **0** (it inverts)	$Z = \overline{A}$

TRUTH TABLES

A	B	Z
0	0	0
0	1	0
1	0	0
1	1	1

A	B	Z
0	0	0
0	1	1
1	0	1
1	1	1

A	Z
0	1
1	0

DATASHEET · LOGIC GATES

01 AND: all inputs 1.

02 OR: at least one input 1.

03 NOT: output is the opposite.

04 Inputs come from switches or sensor circuits.

AND, OR and NOT gates

WORKED EXAMPLE **Which gate?**

1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
a press needs BOTH guard closed AND start pressed	gate	both inputs needed → AND either input → OR opposite → NOT	guard closed = 1 start pressed = 1 press runs only if both are 1	**AND gate** Z = A • B

Look for the words 'both', 'either' and 'not' in the description.

SHORT CIRCUIT

× WHAT EXAMINERS SAW

Logic circuits and simulations had inputs with no input device or no label, so the circuit could not be tested.

✓ THE FIX

Every input must have a suitable input device (e.g. a switch) and a label (A, B, C) that matches the task.

Course report 2026, Tasks 4a–c.

Three gates side by side

THREE GATES, THREE RULES

1



AND: 1 only if A AND B are 1

2



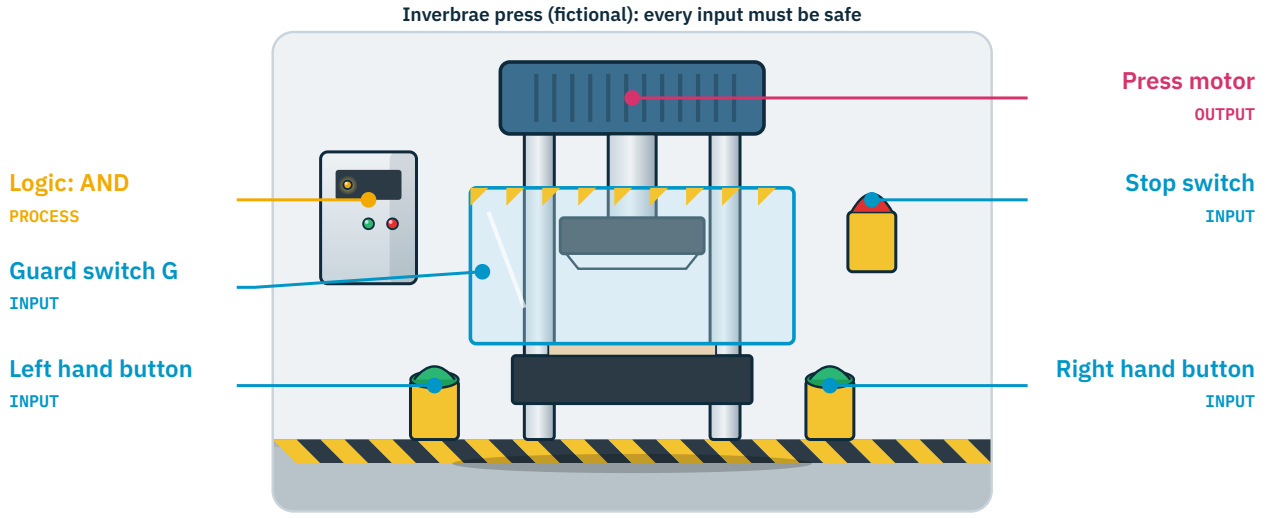
OR: 1 if A OR B (or both) is 1

3



NOT: output is the opposite of A

AND, OR and NOT gates



WORKED EXAMPLE Which gate for a car seatbelt alarm?

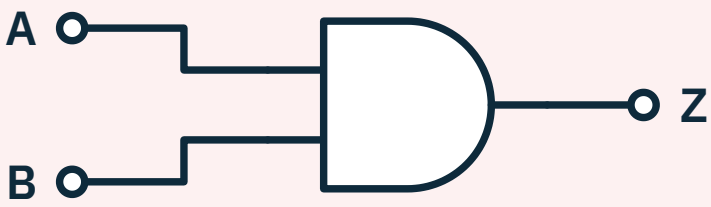
1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
alarm sounds if the engine is on AND the belt is NOT fastened	gates	'and' → AND 'not' → NOT	NOT on belt switch AND with engine	$Z = E \cdot \overline{B}$

WORKED EXAMPLE Reading a gate's output

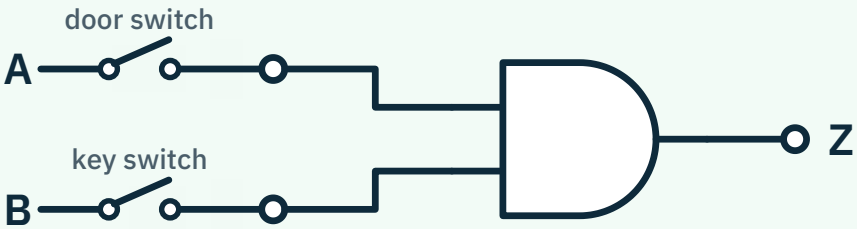
1 GIVEN	2 FIND	3 FORMULA	4 SUBSTITUTE	5 ANSWER + UNIT
OR gate, A = 0, B = 1	Z	OR: 1 if any input is 1	B is 1	**Z = 1**

AND, OR and NOT gates

WRONG No input devices: cannot be tested (course report 2026).



RIGHT Inputs labelled with devices.



REAL ENGINEERING · INVERBRAE MACHINE WORKS

A guillotine at Inverbrae Machine Works (fictional) uses AND logic: the blade only moves when both of the operator's hands press two-hand buttons.

It is impossible to have a hand under the blade while both buttons are held.

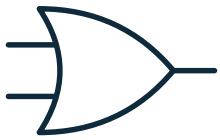
PROBE · QUICK CHECKS

1. AND output when A = 1, B = 0? _____
2. OR output when A = 0, B = 1? _____
3. NOT output when input = 1? _____

AND, OR and NOT gates

EXAM READY · 4 MARKS

1 **State** the name of this logic gate. **[1]**



2 **State** the output of an AND gate when A = 1 and B = 1. **[1]**

3 A lamp must come on if either of two doors is open. **State** the gate needed. **[1]**

4 **Complete** the truth table for a NOT gate. **[1]**

A	Z
0	
1	