1.4 DATA TYPES & STRUCTURES · 1.4.3

Logic gates & truth tables

The six gates, their truth tables, and building tables from circuits. Spec 1.4.3(d)(a).

01 The six gates

NOT `¬A` — inverts.

AND `A·B` — 1 if **both** 1.

OR `A+B` — 1 if **either** 1.

NAND `¬(A·B)` — 0 only if both 1.

NOR `¬(A+B)` — 1 only if both 0.

XOR `A⊕B` — 1 if inputs **differ**.

02 Truth table

A	B	AND	OR	XOR	NAND	NOR
0	0	0	0	0	1	1
0	1	0	1	1	1	0
1	0	0	1	1	1	0
1	1	1	1	0	0	0

Rows **n inputs → 2^n rows** (2→4, 3→8).

03 Working with circuits

Problem → expr AND→ `·` , OR→ `+` , NOT→bar. "member & Tue, or student" = `(M·T)+S` .

Complete TT Add a column **per gate**, fill them, then combine.

Draw circuit One gate per operator; wire inputs in the right order (brackets first).

FINAL PASS BEFORE THE EXAM

Rapid exam tips

Six slips on logic questions.

01

OR = 1 if at least one input is 1; **XOR** = 1 only if they **differ**.

02

NAND/NOR = AND/OR with the output **inverted**.

03

n inputs → **2^n rows**; list them in binary-counting order.

04

For circuits, add an **intermediate column per gate**.

05

Translate problems: AND→·, OR→+, NOT→bar, with brackets.

06

Brackets first, then the gate that joins them.