

Solutions

Each answer shows the steps, then the **result**.

2.1

- NOT 0 = **1**
- NOT 1 = **0**

2.2

- both inputs are 1, written **1 and 1**

2.3

- the output is 1 when the inputs are **different**

2.4

- NAND is NOT AND: it outputs the opposite of AND
- when both inputs are 1, AND is 1, so NAND is **0**

2.5

- 0 NOR 0 = **1**
- 0 NOR 1 = **0**
- 1 NOR 0 = **0**
- 1 NOR 1 = **0**

2.6

- both conditions are required, so the gate is AND
- **X = A AND B**

3.1 C

- AND is 1 only for inputs 1 and 1
- OR is also 1 when one input is 1; XOR is 1 when the inputs differ; NOR is 1 only for 0 and 0

3.2

- OR column: **0, 1, 1, 1**
- X is NOT of that column: **1, 0, 0, 0**

A	B	A OR B	X
0	0	0	1
0	1	1	0
1	0	1	0
1	1	1	0

3.3

(a)

- switch B is off, so use NOT B
- both parts are required: $X = A \text{ AND } (\text{NOT } B)$

(b)

- $\text{NOT } B = \text{NOT } 0 = 1$
- $A \text{ AND } 1 = 1 \text{ AND } 1 = 1$, so $X = 1$

3.4

(a)

- three inputs give $2^3 = 8$ rows

(b)

- $A \text{ AND } B = 1 \text{ AND } 1 = 1$
- $1 \text{ OR } C = 1 \text{ OR } 0 = 1$, so $X = 1$