Engr 123

From Tuesday...

CR, MA, Sub

L3

TCC

Laws of logic

Adders

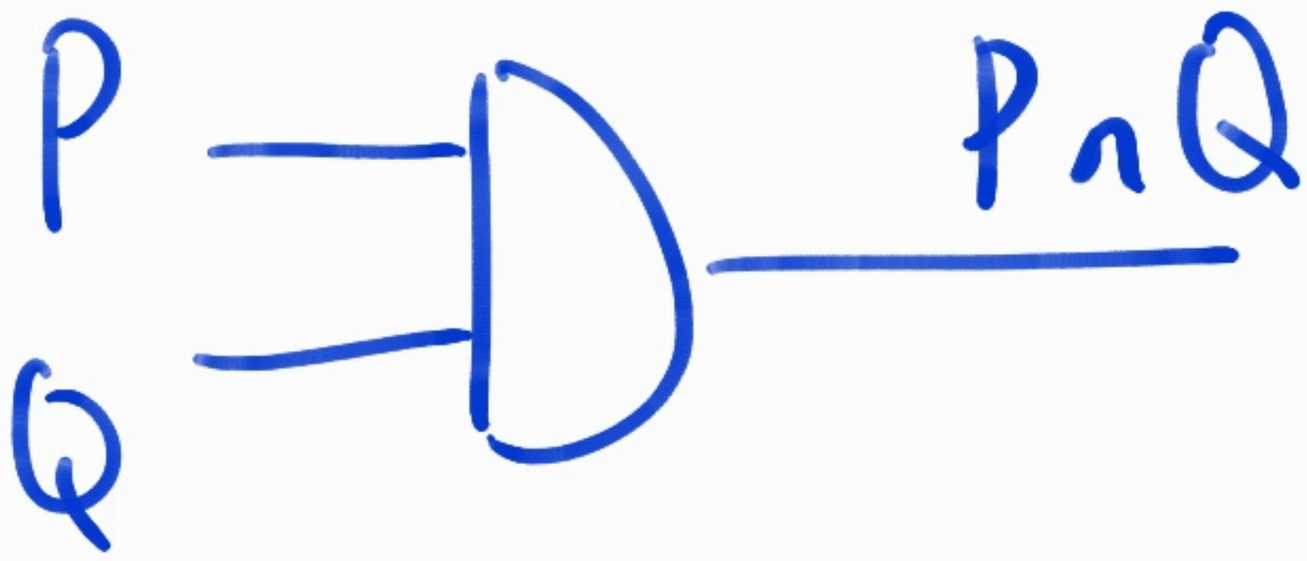
P	Q	$P \wedge \neg P$	$P \vee \neg P$	P xor Q
1	1	0	1	0
1	0	0	1	1
0	1	0	1	1
0	0	0	1	0

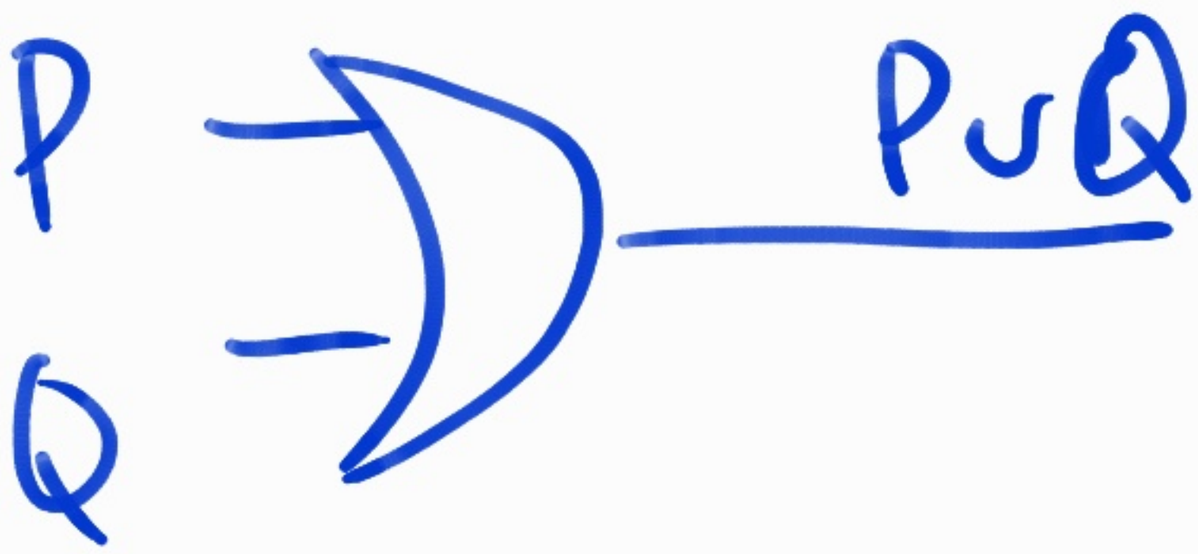
↑ contradiction ↑ tautology ↑ contingent

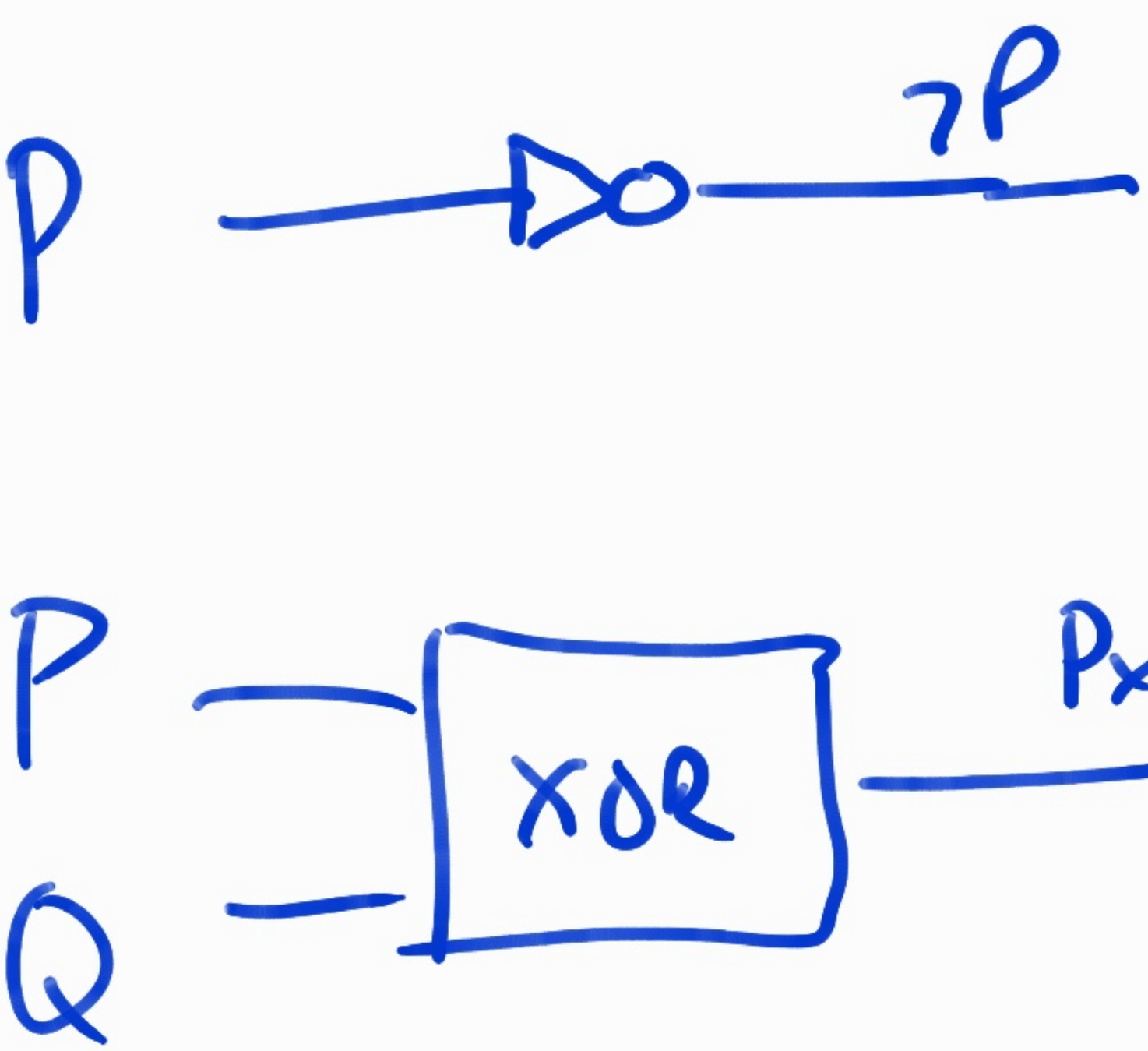
$$[(P \to Q) \wedge (Q \to R)] \to [P \to R] \equiv 1$$

$$P \to Q \equiv \neg Q \to \neg P$$

$$\neg(P \to Q) \equiv P \wedge \neg Q$$


P
Q
P∩Q


P
Q
P∪Q


P
¬P

P
Q
XOR
PxorQ

Binary addition (base 2)

$$\begin{array}{r} {\scriptstyle 1\,1\,1\,1} \\ 1011 \\ +\,1101 \\ \hline 11000 \end{array}$$

$1\times2^3+0\times2^2+1\times2^1+1\times2^0$

11

+13

24

← half-adder

half-adder, adder

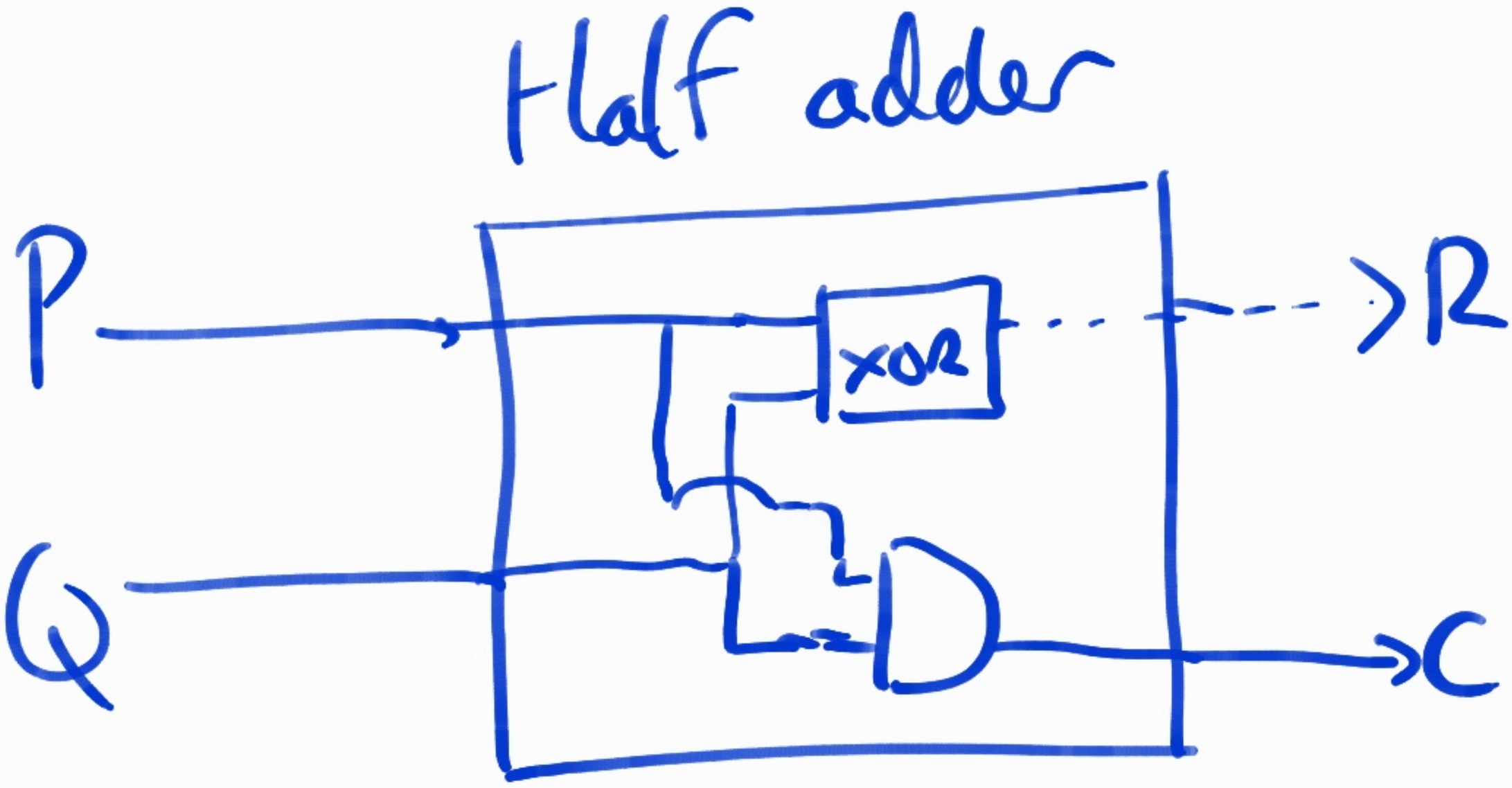
$\frac{1}{2}$ adder

$$\begin{array}{r} P \\ Q \\ \hline CR \end{array} = C\times2+R$$

P	Q	C	R
1	1	1	0
1	0	0	1
0	1	0	1
0	0	0	0

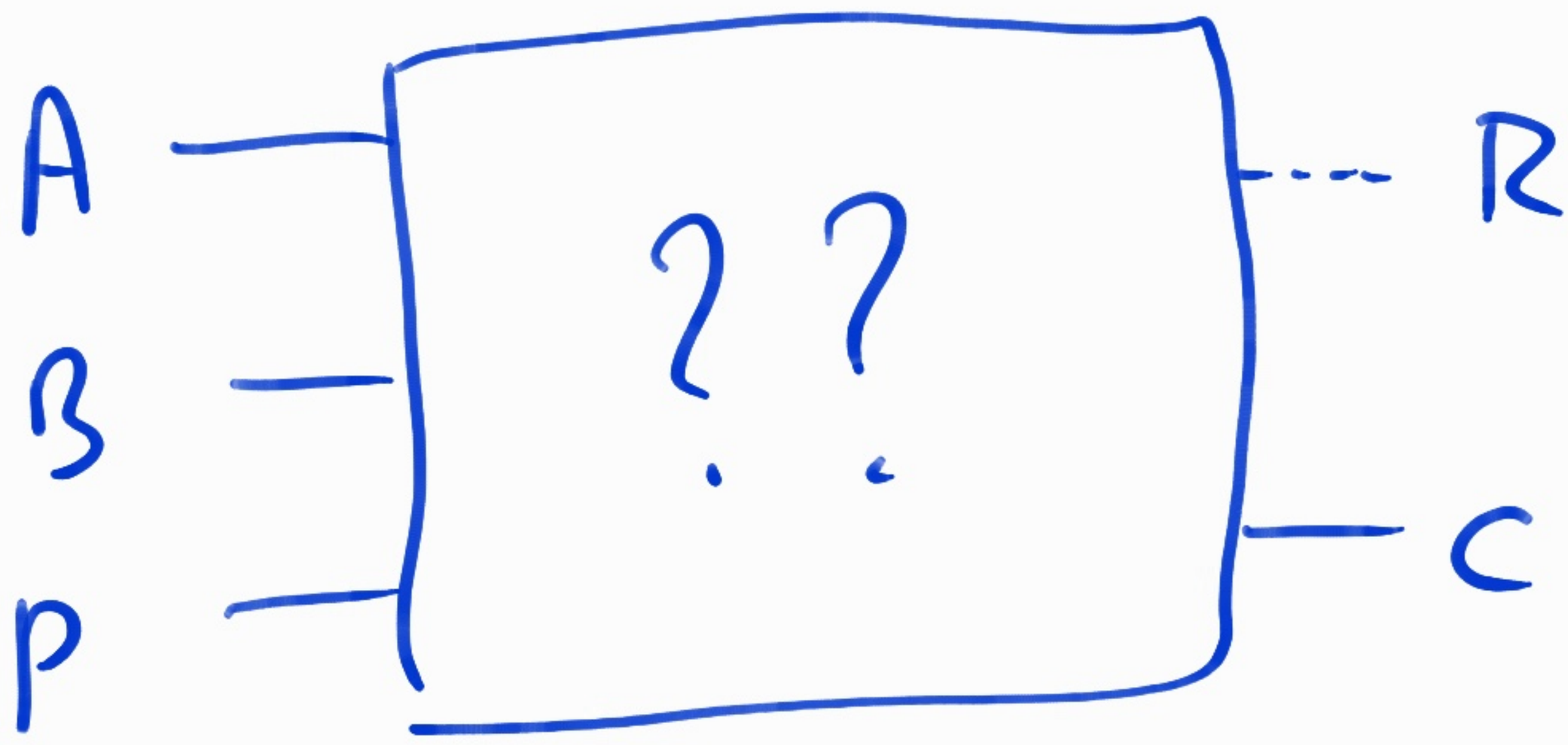
C is and

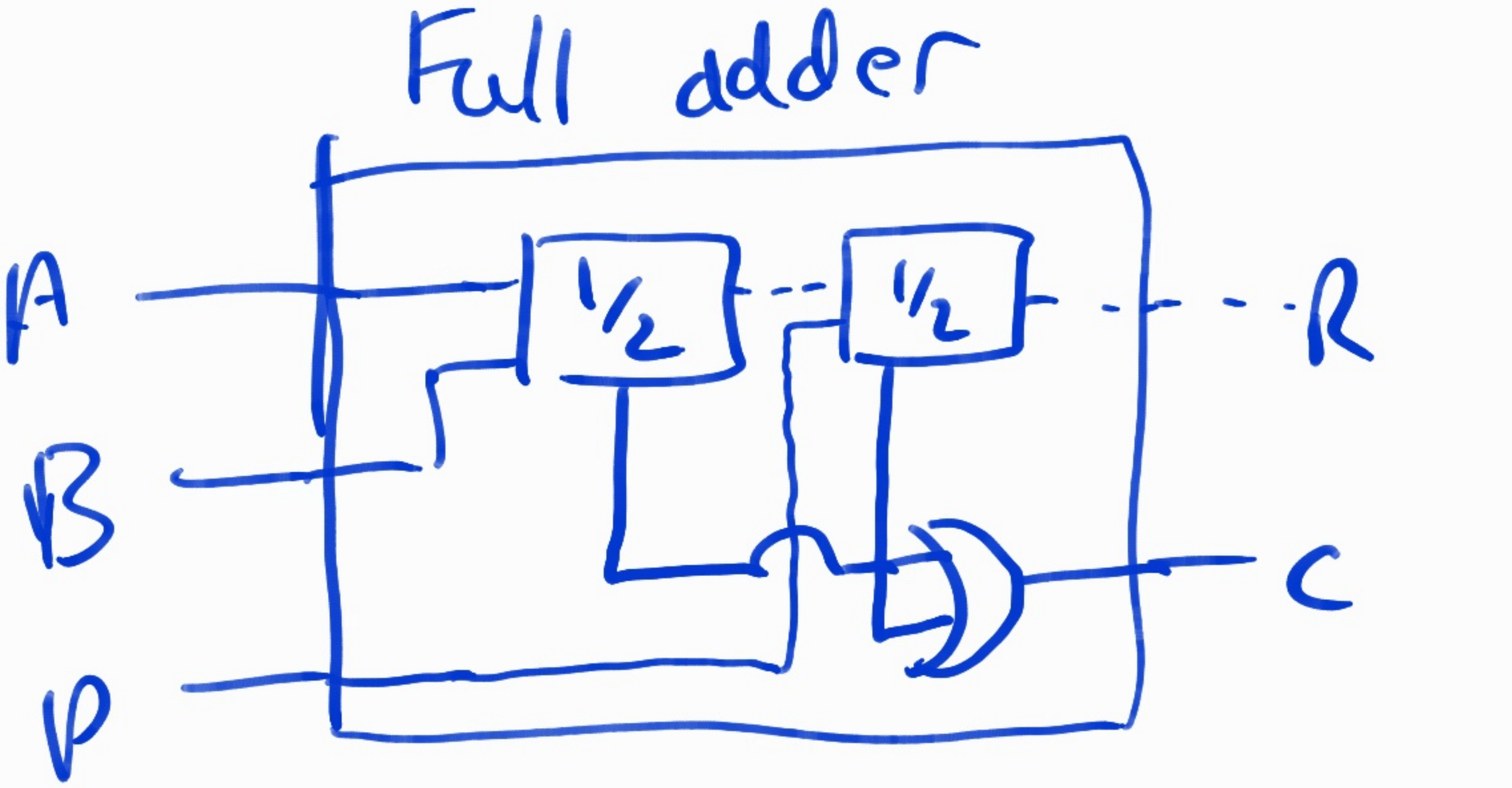
R is xor



Full adder

$$\frac{A^{P}\quad B}{C\quad R}$$





Back to Logic

$$P \leftrightarrow Q \equiv (P \rightarrow Q) \wedge (Q \rightarrow P)$$

$$P \rightarrow Q \equiv \neg P \vee Q$$

$$P \wedge Q \equiv \neg(\neg P \vee \neg Q)$$