Names (pair) _____ Date _____

The Half Adder

Remember

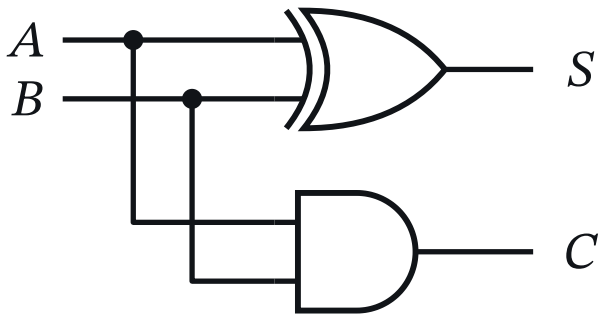
When we add two bits, the result has two bits: the **carry** C and the **sum** S. For example $1 + 1 = 10_2$, so $C = 1$ and $S = 0$. The circuit that does this is called a **half adder**.

1 IN PAIRS Complete the table.

A	B	$A + B$ **(binary)**	C	S
0	0			
0	1			
1	0			
1	1			

2 IN PAIRS Compare columns C and S with the truth tables of the logic gates. Which gate gives C and which gives S?

$C =$ _____ $S =$ _____



Names (pair) _____ Date _____

3 ON YOUR OWN Follow the signals through the half adder.

$A = 1, B = 0$: $S =$ ☐ $C =$ ☐ $A = 1, B = 1$: $S =$ ☐ $C =$ ☐

4 ON YOUR OWN Write S using only ∧, ∨ and ¬.

$S =$ ☐

5 IN PAIRS **Why "half"?** Add $11_2 + 01_2$ in columns. How many bits must be added in the second column? Can a half adder do that?

☐ ☐

$$\begin{array}{rcc} & 1 & 1 \\ + & 0 & 1 \\ \hline & \square & \square\ \square \end{array}$$

_____

_____

_____

The Logic Gates app · otooly.com/logic-gates

Under **Load an example...** choose **Half adder**, change the inputs A and B and watch the outputs S and C.

★ ON YOUR OWN **Exit card.** $A = 1, B = 1 \rightarrow S =$ ☐ and $C =$ ☐