

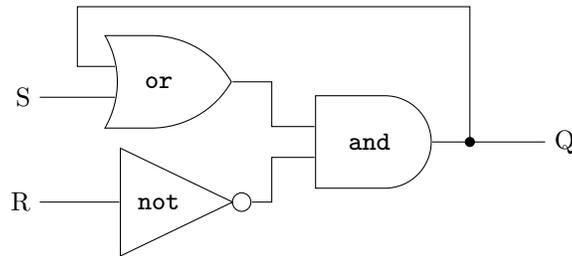
# Warm-Up: Flip-Flops

Prepared by Mark on January 23, 2025.

## Instructor's Handout

### Problem 1:

Below is a circuit of logic gates. S and R are input pins, Q is an output pin. What does it do?

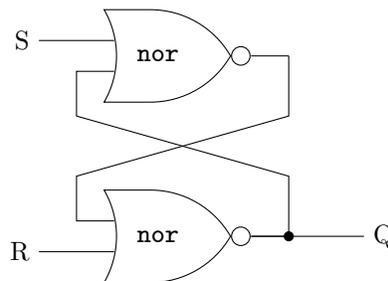


### Solution

This is an S-R (“set-reset”) latch.  
Set S to high, and Q will stay high until it is reset by R.

### Problem 2:

Below is another circuit. How does it work?  
*Hint: nor = not or. It works exactly as you’d expect.*



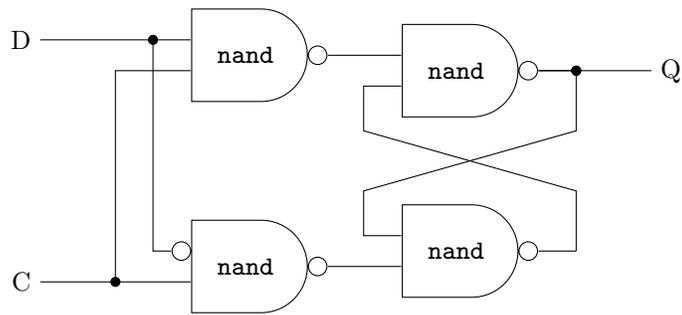
### Solution

This is another S-R (“set-reset”) latch.

**Problem 3:**

Empty circles represent inverted inputs/outputs. This is the reason a **nand** gate looks like an **and** gate with a dot. Pay careful attention to the nand gate in the bottom-left.

What does this circuit do?



**Solution**

This is a D (“data”) flip-flop.

D is a “data” pin. When C is high, this circuit sets Q to D.

When C is low, Q stays at its previous value until D is set to high again.

In other words, this circuit “reads” D whenever C is high.