

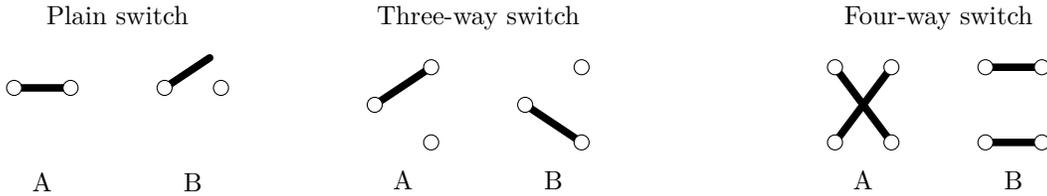
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# The Electrician's Warm-Up

Prepared by Mark on March 3, 2025

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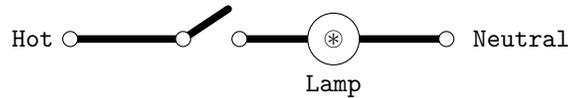
Ivan the electrician is working in an apartment. He has a box of switches, which come in three types:



A switch is always in the “A” or “B” state. Its state changes when you toggle the switch on the wall. Each circle represents a terminal on the switch, and lines represent electrical connections. The two crossing wires in the A state of the four-way switch are **not** connected.

**Example 1:**

First, Ivan wires a simple light in the kitchen: one switch, one lamp. The result is the following circuit:



**Problem 2:**

Ivan now needs to wire a hallway. It has two switches, one at each end. Toggling either switch should toggle the single lamp in the middle. Which switches should Ivan use, and how should he connect their terminals?  
*Hint:* There are two solutions. One is clever, the other is deadly.

**Problem 3:**

Next, Ivan goes to the bedroom. There is one switch by the door and one on each side of the bed. How can he make these three switches control one lamp?

**Problem 4: Bonus**

Is it possible to do the same with four or more switches? If so, how?