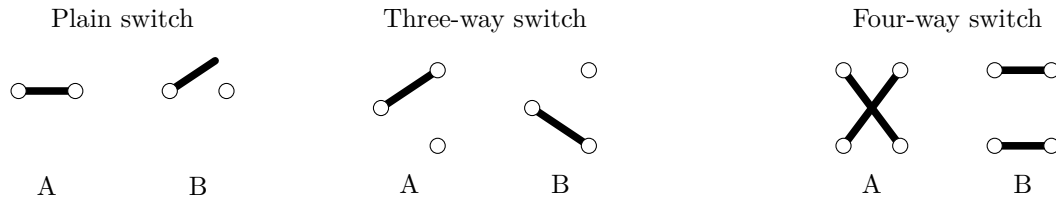


# The Electrician's Warm-Up

Prepared by Mark on February 5, 2025

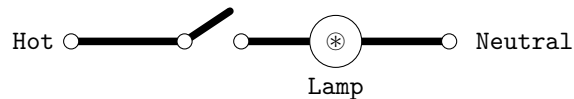
Ivan the electrician is working in an apartment. He has a box of switches, which come in three types:



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?