

Electrical Circuits and Probability

Electrical circuits can be a short hand way to indicate unions and intersections.

In a series circuit (Fig. 1), the current will only flow if all of the lights work. That is, if any of the light bulbs are burned out, none of them will turn in. Christmas tree lights used to be like this. This is equivalent of a 'and'. In a parallel circuit (Fig. 2), the current will continue to flow as long as any of the lights work. Christmas tree lights now are in parallel circuits so if one goes bad, the rest of the string will still light up. This is equivalent of an 'or'.

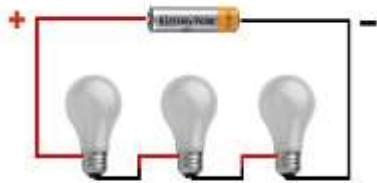


Fig. 1

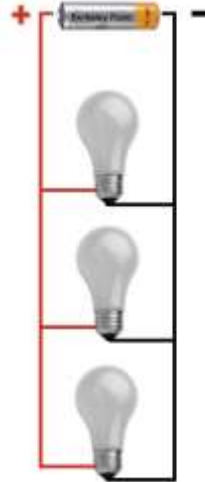
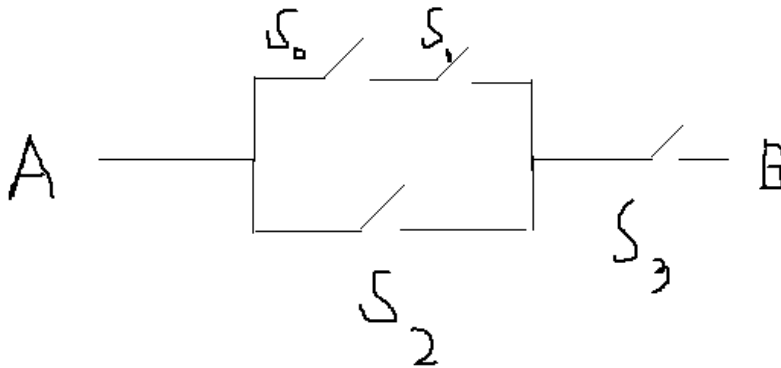


Fig. 2

http://www.berkeleypoint.com/learning/parallel_circuit.html

Therefore, you can demonstrate probability by using electrical circuits (I normally use switches because they are easier to draw than light bulbs). An example circuit is shown below.



In these problems, we are assuming that all of the switches are independent of each other and you are given the probability that each switch is open (or closed). In doing these problems, intersections are multiplications but you have to use the inclusion – exclusion principle when using unions.