

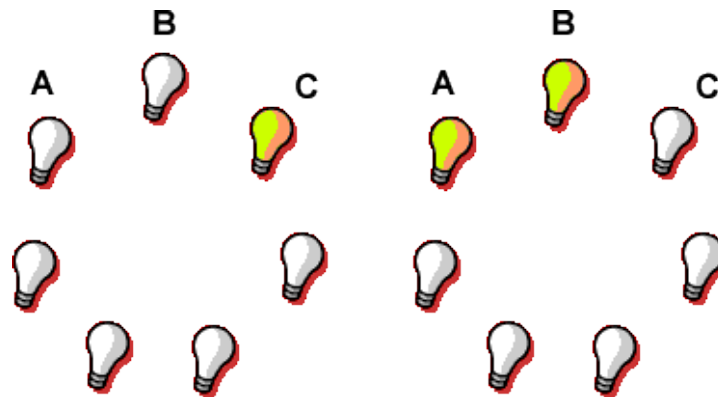
# Lights On!

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There are seven lights in a circle. They are all turned off and the problem is to turn them on.



Each light has a switch. The trouble is that the electrician didn't use proper switches. When you press a switch, if the light is on it turns off, and if a light is off it turns on as usual, however, it also does the same for the two lights on either side.



So, if you pressed the switch for light B in the left picture, lights A and B would turn on and light C would turn off as shown in the right picture.

## Extension:

- Is it possible to turn the lights all off if you start with 6 lights, one of which is on?



- Let's group together all of the on-off configurations that can be obtained from switching on and off lights. How many different groups are there for the seven-in-a-circle and six-in-a-circle arrangements?

### The Math in This Problem:

Students will study a variety of circles with different on-off configurations in order to arrive at solutions for turning all of the light bulbs on. This investigation involves strategic analysis and mathematical reasoning of various arrangements of lit and unlit light bulbs.



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