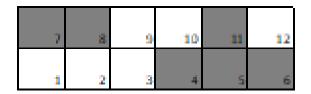# PROBLEM OF THE WEEK #8
(Spring 2024)

The Super Pokémon Quality Resort has 12 guest rooms: a row of six rooms on the first floor, and six more rooms right above them on the second floor. Tonight, each room holds one Pokémon: a total of 4 Squirtles, 4 Charmanders, and 4 Bulbasaurs. Every room has its own light, and the Pokémon that are watchful keep their lights on at night, but those that aren't watchful turn their lights off.

Here's what makes the Pokémon watchful:

- A Squirtle is watchful if it's staying in the room directly between a Charmander's room and a Bulbasaur's room; otherwise the Squirtle is not watchful.

- A Charmander is watchful if it's staying in the room directly between two Bulbasaurs' rooms; otherwise the Charmander is not watchful.

- A Bulbasaur is watchful if it's staying in a room that's directly above or below a Charmander's room; otherwise the Bulbasaur is not watchful.

The lighting pattern of the rooms in the S.P.Q.R. tonight is shown in the diagram below. Which rooms are the Squirtles staying in?

Solution:
Number the first-floor rooms #1–#6 and the second-floor rooms #7–#12 from left to right. A Charmander or a Squirtle in an end room can't be watchful, so the watchful Pokémon in #1 and #12 are Bulbasaurs. They are watchful, so there are Charmanders in #6 and #7. Suppose that a Squirtle is in #2. Then there is a Charmander in #3; it's watchful, so it's between two Bulbasaurs — a contradiction. Suppose instead that a Charmander is in #2. Then there is an watchful Bulbasaur in #3, so a Charmander is in #9. That Charmander is watchful, so there are Bulbasaurs in #8 and #10, which is too many Bulbasaurs — a contradiction. So #2 must contain an watchful Bulbasaur, which means a Charmander is in #8.

The Pokémon in #9 is watchful, so it isn't a Charmander. Suppose it's a Bulbasaur: since it's watchful, a Charmander is in #3, which means another Bulbasaur is in #4. That's too many Bulbasaurs again, so there is a Squirtle in #9. Now we have a Bulbasaur in #10, and therefore a Charmander in #4. We've located four Charmanders and four Bulbasaurs, so rooms #3, #5, #9, and #11 must be occupied by Squirtles. □

Source: Tadao Kitazawa, *Arithmetical, Geometrical and Combinatorial Puzzles from Japan*, MAA Press (2021), 111–113, 119.