Combinatorics: The Breakfast of Mathletes
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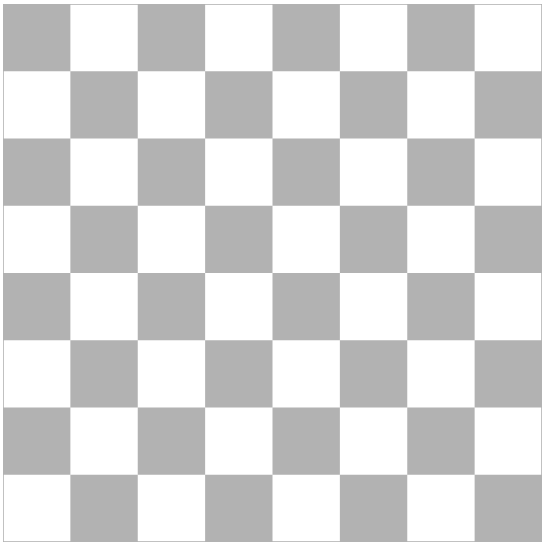
1. Using only the grid lines on a chessboard, how many squares are there?
    a. What's your initial guess, before working out the problem?
    b. Hint: There are significantly more than 64. Take your time and count 'em up.
    c. What other questions could you ask either about, or inspired by, this situation?



2. You're meeting my three hypothetical (but adorable) daughters, Aruna, Bharati, and Chitra.
    a. How many ways can you give them five candies such that each girl gets at least one?
    b. How many ways can you give them five candies if it's okay for not all to get a candy?
    c. How many ways can you give them eight candies such that each girl gets at least one?
    d. How many ways can you give them eight candies if it's okay for not all to get a candy?
    e. I forgot to mention that they're identical triplets, and they're also still babies, so they can't talk (especially since you're stuffing them full of candy) so you can't tell them apart. Does this change the number of ways in parts a–d above?
    f. What other questions could you ask either about, or inspired by, this situation?

3. Pretend you have a bunch of identical equilateral triangles cut out of a rigid material (like cardboard) and cups of red, green, and blue paint. How many different ways can you color these triangles by dipping each vertex of a triangle in one (and only one) cup of paint?
    a. What do you mean by "different"? Does it matter? Do you all agree?
    b. Does it matter that the triangles are equilateral? Why? What happens if they're not?
    c. What other questions could you ask either about, or inspired by, this situation?