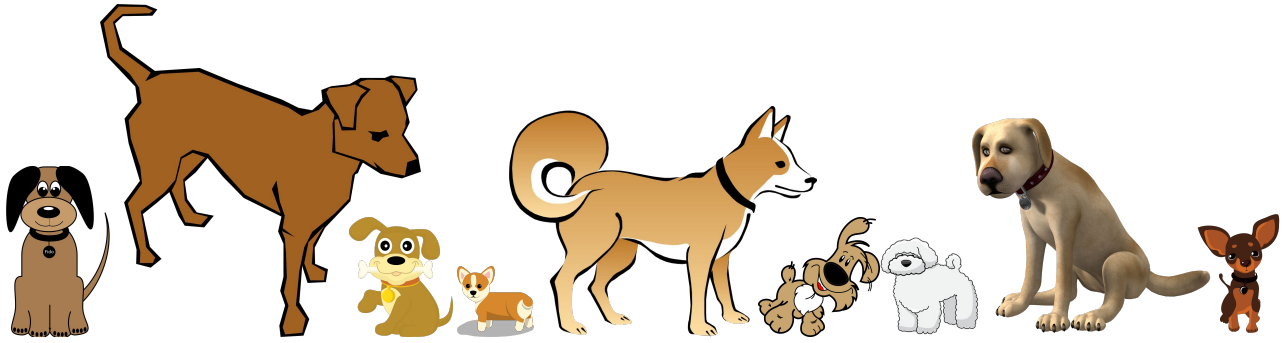
CEMC at Home

Grade 4/5/6 - Wednesday, April 15, 2020

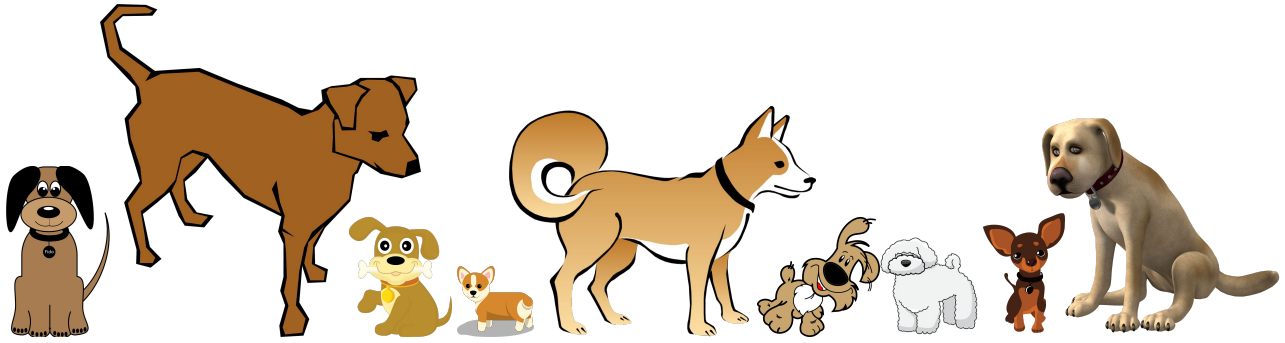
Doggies Swapped

Consider this lineup of nine dogs of various sizes:



First lineup

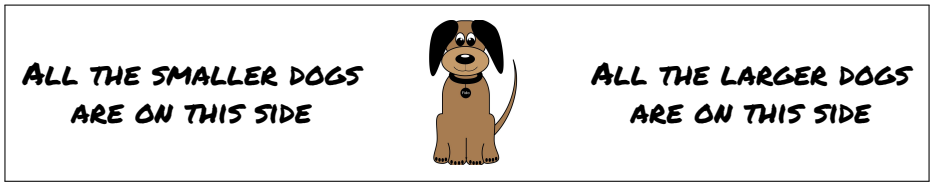
We can move dogs in the lineup by swapping them. A *swap* means two dogs exchange positions in the lineup. For example, after a swap of the two rightmost dogs, the lineup looks like this:



After one possible swap

Problem 1: The goal in this problem is to move the biggest dog (2nd from the left) to the rightmost position, and the smallest dog (4th from the left) to the leftmost position of the lineup, and to do so using the fewest swaps possible. In this problem, we can only swap two dogs that are *right beside each other*, but a dog may get swapped again after it moves into a new position in the lineup. What is the minimum number of swaps required to get the *first lineup* into this form following these rules?

Problem 2: The name of the dog in the leftmost position in the first lineup is **Spot**. The goal in this problem is to rearrange the dogs so that all dogs that are smaller than **Spot** are to **Spot**'s left and all dogs that are larger than **Spot** are to **Spot**'s right. (Otherwise, the dogs can be in any order.) In this problem, we can swap two dogs in *any positions* in the lineup, but each dog can be involved in *at most one swap*. For example, we could choose to swap the dog in the first position with the dog in the last position in the lineup, but then neither dog can be swapped again later. Can you find a sequence of swaps, following these new rules, that puts the first lineup into this form?



More Info:

Check out the CEMC at Home webpage on Wednesday, April 22 for a solution to Doggies Swapped.