Heads and tails

Problem

Given a set n heads and n (or n-1) tails alternate them by moving two touching coins at a time, which results in an alternating line of touching heads and tails. Note that only horizontal moves are allowed, and the coins can't be rotated.

Questions

Q1) Given three heads followed by three tails in a line, what is the minimum number of moves to alternate the heads and tails?

From the starting position of HHHTTT there a 5 possible moves but a couple don't result in much progress so we move the first 2 coins because that creates two pairs that are alternating rather than one pair (..HTTTHH) if we then move that newly created pair to the end it creates 3 alternating pairs (..HTT..HTH) and leaves a gap in the middle where the first two coins can go to complete the set (…THTHTH); thus we were able to complete this in a minimum of 3 moves.

Q2) Try the same task with three heads followed by two tails.

Having one less tail is very similar to even number of heads and tails except for one part, the very last move comes from two coins moving into a gap left from doing the moves from above, which either from the end or the start (..HT..HTH -> ….HTHTH).

Our solution scales very well because the middle part is done iteratively and only iterates thought the whole array once O(n).

Methods

Our solution was found by looking at the possible moves with real coins and finding what moves resulted in the most pairs of alternating coins, a pattern was then found which was used to scale the solution. The solution with n-1 tails was found shortly after as it just required a small modification.