NAME(s): _____ ID(s):_____

The Power Plant

A power plant has an onsite telephone system with numbers that run from 000 to 999. Recently the plant's automated switchboard has been transposing two adjacent digits of the number dialled (The switch bug). Unfortunately the boss has decided to fire everyone that has a non-working site number, and this power plant employs exactly 501 workers. This power plant has put you in charge of devising a scheme where a switchboard error (transposing two adjacent digits) will only result in a call to an inoperative number. To save the jobs of plant workers devise a scheme where more than 500 telephones numbers are valid and the switchboard error can be detected. Note: a fourth digit cannot be added to the telephone numbers, such a solution would be too expensive for the power plant.

Hint: A phone number "abc" can be broken into 3 pairs "ab", "bc", and "ac". If the second digit in the pair is smaller than the first call the pair out of order. Additionally, if the phone number has an odd amount of pairs out of order call the phone number an "ugly phone number" and call every other number a "beautiful phone number". What happens to a beautiful phone number when a switch bug occurs?