

161.

A PROBLEM IN PERMUTATIONS.

[From the *Quarterly Mathematical Journal*, vol. i. (1857), p. 79.]

THE game called Mousetrap gives rise to a singular problem in permutations. A set of cards, ace, two, three, &c., say up to thirteen, are arranged in a circle with their faces upwards—you begin at any card, and count one, two, three, &c., and if upon counting suppose the number five, you arrive at the card five, that card is thrown out; and beginning again with the next card, you count one, two, three, &c., throwing out if the case happen a new card as before, and so on until you have counted up to thirteen, without coming to a card which ought to be thrown out. It is easy to see that, whatever the number of the cards is, they may be so arranged as to be all thrown out in the order of their numbers; but that it is not possible in general to arrange the cards so that all the cards, or any specified cards, may be thrown out in a given order. Thus, if all the cards are to be thrown out in the order of their numbers, the arrangements in the case of a single card, two, three, &c. cards, are

1

1 2

1 3 2

1 4 2 3

1 3 2 5 4

1 4 2 5 6 3

1 5 2 7 4 3 6

1 6 2 4 5 3 7 8

&c.

It is required to investigate the general theory.