i. in a few hours our king will assign to each of his 11 sages a 3 digit decimal number. as customary, the number will be written on the sage's forehead, for all but him to see.

ii. the wizards will approach the yard and see each other, but will not be able to communicate otherwise.

iii. they will be asked, simultaneously, to pick a hand to raise.

iv. after seeing the raised hands of the other sages, each sage will deduce his own assigned number.

how?

<u>solution</u> first, let left hand equal 0 and right hand equal 1. think of each number is a 10 digit number in binary. for $i \in [10]$ the ith sage will raise his hand according to the xor of the ith digits of his fellow sages' numbers.

this way, the 11th sage will be able to deduce his number, and the ith sage, for $i \in [10]$, will have all the information bits available, except for his own ith bit. thus, we'll instruct the 11th sage to raise his hand according to the xor of all the digits he sees.