lecture 2

1.

for n+1 numbers, if each of two of them are differ by at least 2. The biggest will at least be 2^n.

When n>1, $2^n > 3n$ therefore confilct, so there is at least two numbers that differ by at most 2

2.

a square can be separted into four small square, with the longest distance in the square is $\sqrt{2}$. there are five point while there are only four square, which means there are at least two point in one small square, to the distance between is shorter than $\sqrt{2}$

3

we can choose 2-10 people in the ten people to divide into two groups. Therefore there are

$(c(10,2) * (2^2 - 2) + c(10,3) * (2^3 - 2) + 2^4 - 2 + \ldots + 2^{10} - 2)/2$