

1) Give the informal definition of a 100 $p$ th percentile of a data,  $p \in (0, 1)$ . Then, give the formal definition and show that this formal definition satisfies what is informally required.

2) Write the statement of the Inclusion-Exclusion Principle and prove it.

3) Give the definition of a  $\chi_n^2$  distribution and show how to compute mean and variance of such a distribution. Why is this distribution important?