Module 16 self-assessment

Question 1

Assume you are conducting a poll to determine the opinion of a large population regarding a binary decision, i.e. 'YES' or 'NO'. Such polls are usually conducted before election or a referendum. Assume that a fraction of p of the whole population will vote 'YES' while $1 - p$ will vote 'NO' and that 1000 independent and representative voters are selected (in reality this is not always the case). Explain why the probability of predicting the correct outcome depends on p and use the Central Limit Theorem to approximate the probability that the poll will predict the correct outcome if $p = 0.48$.

Question 2

Let $X_1, X_2, \ldots X_n$ be iid variables drawn from the standard normal, and

$$Y_n = \sum_{i=1}^n X_i^2.$$

Show that $\mathbb{E}[X_j^2] = 1$, and compute $\mathbb{E}[X_j^4]$. Finally, approximate $\mathbb{P}(Y_{100} > 110)$.