[nex21] De Moivre−Laplace limit theorem.

Show that for large Np and large Npq the binomial distribution turns into the Gaussian distribution with the same mean value $\langle n \rangle = Np$ and variance $\langle\langle n^2 \rangle\rangle = Npq$:

$$P_N(n) = \frac{N!}{n!(N-n)!}\, p^n q^{N-n} \quad \longrightarrow \quad P_N(n) \simeq \frac{1}{\sqrt{2\pi\langle\langle n^2 \rangle\rangle}}\, \exp\left(-\frac{(n-\langle n \rangle)^2}{2\langle\langle n^2 \rangle\rangle}\right).$$

Solution: