PROBLEMS C: INTENSIVE AND STRONGLY INTENSIVE QUANTITIES

GENERATE MMM DATA FOR M = 1000 AND N = 1, 10, 100, 1000

C1: FOR EACH EVENT SAMPLE CALCULATE SCALED VARIANCE OF
MULTIPlicity DISTRIBUTion, \( \omega[N] = \frac{\text{Var}[N]}{\langle N \rangle} \), AND
PLOT IT AS A FUNCTION OF N.
Let us define strongly intensive quantities:

$$\Sigma[N, \vec{p}_T] = (\omega[N] \langle p_T \rangle + \omega[\vec{p}_T] \cdot \langle N \rangle - 2 \cdot \text{cov}[N, \vec{p}_T]) / c$$

$$\Delta[N, \vec{p}_T] = (\omega[N] \langle p_T \rangle - \omega[\vec{p}_T] \cdot \langle N \rangle) / c$$

where

$$c = \omega[\vec{p}_T] \cdot \langle N \rangle$$

* Single particle transverse momentum
C2: For each event sample calculate $\Sigma[n, p_T]$ and $\Delta[n, p_T]$ and plot them as a function of $n$.

Let us define MMH+ as MMH with event-by-event fluctuations of particle multiplicity $n$ according to $p(n) = \text{Poisson}(n | \langle n \rangle)$ within MMH+. Generate four event samples with $M = 1000$ and $\langle n \rangle = 1, 10, 100, 1000$.

C3: For each event sample calculate $\Sigma[n], \Sigma[n, p_T], \Delta[n, p_T]$ and plot the results for each quantity on a separate plot as a function of $\langle n \rangle$. 
C4: Add to the "C3" plots the corresponding results obtained within MMM and discuss observed dependences.

To do: Formulate problems D: MMM++ = MM WNM and problems E: Factorial Moments.