Section 1.2 review

1. Problem 1.2. This is an *application* of results from Section 1.2; do not re-derive mean, variance, and covariance formulas.

2. (Section 1.2.3) Consider a Poisson random variable with a mean of 100. Graph the probability mass function of a Poisson random variable with mean 100 over the integer support points 75 to 125. **R** uses the command `dpois` to calculate the Poisson probability mass function; you can use `seq` in **R** to generate the support points, or simply provide a range of integers using the `:` operator. Overlay a normal curve with mean 100 and standard deviation 10 (You can do this in **R** using the `seq` (or `:` operator), `dnorm` and `lines` commands).

3. In Section 1.2.2, the book states that the covariance of two multinomial counts n_j and n_k is $-n\pi_j\pi_k$. Justify the steps in the following proof:

$$
\begin{aligned}
Cov(n_j, n_k) &= Cov\left(\sum_i Y_{ij}, \sum_{i'} Y_{i'k}\right) \\
&= \sum_i \sum_{i'} Cov(Y_{ij}, Y_{i'k}) \\
&= \sum_i Cov(Y_{ij}, Y_{ik}) \\
&= \sum_i \left(E(Y_{ij}Y_{ik}) - E(Y_{ij})E(Y_{ik})\right) = -n\pi_j\pi_k
\end{aligned}
$$