Worksheet 08

1. For a random variable X, let $Y = a \cdot X$ for some constant a. Find a formula for $Var(Y)$ in terms of the variance of X.

2. For a random variable X, let $Y = X + b$ for some constant b. Find a formula for $Var(Y)$ in terms of the variance of X.

3. Let $X \sim Bin(n, p)$ and $Y = X/n$. Find the expected value and variance of Y. What is the limit of both quantities as $n \to \infty$? What is the intuition for these results?

4. For any n, define $p_n = \lambda/n$ for some fixed $\lambda > 0$. If $X \sim Bin(n, p_n)$, find the following:

$$\lim_{n\to\infty} \mathbb{E}X = ?$$
$$\lim_{n\to\infty} Var(X) = ?.$$