1. Let $X$ and $Y$ be independent random variables, both uniformly distributed in $\{-2, 1, 2\}$.
   (a) Find the distribution of $X^2$.
   (b) Find $E[X^2]$.
   (c) Find the distribution of $X - Y$.
   (d) Find $E[X - Y]$.
   (e) Find $E[(X - Y)^2]$.

2. Suppose we flip a fair coin $n$ times to obtain $X_1, X_2, ..., X_n \in \{H, T\}$. Let $Y$ be the number of pairs of consecutive Heads (i.e., the number of $i$’s such that $X_i = X_{i+1} = H$).
   (a) Find $E[Y]$.
   (b) Find $Var(Y)$.
   (c) What does $\frac{E[Y]}{n}$ tend to as $n \to \infty$? (What would be the answer for $\frac{Y}{n}$ case?)