A box contains 5 red and 5 blue marbles. Two marbles are withdrawn randomly. Let $X$ denotes a random variable defined as the number of red marbles chosen.

a- What is the probability mass function of $X$

$$P\{X=0\} = \frac{5}{10} \cdot \frac{4}{9} = \frac{2}{9}$$
$$P\{X=1\} = Pr\{RB\} + Pr\{BR\} = \frac{2 \cdot 5}{10} \cdot \frac{5}{9} = \frac{5}{9}$$
$$P\{X=2\} = \frac{5}{10} \cdot \frac{4}{9} = \frac{2}{9}$$

Suppose that you win $1.10 if the marbles chosen are the same color and you lose $1.00 if the marbles chosen are different colors

b- Find the expected value of the amount you win

$$E[X] = (1.1)\frac{4}{9} - (1) \frac{5}{9} = -\frac{6}{9} \approx -0.67$$

c- Find the variance of the amount you win

$$Var(X) = (1.1)^2 \frac{4}{9} + \frac{5}{9} - \left(\frac{6}{9}\right)^2 \approx 1.089$$