For numerical answers with decimal digits please read instructions.

1. Let X, Y be two discrete random variables taking values $\{-1, 1\}$. Suppose their joint distribution is given by the table

	X=-1	X=1
Y=-1	0.3	0.2
Y=1	0.3	0.2

   (a) $Cov(X, Y)$ is ______.
   (b) Are X and Y independent ?

2. Let X and Y be discrete random variables with Range (X) =$\{0, 1, 2\}$ and Range $(Y) = \{1, 2\}$ with joint distribution given by the chart below.

	$X = 0$	$X = 1$	$X = 2$
$Y = 1$	0.1	0.2	0.1
$Y = 2$	0.3	0.2	0.1

   (a) $\mathbb{E}[XY]$ is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i), (ii)\ \}$ *=1.*
   (b) $\mathrm{Cov}(X, Y) := \mathbb{E}[XY] - \mathbb{E}[X]\mathbb{E}[Y]$ is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i), (ii)\ \}$ *=1.*

3. Let $X \sim \mathrm{Geometric}\left(\frac{1}{2}\right)$ and consider the event $A = \{X \leq 3\}$.
   (a) $\mathbb{E}[X|A]$ is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i), (ii)\ \}$ *=1.*
   (b) $\mathrm{Var}[X|A]$ is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i), (ii)\ \}$ *=1.*

4. Let X and Y be described by the joint distribution

	$X = -1$	$X = 0$	$X = 1$
$Y = -1$	1/15	2/15	2/15
$Y = 0$	2/15	1/15	2/15
$Y = 1$	2/15	2/15	1/15

and answer the following questions.

(a) $\mathbb{E}[X|Y=-1]$ is $\frac{(i)}{(ii)}$.
The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i),(ii)\ \}$ *=1.*

(b) $\mathrm{Var}[X|Y=-1]$ is $\frac{(i)}{(ii)}$.
The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i),(ii)\ \}$ *=1.*

5. A fair die is rolled.

   (a) The expected value given that the roll was even is _____.

   (b) The variance of the value given the roll was even is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i),(ii)\ \}$ *=1.*

6. Let $Y \sim \text{Uniform}(\{1,2,\ldots,15\})$ and let X be the number of heads on Y flips of a fair coin. The expected value of X is _____.

7. Let X be a discrete random variable. Using Chebyshev's inequality the upper bound on the likelihood that X will be more than two standard deviations from its expected value is $\frac{(i)}{(ii)}$.
   The above fraction should be in the simplest form, i.e. g.c.d $\{\ (i),(ii)\ \}$ *=1.*

8. Let $X \sim \text{Uniform}(\{-2,-1,0,1,2\})$, and let $f(x)=x^2$. Then $\mathbb{E}[f(X)]$ is _____.