

Discrete Random Variables

1. On a roulette wheel there are 37 numbers 0,1,,36. 18 numbers are black. If I bet 1 on black, I win 1 if a black number comes up, otherwise I lose my stake. Let X denote my winnings on one bet.

(i) Calculate $E(X)$ and $\text{Var}(X)$

Suppose I make 6 such bets. Let Y denote my total winnings.

(ii) Derive the distribution of Y .

(iii) Calculate $E(Y)$ and $\text{Var}(Y)$

2. The probability distribute of discrete random variable X is tabulated below. There are 5 possible outcome of X , i.e. 1, 2, 3, 4 and 5.

x_i	1	2	3	4	5
$p(x_i)$	0.30	0.20	k	0.10	0.20

- (1 Mark) Compute the value of k .
 - (1 Mark) What is the expected value of X ?
 - (1 Mark) Given that $E(X^2) = 9.5$, compute the variance of X .
3. The probability distribution of discrete random variable X is tabulated below. There are 6 possible outcome of X , i.e. 0, 1, 2, 4, 8 and 10.

x_i	0	1	2	4	8	10
$P(x_i)$	0.25	0.15	0.25	0.15	k	0.10

- (1 marks) Compute the value for k .
 - (3 marks) Determine the expected value $E(X)$.
 - (2 marks) Evaluate $E(X^2)$.
 - (3 marks) Compute the variance of random variable X .
4. Suppose X is a random variable with
- $E(X^2) = 3.6$
 - $P(X = 2) = 0.6$
 - $P(X = 3) = 0.1$
- The random variable takes just one other value besides 2 and 3. This value is greater than 0. What is this value?
 - What is the variance of X ?
5. Consider the random variables X and Y . Both X and Y take the values 0, 1 and 2. The joint probabilities for each pair are given by the following table.

	$X = 0$	$X = 1$	$X = 2$
$Y = 0$	0.1	0.15	0.1
$Y = 1$	0.1	0.1	0.1
$Y = 2$	0.2	0.05	0.1

Compute the $E(U)$ expected value of U , where $U = X - Y$.

6. Suppose X is a random variable with

- $E(X^2) = 3.6$
- $P(X = 2) = 0.6$
- $P(X = 3) = 0.1$

(i) The random variable takes just one other value besides 2 and 3. This value is greater than 0. What is this value?

(ii) What is the variance of X ?

7. Consider the random variables X and Y . X takes the values 0,1 and 2. Y takes the values 0 and 1. The joint probabilities for each pair are given by the following table.

	$X = 0$	$X = 1$	$X = 2$
$Y = 0$	0.1	0.4	0.1
$Y = 1$	0.1	0.1	0.2

- Compute the expected values of X and Y .
- Compute the $E(X|Y = 1)$