

8.4

Quick Notes

Random Variable – A quantity that depends on chance. We can create a random variable by assigning a numeric value to each outcome in a chance experiment.

Probability distribution of a random variable X lists all values X takes and all the probabilities associated with these values. If random variable X takes values x_1, x_2, \dots, x_n with corresponding probabilities: p_1, p_2, \dots, p_n , then **expected value of X**: $E(X) = \mu_X = x_1 p_1 + x_2 p_2 + \dots + x_n p_n$

Ex: If a coin is tossed 3 times and X=number of heads:

Probability distribution of X is :

X	0	1	2	3
P(x)	1/8	3/8	3/8	1/8

$$E(X) = 0(1/8) + 1(3/8) + 2(3/8) + 3(1/8) = 12/8 = 1.5$$

Ex) If we roll a red and a blue die, consider the following random variables;

- a) X: the sum of the two results.
- b) Y: the larger result minus the smaller (0 if they are the same)
- c) Z: the red die's result minus the blue's

- 1) For each of the above, what are the possible values that the random variable could take on?
- 2) Make a probability distribution for Y (part b).
- 3) Calculate the expected value of Y (part b). What does this mean?

Ex) Assume that we take a 4 question multiple choice quiz (each A, B, C,) and guess on all questions.

Let X be the number of questions we get correct.

- 1) What values can X take on?
- 2) Make a probability distribution for X.
- 3) Find the expected value of X. (Two different ways)

Ex) An urn contains 3 green and 2 red balls. Assume that we reach in and randomly pull 3 out (without replacement). Let X be the number of green balls that we pull out.

- 1) What values can X take on?
- 2) Make a probability distribution for X.
- 3) Find the expected value of X.