

Probability Distributions

Prof. Stoyanov has 8 cats and 7 dogs in total. Each day she picks three of her pets to walk around the neighborhood.

1. State the probability distribution that describes the number of cats she walks on a given day, and also state the values of its associated parameter(s).
2. Write an expression for the probability that Prof. Stoyanov selects 3 cats to take on a walk today.
3. Prof. Stoyanov's neighbor loves cats and so will be happy if he sees her walking only cats. Otherwise, he will be sad. What probability distribution describes whether or not the neighbor will be happy? State also the values of the parameter(s) associated with the probability distribution.

Random Variables

A bag has 4 pieces of fruit: 1 mango, 2 apples, and 1 orange. I reach into the bag and draw out one fruit at a time, selecting each fruit at random (so all the fruit left in the bag are equally likely on each draw). I put the fruit away after I take it out (and don't put it back into the bag).

4. Let D be a random variable describing the draws until and including the first time I draw a apple. In the space below, write out the probability mass function for D . Show any work that you use to arrive at your answer.
5. Draw the graph of the CDF for D .

Expected Value and Variance

Let X be a random variable which takes the value of a ticket drawn at random from the following box: $[-1, 1, 1, 1]$.

6. Calculate $E(2X + 3)$.

7. Calculate $Var(X)$.

8. Calculate $SD(3X)$.

Normal Approximation and Continuous Distributions

Suppose I draw 10,000 independent and identically distributed copies of X from **Questions 6-8**.

9. Calculate the variance of S_n .

10. Calculate the variance of \bar{X}_n .

11. *True or False: The function below is a valid probability density function. Hint: The area of a circle is πr^2 where r is the radius of the circle.*

