

Worksheet #7 -- Geometric Distribution

- 1) Lilly is a dog who loves to play catch. Unfortunately, she is not very good, and the probability that she catches a ball is 10%. Suppose the ball will be tossed to Lilly until she catches the ball.

- A. What is the probability that Lilly will catch the ball on her second try?

$$p(x=2) = \text{geompdf}(.1, 2)$$

- B. What is the probability that it will take more than three tosses for Lilly to catch her first ball?

$$p(x > 3) = 1 - \text{geomcdf}(.1, 3) = .729$$

- C. What is the expected number of tosses before Lilly will catch her first ball?

$$\frac{1}{.1} = 10$$

- 2) Suppose 15% of cereal boxes contain a prize. You are determined to buy cereal boxes until you win a prize.

- A. What is the probability you will have to buy at most 2 boxes?

$$p(x \leq 2) = \text{geomcdf}(.15, 2) = .2775$$

- B. What is the probability you will have to buy exactly 4 boxes?

$$p(x=4) = \text{geompdf}(.15, 4) = .092$$

- C. What is the probability you will have to buy more than 4 boxes?

$$p(x > 4) = 1 - \text{geomcdf}(.15, 4) = .522$$

- D. What is the average number of boxes you will need to buy before you get a prize?

$$\frac{1}{.15} = 6.7$$

- 3) Suppose that among employed women, 25% have never been married. Suppose we randomly sample women in a particular business office.

- A. What is the probability that the first woman who says she has never been married is the fourth woman I sample?

$$p(x=4) = \text{geompdf}(.25, 4) = .105$$

- B. What is the probability that I sample 5 women before finding one who has never been married?

$$p(x=5) = \text{geompdf}(.25, 5) = .079$$

- C. What is the probability that we find the first never married woman within the first 5 we sample?

$$p(x \leq 5) = \text{geomcdf}(.25, 5) = .763$$

- D. What is the probability that we sample at most 2 women before finding one who has never been married?

$$p(x \leq 2) = \text{geomcdf}(.25, 2) = .4375$$

REMINDER...

What are the Differences between the Geometric and the Binomial Distributions?

1. The most obvious difference is that the Geometric Distribution does not have a set number of observations, n .
2. The second most obvious difference is the question being asked:
Binomial: Asks for the probability of a certain number of successes.
Geometric: Asks for the probability of the first success.

Geometric or not???

Determine if each situation described meets the 4 major principles of a geometric distribution. Explain your answer.

- 1) Blood type is inherited. If both parents carry genes for the O and A blood types, each child has probability 0.25 of getting two O genes and so of having blood type O. Different children inherit independently of each other. We wish to find the probability that the first child these parents have with type O blood is their third child.

geometric — # of trials is unknown

- 2) There are 20 red marbles, 10 blue marbles, and 5 white marbles in a jar. Select a marble without looking, note the color, and then replace the marble in the jar. We're interested in the number of marbles you would have to draw in order to be sure you have a red marble.

geometric — # of trials is unknown

- 3) You want to know what percent of married people believe that mothers of young children should not be employed outside their home. You plan to interview 50 people, and for the sake of convenience you decide to interview both the husband and wife in 25 married couples. The random variable X is the number among the 50 persons interviewed who think mothers should not be employed.

not geometric — husband/wife opinions are not independent