Math 17C
Kouba
Discussion Sheet 10

1.) A bag contains 15 yellow, 20 red, and 25 green golf balls. Randomly select 1 ball. Replace it. Do this 30 times. Let random variables X_1, X_2, and X_3 represent the number of yellow, red, and green golf balls selected.

a.) What is the probability of selecting 5 yellow, 10 red, and 15 green golf balls ? 10 balls of each color ?

b.) Determine the expected value of each of X_1, X_2, and X_3 .

c.) Determine the variance of each of X_1, X_2, and X_3 .

d.) Determine the standard deviation of each of X_1, X_2, and X_3 .

2.) A bag contains 15 yellow, 20 red, and 25 green golf balls. Randomly select 30 balls without replacement. What is the probability of selecting 5 yellow, 10 red, and 15 green golf balls ? 10 balls of each color ?

3.) (Genetics– Mendel) Consider two characteristics of tomatoes– fruit color (red or yellow) and shape (spherical or elongated). Assume that genotypes are given as :

RR : red, Rr : red, rr : yellow $\qquad$ SS : spherical, Ss : spherical, ss : elongated

Cross parent plant Rr/Ss with parent plant Rr/Ss. Record the genotypes of the offspring in a 4 by 4 table. Then set up a corresponding probability table. What is the probability that 100 randomly selected offspring from this cross have the following types of tomatoes ?

a.) 25 red elongated, 25 red spherical, 25 yellow elongated, 25 yellow spherical

b.) 15 red elongated, 35 red spherical, 10 yellow elongated, 40 yellow spherical

4.) Consider a loaded coin, where the probability of Heads is 2/7 and the probability of Tails is 5/7.

a.) Flip the coin until Heads appears. Let random variable X be the number of flips needed to get a Heads. The values of X are $1, 2, 3, 4, \cdots$.

i.) What is $P(X = 1)$? $P(X = 9)$? $P(X \geq 4)$? $P(X \leq 8)$?

ii.) Compute the expected value, variance, and standard deviation of X.

b.) Flip the coin until Tails appears. Let random variable X be the number of flips needed to get a Tails. The values of X are $1, 2, 3, 4, \cdots$.

i.) What is $P(X = 1)$? $P(X = 2)$? $P(X \geq 3)$? $P(X < 10)$?

ii.) Compute the expected value, variance, and standard deviation of X.

5.) Assume that the number of friends X writing on Your Wall on Facebook each day is Poisson distributed with a mean of 5 per day.

a.) What is the $P(X = 0)$? $P(X = 1)$? $P(X = 8)$?

b.) What is $P(X \leq 2)$? $P(X \geq 4)$?

6.) Assume the following function is a probability density function which represents the number of hours x students will spend preparing for the Math 17C Final Exam.

$$f(x) = \begin{cases} 4/x^2, & \text{if } x \geq 4 \\ 0, & \text{otherwise} \end{cases}$$

a.) Show that f is a probability density function.

b.) What is the probability that you will study between 4 and 6 hours for the Final Exam ?

c.) What is the probability that you will study 8 or more hours for the Final Exam ?

d.) What is the expected (mean) number of hours that you will study for the Final Exam ? What is the variance ? What is the standard deviation ?

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"I know where I'm going and I know the truth, and I don't have to be what you want me to be. I'm free to be what I want." – Muhammad Ali