Topic 5 – Statistics and Probability

1. A jar contains six red balls, numbered  to , and nine white balls, numbered  to . A ball is chosen at random from the jar. Find the probability that:

a. the ball is red.

b. the ball is even-numbered.

c. the ball is red and even-numbered.

d. the ball is red or even-numbered.

e. the ball is red, given that it is even-numbered.

f. What if  balls are chosen at random from the jar? Find the probability that both balls are white…

i. with replacement ii. Without replacement

g. Identify which parts (a – g) pertain to the following vocabulary: union, intersection, independent event, addition law,

dependent event, conditional probability

2. Given that , , find .

3. You have 10 books.

a. How many ways can you arrange the books on a shelf?

b. What if the shelf only holds 6 books?

c. What if you need to pick 3 to take on a trip?

d. Which of these is a permutation? Combination?

**Discrete Random Variables** What makes it discrete?

Probability Mass Function, Expectation/Mean, Fair game, Mode, Median, Mean, Variance

E(aX + b) = \_\_\_\_\_\_\_\_\_\_\_\_\_ Var(aX + b) = \_\_\_\_\_\_\_\_\_\_\_

4. a. Complete the probability distribution table for X. b. Find E(X)

|  |  |  |  |
| --- | --- | --- | --- |
| x | 0 | 1 | 2 |
| P(X = x) | 0.2 | 0.4 |  |

5. Given that a random variable W has mean 7 and variance 5, find a. E(3W – 4) b. Var(3W – 4)

|  |  |  |
| --- | --- | --- |
| Distribution | **Binomial Distribution** | **Poisson Distribution** |
| Used to determine the probability of | a certain number of successes in a given **number of independent trials** | a certain number of successes within a **certain interval** of time or space |
| Characteristics of n | n is finite | n has no upper bound |
| Distribution notation |  |  |
| Probability Distribution Function |  |  |
| Mean and Variance |  |  |
| Examples | Number of Heads when 7 coins are tossed.Number of defects in 200 gizmos.Number of bullseyes in 12 shots. | Number of phone calls per hour.Number of misprints on a typical page of a book.Air bubbles per yard of taffy. |

|  |  |  |
| --- | --- | --- |
|  |  |  |
| 83/84 | DISTR (2nd VARS); A: binompdf( | DISTR (2nd VARS); B: binomcdf( |
| Nspire | Menu; 5: Probability; 5: Distributions; D: BinomialPdf… | Menu; 5: Probability; 5: Distributions; E: BinomialCdf… |

|  |  |  |
| --- | --- | --- |
| Calculator |  |  |
| TI-83/84 | DISTR (2nd VARS), C: poissonpdf( | DISTR (2nd VARS), D: poissoncdf( |
| TI-Nspire | Menu, 5, 5, H: PoissonPdf… | Menu, 5, 5, I: PoissonCdf… |

6. The probability that a storm trooper has passed the marksmanship test is 14%. In a group of 18 randomly chosen storm troopers,

a. What is the probability that exactly 5 of these storm troopers passed the marksmanship test?

b. What is the probability that at least 5 of these storm troopers passed the marksmanship test?

c. Approximately how many of these storm troopers would be expected to have passed the marksmanship test?

7. During the dinner rush, customers arrive at Berr Gerr’s at the rate of 3 customers every 10 minutes.

Let discrete random variable X be the number of customers to arrive in one hour. Assuming a Poisson distribution,

a. State the value of m for this distribution.

b. Find the probability that at most 15 customers arrive in one hour

**Continuous Random Variables** What makes it continuous?

Continuous probability density function, mean/expectation, mode, median, variance

8. Consider the probability density function .

a. Check that  is able to be a probability density function.

b. For this distribution find the i. mode ii. median iii. mean

c. Find  and .

The Normal Distribution: I will be told that it is this. 

The Standard Normal Distribution:  and . When should I use this?

|  |  |  |
| --- | --- | --- |
| Calculator |  |  |
| TI-83/84 | DISTR (2nd, VARS)2:normalcdf | DISTR (2nd, VARS)2:normalcdf 🡪 lower bound is -9E99 (to get E: 2nd, comma) |
| TI Nspire | Menu, 5, 5, 2  | Menu, 5, 5, 2 🡪 lower bound default is  or  |

9. A random variable X is distributed normally with a mean of 2.5 kg and variance 0.5 .

a. Find b. Let. Find the value of k.

10. An adult scallop population is known to be normally distributed with a standard deviation of 5.9 g. If 15% of scallops weight less than 58.2 g, find the mean weight of the population.