Additional Topics

I Finite –discrete, Infinite-discrete, Continuous

A Random variable, $X$, is classified by the size of its range. The range of $X$ is all possible values it can have.

$X$ is finite discrete if its range has a set integer number of values.

Example: Choose a ball from a box of balls without replacement. $X$ is how many balls chosen are a certain color. This is finite because eventually you will run out of balls and have to stop.

$X$ is infinite discrete if its range is infinite but can be enumerated by the positive integers.

Example: Choose a ball with replacement until a red ball is chosen. $X$ is the number of times one must choose until red is chosen. We cannot determine a bound on how many times one must choose so $X$ is infinite but the number of times is enumerated by the positive integers.

$X$ is continuous if its range is an interval and any number in the interval is possible.

Examples: i) $X$ is the unrounded time it takes to accomplish a task.

ii) $X$ is the unrounded height of a person.

Practice: Classify each random variable:

1. A room for a class has a maximum capacity of 105. $X$ is the number of students in the room at a given time.

2. $X$ is the unrounded time it takes a person to run a 5 mile track.

3. A person chooses a card with replacement from a shuffled deck of cards until he gets an ace. $X$ is the number of times he must choose.

II Standard Deviation and Variance:

Standard deviation and variance measure how spread out a random variable is from its mean value.

$$
\mu = E(X) \quad Var(x) = E((X - \mu)^2) \quad \sigma(X) = \sqrt{Var(X)}
$$

Example: $x| \quad 0 \quad 1 \quad 2 \quad 3 \quad 4 \quad x| \quad 0 \quad 1 \quad 2 \quad 3 \quad 4$

$P(X1=x)| .1 \quad .2 \quad .4 \quad .2 \quad .1 \quad P(X2=x)| .35 \quad .1 \quad .1 \quad .1 \quad .35$

Both $X1$ and $X2$ have mean 2 but $X2$ has higher probabilities away from the mean so $X2$ will have a higher variance and standard deviation.
Statistics in the Calculator:

First we enter the probability distribution of X. STAT enter (This selects EDIT in STAT)

Clear L1 scroll up to the list name and do CLEAR enter. Type in the values of X.

Clear L2 and enter the frequencies or the probabilities. The calculator will make the frequencies into relative frequencies for you. If the probabilities are all equal, you do not need L2.

2nd MODE to Quit

STAT->CALC enter (this selects 1-Var Stats) 2nd 1, 2nd 2 enter

We will interpret the results in class.

Median and Mode

In a uniform distribution the median is the middle value of X. When there are an even number of values, find the average of the two middle values.

In general, \( P( X \leq \text{med} ) = P( X \geq \text{med} ) \)

The mode is the value with the highest probability and need not be unique.