**AP Test Review – Random Variables**

I. Random Variables

 A. Continuous vs. Discrete

 B. Probability Distribution

 C. Mean, µX

Never round means of random variables. Remember, they are the average number, not an actual number from the distribution.

 a) also called the expected value, E(X)

 b) µ = E(X) = Σxipi (on formula sheet)

 D. Standard Deviation, σX

Standard deviation is NOT on your formula sheet, variance is. Remember how to get the standard deviation from the variance.

a) square root of the variance

 b) σX = $\sqrt{Σ(x\_{i}-μ\_{x})^{2}p\_{i}}$

 E. Effects of a linear transformation Y = a + bX

 i) probability distribution of X is the same as Y

 ii) µY = a + bµX

Effects of linear transformations are the change in SOCS when multiplying or adding constants to a random variable.

 iii) σY = |b|σX

F. Combinations

 a) If T = X + Y, then E(T) = µT = µX + µY

b) If T = X + Y, then σT = $\sqrt{σ\_{x}^{2}+σ\_{y}^{2}}$

 c) If D = X – Y, then E(D) = µD = µX - µY

d) If D = X – Y, then σD = $\sqrt{σ\_{x}^{2}+σ\_{y}^{2}}$

II. Binomial Random Variables

 A. Conditions for binomial setting

When checking if the conditions for a binomial are met, remember the acronym BINS.

 a) Binary

 b) Independent

 c) Number

 d) Success

 B. Binomial Probability

 a) $P\left(X=k\right)= \left(\begin{matrix}n\\k\end{matrix}\right)p^{k}\left(1-p\right)^{n-k}$ (on formula sheet)

 b) This finds the probability of k successes in n trials

 c) binompdf (n, p, k) on calculator

Remember to state the distribution and values of interest when performing probability calculations.

 d) binomcdf (n, p, k) on calculator

 C. Mean of a Binomial Random Variable

 a) µx = np

 b) also interpreted as expected value

 D. Standard Deviation of a Binomial Random Variable

 a) σx = $\sqrt{np\left(1-p\right)}$

 E. Normal Approximation for Binomial Distributions

 a) check BINS

b) check for 10% condition: n ≤ $\frac{1}{10}$ N

 c) check for large counts: np ≥ 10 and n(1-p) ≥ 10

 d) if all conditions are met, the Binomial Distribution will follow the N(np, $\sqrt{np\left(1-p\right)}$)

III. Geometric Random Variables

 A. Conditions for a Geometric Setting

 a) all BINS conditions, except for Number

 B. Geometric Probability

 a) P(Y = k) = p(1 – p)n-k

b) this finds the probability of the first success on the nth trial

 c) geometpdf (p, n)

 d) geometcdf (p, n)

 C. Mean of a geometric random variable

 a) µY = E(Y) = $\frac{1}{p}$

Tips and Common Mistakes:

* Use binompdf an geometpdf when finding the probability of a singular value. Use binomcdf and geometcdf if you are finding an interval of values (inequalities)
* When finding probability using binomcdf and geometcdf, it always finds the probability of X≤k, you need to use complements to find greater than inequalities