Stat 2470, 1/27 Discussion Questions Name ______________________

Instructions: Attempt to answer these questions by reading the textbook or with online resources before coming to class on the date above.

1. What is the formula for the expected value of a discrete probability distribution? What other statistical concept does it produce?

$$E(X) = \mu_X = \sum_{x \in D} x \cdot p(x)$$ the mean

2. How do we find the expected value of a function of X? For instance, if we want to transform the units of the variable? What happens if the transformation is linear?

$$E(h(x)) = \sum h(x) \cdot p(x)$$

if $h(x) = a + bx$ then $E(h(x)) = a + bE(x)$

3. What is the formula for the variance of a random variable? What is the short-cut formula? Why do you think, computationally, that this may be less work?

$$V(X) = \sum_D (x-\mu)^2 \cdot p(x) = E((x-\mu)^2) = E(x^2) - [E(x)]^2$$

Saves a computational step (or many) by saving subtraction for the end

4. How is variance affected by a (linear) transformation?

$$V(h(x)) = |b|^2 V(x)$$ if $h(x) = a + bx$

5. What are the conditions that need to be satisfied for a random variable to be binomial?

1. sequence of smaller experiments called trials, # fixed in advance
2. each trial has only 2 outcomes (success = 1 or failure = 0)
3. trials are independent
4. probability of success is constant from trial to trial

6. Describe at least two events that can be considered binomial.

coin flipping
rolling a die seeking a particular side (or fixed combinatio[n] of sides)

7. What is the formula for the binomial distribution? How can we use the calculator to find this same thing?

$$b(x; n, p) = \begin{cases} \binom{n}{x} p^x (1-p)^{n-x} & x = 0, 1, 2, \ldots, n \\ 0 & \text{otherwise} \end{cases}$$

on TI-84 : DISTR → binomalpdf (n, p, x)

8. What is the cumulative binomial distribution? When should we use it?

$$B(x; n, p) = \sum_{y=0}^{x} b(y; n, p) \quad x = 0, 1, \ldots, n$$

when we want the probability X is less than or equal to a certain value

9. What is the expected value and the variance of the binomial distribution?

$E(X) = np$ $\quad V(X) = npq = np(1-p)$