4/17/2002 MA331 Applied Prob/Stats I Name:_____
Dr. Lunsford Test 2 (100 Points Total)

Neatly show all work on this test. Clearly indicate your answers. Good luck!

I. Multiple Choice. Circle the best answer for each problem. (4 points each – 20 total)

1. If the random variable X has the cumulative distribution function (c.d.f.)

$$F_X(x) = \begin{cases} 0, & x < 0 \\ x^2, & 0 \le x < 1 \\ 1, & 1 \le x \end{cases}$$

then $P(\frac{1}{4} \le X \le \frac{3}{2}) =$

(a) 15/16 (b) 1 (c) 1/16 (d) 35/4 (e) None of these

2. Suppose $X \sim N(0,1)$. Then $P(-0.73 \le X \le 1.53) =$

(a) .9370 (b) .7043 (c) .2327 (d) .4716 (e) None of these

3. If X is $N(0,1)$ then the value of c such that $P(|X| < c) = .9812$ is

(a) 2.08 (b) 2.326 (c) 2.10 (d) 2.35 (e) None of these

4. If $X \sim b(11,.25)$ then $P(X < 5) =$

(a) .9657 (b) .8854 (c) .1146 (d) .0803 (e) None of these

5. Suppose that 60% of Americans believe the economy is getting better. Let X equal the number of Americans who believe the economy is getting better in a random sample of thirty Americans. Then X has which of the following binomial distributions?

(a) $b(30,60)$ (b) $b(30,0.30)$ (c) $b(60,1/2)$ (d) $b(30,0.60)$
(e) None of these

II. If $X \sim b(10,0.65)$ then find $P(X > 7)$. (6 points)

III. An urn contains six red chips and three white chips. You draw four chips from the urn without replacement. Let the random variable X denote the number of red chips in the draw. Please answer the following. (12 total points total)

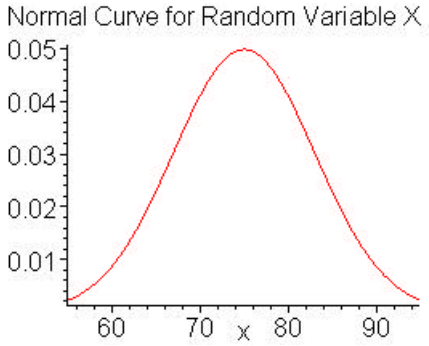
(a) How is the random variable X distributed? Please indicate the p.d.f. or p.m.f. of the distribution and all valid values of X. (4 points)

(b) How many red chips do you expect to draw on average? (3 points)

(c) Find the probability that you will draw at most three red chips. (5 points)

IV. Let X be $X \sim N(75,64)$. Please answer the following. (5 points each – 10 total)

(a) Find $P(|X-75|>6)$ and show this probability graphically on the p.d.f of X to your right.

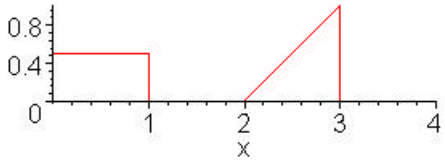


(b) Find a number c so that $P(|X-75|<c)=.95$

V. Let X be a random variable with p.d.f. $f(x)=\begin{cases}1/2, & 0\le x\le 1\\ x-2, & 2\le x\le 3\\ 0 & ,elsewhere\end{cases}$.

A graph of the p.d.f. is shown below. Please answer the following. (20 points total)

(a) Find the cumulative distribution function (c.d.f.), $F(x)$, for X. (6 points)



(b) Show the probability $P(\frac{1}{2}\le X\le\frac{5}{2})$ graphically on the p.d.f. (2 points)

(c) Find the probability in part (b) by using two distinct methods (geometry, using the p.d.f., or using the c.d.f.). Clearly indicate which methods you use. (6 points)

(d) Find $E[X]$. (6 points)

VI. The weight of prepackaged one pound bags of carrots is normally distributed with mean 1.18 pounds and standard deviation 0.07 pounds. Suppose sixteen of these bags are chosen at random and weighed (i.e. the random variables X_i, $i = 1,...16$ are the weights of each bag in the sample). Let $\overline{X}$ be the sample mean of this random sample. Please answer the following. (18 points total)

a. What is $E\left[\overline{X}\right]$? (3 points)

b. What is $Var\left[\overline{X}\right]$? (3 points)

c. Find $P\left(\overline{X} < 1.15\right)$. (6 points)

d. Find the probability that at least one of the sixteen packages weighs less than 1.065 pounds. (Hint: Let Y be the number of packages that weigh less than 1.065 pounds and note that $P(X_i < 1.065) \approx 0.05$, $i = 1,...,16$) (6 points)

VII. During the Friday night shift, $n = 100$ mints were randomly selected from a production line and weighed. They had an average weight of $\bar{x} = 21.45$ grams and a standard deviation of $s = 0.31$ grams. Please answer the following. (9 points total)

a. Find a 90% confidence interval for m, the mean weight of mints produced. (6 points)

b. Suppose we desire to compute a 95.76% confidence interval for m. Without doing the computation, describe how this will effect the confidence interval computed in part (a). Why does this make sense? (3 points)

VIII. The networks CNN and Fox routinely conduct phone-in polls asking Americans about current events. Suppose one of these polls reveals that p% of Americans agree with some statement S. Based on your readings from *Statistics You Can't Trust* and our discussions in class, what criticisms (if any) would you make regarding this statistic? In general, when you see or hear the results of a poll, what information do you look or listen for regarding the validity of the results? (5 points)