

Math 325 Exam#2

Name _____

ID# _____

1. (16 pts) Let X be a random variable distributed as shown in the table below. Determine $E(X)$, $E(\frac{1}{X})$, $E(X^2 - 1)$, and $V(X)$.

X	1	2	3	4	5
prob	.15	.2	.3	.2	.15

2. (9 pts) Among 20 light bulbs, 2 are defective. A sample of 4 bulbs is selected for testing. Find the probability distribution for Y , the number of defective bulbs among the four selected.
3. (8 pts) A company produces VCRs that are 5% defective. Three VCRs are randomly selected. Find the probability distribution for Y , the number of defective VCRs among the three selected.

4. (16 pts) Analysts estimates that AT&T has 60% share of the U.S. long-distance market. If 25 long-distance calls are randomly sampled, what is the probability that
- (a) less than 15 of them are on AT&T's network?
 - (b) exactly 15 of them are on AT&T's network?
 - (c) less than 15 of them are not on AT&T's network?
 - (d) what is the mean and variance of the number of calls on AT&T's network?
5. (10 pts) A manufacturer ordered 20 parts from each of the two suppliers A and B. Supplier A produces 5% defective parts and Supplier B produces 10% defective parts. What is the probability that there will be exactly 2 defective parts among the 40 ordered?
6. (10 pts) A company produces 5% defective parts. An inspector randomly selects the parts and examine them one by one.
- (a) What is the probability that the first defective part is found in 5th examination?
 - (b) What is the expected number of examinations to find the first defective part?

7. (10 pts) Suppose that the number of incoming calls to a telephone switchboard per minute is Poisson distributed with a mean of 2.4 calls per minute.
- If an operator wants to take a 1-minute break, what is the probability that there will be no calls during a 1-minute period?
 - If an operator can handle at most 5 calls per minute, what is the probability that the operator will be unable to handle the calls in a 1-minute period?
8. (10 pts) Suppose you are going to play a game by randomly selecting three balls from a box which contains 6 white balls and 4 black ones. You will lose \$4 on each white ball selected and win \$6 on each black ball selected. What are the mean and variance of your net gain?
9. The moment-generating functions for a binomial distribution $B(n, p)$, a geometric distribution $G(p)$, and Poisson distribution $P(\lambda)$ are $(pe^t + (1 - p))^n$, $\frac{pe^t}{1 - (1-p)e^t}$, and $e^{\lambda(e^t - 1)}$ respectively.
- (5 pts) If a random variable Y has moment-generating function $m(t) = \frac{e^t}{3 - 2e^t}$, find the probability that $Y = 3$.
 - (3 pts) If a random variable Y has distribution $P(\lambda = 5)$, find $E[Y^2]$.
 - (3 pts) If a random variable Y has distribution $B(n = 10, p = .2)$, find $E[Y(Y - 1)]$.