

Math 166.200

Exam II

Tuesday, October 16, 2012

Printed Name: _____

Signature: _____

- You must show all appropriate work to receive full credit.
- If you give a decimal answer that is not money, then round to at least 4 decimal places.
- There are 100 points possible. Point values for each problem are as indicated.
- Be careful in converting percentages $2\% = .02$
- SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED.
- If you need more space to work a problem, you may use the back of the exam. Please indicate where the problem is located.
- INFORMATION ABOUT CARDS. Each standard deck of cards has 52 cards. There are 4 suits in a deck of cards; Hearts, Diamonds, Spades, and Clubs. The Hearts and Diamonds are both red, while the Spades and Clubs are both black. Within each suit there are 13 cards and they are labeled Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King. If you feel that you need more information about a card deck please ask.
- There are 26 letters in the English alphabet.
- there are 33 letters in the Russian alphabet.
- Formula that was requested: $P_{\lambda}(X) = \frac{\lambda^x}{x!} * e^{-\lambda}$

Good Luck!

1. (6 points) You have 9 chairs arranged in three rows with each row having three seats, i.e. the seats are arranged in a square. In how many ways can a group of 9 people be seated in the chairs if Bob and Jim (two members of the group) are seated in the corner seats?

$$\begin{array}{ccc} _ & _ & _ \\ _ & _ & _ \\ _ & _ & _ \end{array} \quad \left(\frac{2}{c} \cdot 7 \cdot \frac{1}{c} \cdot \frac{6}{c} \cdot 5 \cdot 4 \cdot \frac{3}{c} \cdot \frac{2}{c} \cdot \frac{1}{c} \right) \cdot \overset{6}{c(4,2)}$$

2. (12 points) A club has the following membership as shown in the table. A group of 6 people are being selected for an activity.

	Freshmen	Sophomores	Juniors
number of people	9	3	7

- (a) How many ways can exactly 3 freshmen or exactly 2 Juniors be selected?

$$C(9,3) \cdot C(10,3) + C(7,2) \cdot C(12,4) - C(9,3) \cdot C(7,2) \cdot C(3,1)$$

- (b) What is probability that exactly 2 freshmen and at least 3 juniors will be selected?

$$\frac{C(9,2) \cdot C(7,3) \cdot C(3,1) + C(9,2) \cdot C(7,4)}{C(19,6)}$$

3. (5 points) A local pizza joint is holding a drawing for free large pizzas. There are 5 coupons for a supreme pizza, 4 coupons for a meat-eater pizza, 2 coupons for a pepperoni pizza and one coupon for a veggie pizza. Twenty people have entered the drawing and according to the rules of the contest, no person can win more than one coupon. In how many ways can the coupons be awarded?

$$C(20,5) \cdot C(15,4) \cdot C(11,2) \cdot C(9,1)$$

or.

$$\frac{20!}{5! \cdot 4! \cdot 2! \cdot 8!}$$

Check the back of the page for more problems.

4. (5 points) A box contains 28 red balls and 12 green ball. Eight balls are drawn from the box at the same time. Let X be the number of green balls drawn. Compute $P(X \geq 2)$

$$1 - \frac{C(12,1)C(28,7) + C(12,0)C(28,8)}{C(40,8)}$$

5. (6 points) Ten people are each picking a number between 1 and 25 inclusive. What is the probability that exactly 4 people pick a number less than 8 and exactly two of the people pick a number bigger than 19?

$$\frac{8}{5} \left(\frac{7}{25}\right)^4 \left(\frac{6}{25}\right)^2 \left(\frac{12}{25}\right)^4 \cdot C(10,4) \cdot C(6,2)$$

< 8
 > 19
Rest

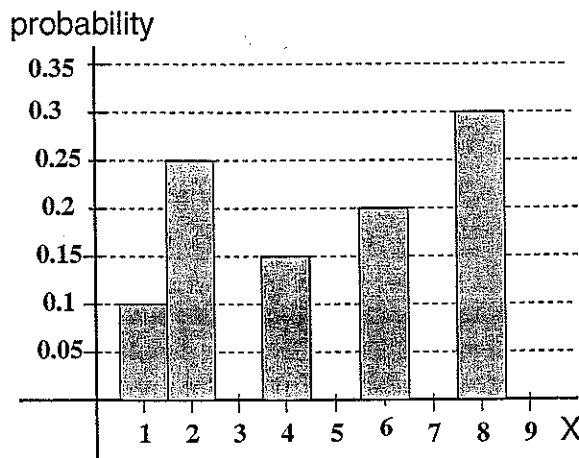
6. (12 points) Use the histogram for the random variable X to compute the following.

(a) $E(X) = 4.8$

(b) median = 5

(c) standard deviation = 2.61916

(d) variance = 6.85999910



7. (4 points) Find the mode for the random variable X.

X	3	4	6	7	8	10
frequency	4	4	12	3	12	3

6 & 8

8. (15 points) The amount of time between taking a pain reliever and getting relief is normally distributed with a mean of 16 minutes and a standard deviation of 8 minutes.

- (a) Find the probability that the time between taking this medication and getting relief is more than 19 minutes. **Compute out a numerical answer.**

$$ncdf(19, 1E99, 16, 8) = .3538$$

- (b) Find the probability that the time between taking this medication and getting relief is between 12 and 21 minutes. **Compute out a numerical answer.**

$$ncdf(12, 21, 16, 8) = .42547$$

- (c) If 300 people are randomly selected for a study, find the probability that at most 130 and more than 110 will take between 12 and 21 minutes to get relief from this medication. **Compute out a numerical answer.**

$$300 \quad p = ncdf(12, 21, 16, 8) =$$

$$110 \{ 111, \dots, 129, 130 \}$$

$$bcdf(300, p, 130) - bcdf(300, p, 110) = .6096$$

9. (5 points) Accidents occur at the rate of three per week along a certain highway. What is the probability that there will be two or fewer accidents on a given day?

$$\lambda = \frac{3}{7}$$

$$P(X \leq 2) = P(X=2) + P(X=1) + P(X=0)$$

$$= \frac{\left(\frac{3}{7}\right)^2}{2!} e^{-3/7} + \frac{\frac{3}{7}}{1!} e^{-3/7} + \frac{\left(\frac{3}{7}\right)^0}{1} e^{-3/7}$$

Check the back of the page for more problems.

$$= .99045$$

10. (3 minutes) Let the random variable X be the average amount of time you spend waiting in line at the grocery store. Assume that the mean for the random variable is 2.5 minutes. Compute $P(X = 3)$. If it is not possible, tell what additional information is needed.

RV. is cont. so Area under the graph is probability.
 $P(X=3) = 0$

11. (6 points) The random variable X has a mean of 30 and a standard deviation of 6. Using Chebychev's theorem, it was determined that at least 75% of data was within k standard deviations of the mean. Find the upper and lower values of this interval.

$$1 - \frac{1}{k^2} = .75$$

$$.25 = \frac{1}{k^2}$$

$$k^2 = \frac{1}{.25} = 4$$

$$k = 2$$

$$30 + 2(6) = 42$$

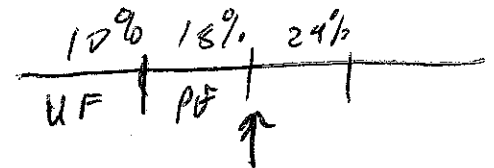
$$30 - 2(6) = 18$$

12. (5 points) The members of a running club are to be divided into groups based on their times in a race. The times are normally distributed with a mean of 19 minutes with a standard deviation of 3.5 minutes. The groups are going to be created in the manner indicated by the table. What is the slowest time that a runner could complete the race and still be a member of the "Pretty Fast" group?

group	part of the distribution
Ultra Fast	to 10%
Pretty Fast	next 18%
Fast	next 24%
Slow	rest

inv norm(.28, 19, 3.5)

16.96 min.



13. (5 points) A business knows that 18% of its customers pay their bills with a credit card. Seven of the customers are selected at random, what is the probability that the only the first three customers pay their bills with a credit card?

$$(.18)^3 (.82)^4$$

14. (4 points) Bob is drawing balls one at a time from a box that has 4 red and 5 yellow balls. The ball is replaced in the box before the next ball is drawn. What is the probability that the fourth time a red ball is drawn in on the sixth draw?

$$C(5, 3) \cdot \frac{4}{9} \cdot \frac{4}{9} \cdot \frac{4}{9} \cdot \frac{5}{9} \cdot \frac{5}{9} \cdot \frac{4}{9}$$

r
r
r
y
y
r

15. (7 points) A game cost \$2 to play and consists of drawing two balls, with replacement between draws, from a box containing 2 red and 18 green. Drawing only one red ball wins \$3 and not drawing a red ball means you lose the game. Draw two red balls, then you win the grand prize. What should the grand prize be so that a person playing this game would expect to lose on average \$1 each time they play the game?

1R	2R	0R
3 - 2 = 1	A - 2	- 2
.18	$\left(\frac{2}{20} \cdot \frac{2}{20} \right)$	$\frac{18 \cdot 18}{400} = .81$
	$\frac{4}{400} = .01$	

.01A = .46

A = 46

$$1(.18) + .01(A - 2) + .81(-2) = -1$$

$$.01A - .02 - 1.44 = -1$$

$$.01A - 1.46 = -1$$

Check the back of the page for more problems.