Math 220 : Elementary Statistics — Kane Nashimoto
Exam 2 - Ch. 3, 5, 6
Fall 2007 — Name : _____

Directions: This exam contains six problems worth a total of 100 points. For each computational problem, you must first write the formula to be used and present all your subsequent work in order to receive full or partial credit. Circle your final answers.

1. The following contingency table cross-classifies a total of 385 working individuals according to political affiliation (Democrat vs. Republican) and income level (high vs. low).

	Income	
Affiliation	High	Low
Democrat	75	110
Republican	100	100

(a) Compute the conditional proportions of high- and low-income people for Democrats and Republicans separately. Describe the association between political affiliation and income. (8 pts.)

(b) The contingency table above is split into two parts: one for people with advanced degrees and the other for those without advanced degrees. Describe the association between political affiliation and income in each of the two tables. (8 pts.)

With advanced degrees

	Income	
Affiliation	High	Low
Democrat	30	20
Republican	75	50

Without advanced degrees

	Income	
Affiliation	High	Low
Democrat	45	90
Republican	25	50

(c) The observations in (a) and (b) are paradoxical. How would you resolve this paradox? Explain. (6 pts.)

2. Of all the members of a large fitness club, 70% regularly use treadmills, 40% regularly use weightlifting equipment, and 30% regularly use both treadmills and weightlifting equipment.

   (a) Find probability that a randomly selected member of this club will be a regular user of the treadmill, weightlifting equipment, or both. (6 pts.)

   (b) Find probability that a randomly selected member of the club will be a regular user of the treadmill, given that he or she is a regularly user of the weightlifting equipment. (6 pts.)

   (c) Are the events "selected person is a regular user of the treadmill" and "selected person is a regular user of the weightlifting equipment" independent? Justify your answer. (6 pts.)

3. When you approach a traffic light, there is a 60% chance that the light is red. Suppose that you drive a long stretch of road that has 9 traffic lights. Assume that traffic lights operate independently.

   (a) Let X be the number of traffic lights that are red. What distribution does X have? (6 pts.)

   (b) Compute the probability that less than 4 traffic lights will be red. (6 pts.)

   (c) Compute the probability that more than 5 traffic lights will be red. (6 pts.)

   (d) Compute the probability that exactly 7 traffic lights will be red. (6 pts.)

4. Consider the following data set with two variables.

x	3	4	7	8	6	4	2
y	5	4	6	7	4	8	1

Using your calculator, compute the Pearson correlation between the two variables and the least-squares regression equation for predicting Y from X. (8 pts.)

5. The price of mid-grade gasoline (in cents per gallon) is best characterized as having a normal distribution with mean $\mu = 272$ and standard deviation $\sigma = 11$.

   (a) What is the probability that the mid-grade gasoline at a randomly selected gas station is priced higher than 286 cents? (8 pts.)

   (b) Forty percent (40%) of all mid-grade gasolines are priced lower than x cents. Find the value of x. (8 pts.)

6. For randomly selected 20 adults of various ages, the relationship between X = age (in years) and Y = systolic blood pressure (in mmHg) was examined using a regression framework. The results of the regression analysis are given on the following page.

   (a) Predict the systolic blood pressure for an adult whose age is 40. (6 pts.)

   (b) Interpret the value of the coefficient of determination for this analysis. (6 pts.)

Figure 1. SPSS output for Problem 6.

Variables Entered/Removed[b]

Model	Variables Entered	Variables Removed	Method
1	Age[a]	.	Enter

a. All requested variables entered.

b. Dependent Variable: Systolic

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.487[a]	.237	.195	8.144

a. Predictors: (Constant), Age

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	371.442	1	371.442	5.601	.029[a]
	Residual	1193.758	18	66.320		
	Total	1565.200	19			

a. Predictors: (Constant), Age

b. Dependent Variable: Systolic

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	123.718	5.420		22.824	.000
	Age	.249	.105	.487	2.367	.029

a. Dependent Variable: Systolic