Math 220 : Elementary Statistics — Kane Nashimoto
Exam 2 - Ch. 5, 6, 7
Spring 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. Featured below are scores on the first quiz (x) and second quiz (y) for a random sample of seven students in a physics course.

x	6	5	8	9	9	4	6
y	8	4	6	8	7	4	7

   (a) Suppose that you are interested in predicting the second quiz score for an individual from his or her first quiz score. Using your calculator's built-in function, compute the least-squares regression equation. (5 pts.)

   (b) Using your calculator's built-in function, compute the Pearson correlation coefficient between the two sets of quiz scores. (5 pts.)

   For (a) and (b), if you prefer, you may perform computation by hand. Take as given:

$$\sum x = 47\,;\ \sum y = 44\,;\ \sum x^2 = 339\,;\ \sum y^2 = 294\,;\ \sum xy = 309$$

   Show your work on the backside of this page.

2. A biased coin such that $P(\text{head}) = .60$ will be flipped 25 times and the outcomes will be observed.

   (a) What is the probability that between 10 and 15 heads (inclusive) will be observed? (8 pts.)

   (b) What is the probability that more than 20 heads will be observed? (8 pts.)

3. Of all the students attending a women's college in Missouri, 70% of them are from Missouri, 60% live on campus, and 40% are from Missouri and live on campus. You just met one student attending this college.

   (a) What is the probability that the student you met is from Missouri, lives on campus, or both? (8 pts.)

   (b) If you know that the student you met is from Missouri, what is the probability that she lives on campus? (8 pts.)

   (c) Are the events "the student you met is from Missouri" and "the student you met lives on campus" independent? Justify your answer mathematically. (8 pts.)

4. Octane rating of 87 for a gasoline means that the burning characteristic of the gasoline is like that of a fuel that contains 87% octane (burns slowly) and 13% heptane (burns quickly). However, gasolines are made up of many different chemicals and octane ratings are just approximations. Suppose that the true octane ratings of all gasolines labeled 87 are normally distributed with mean $\mu = 87.0$ and standard deviation $\sigma = 0.4$.

   (a) What is the probability that the gasoline labeled 87 sold at a gas station near your residence will have a true octane rating higher than 87.6? (8 pts.)

   (b) Thirty-three percent (33%) of all gasolines labeled 87 have true octane ratings below x. Find the value of x. (8 pts.)

5. Mary and James have four children, who are seven, five, three, and two years old. You have not met the children, and you are curious about their genders. Assume $P(\text{boy}) = P(\text{girl}) = .5$ for each child.

   (a) What is the probability that the youngest child is a boy? (8 pts.)

   (b) What is the probability that at least one of the four children is a boy? Hint: Use complement. (8 pts.)

6. For a total of $n = 50$ adult men, $Y =$ weight (in pounds) was modeled as a function of $X =$ height (in inches) using a least-squares regression. The results of the regression analysis, with the residual plot, are given on page 4.

   (a) Predict the weight of an adult man whose height is 70.0 inches. (6 pts.)

   (b) What proportion of the variability in weight is accounted for by the regression model? (6 pts.)

   (c) Based on the residual plot, comment on the fit of the regression model. (6 pts.)

Figures 1 and 2. Regression analysis and residual plot for Problem 6.

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

a. All requested variables entered.

b. Dependent Variable: Weight

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.694[a]	.481	.470	10.182

a. Predictors: (Constant), Height

b. Dependent Variable: Weight

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4611.760	1	4611.760	44.483	.000[a]
	Residual	4976.439	48	103.676		
	Total	9588.198	49			

a. Predictors: (Constant), Height

b. Dependent Variable: Weight

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	-130.143	44.604		-2.918	.005
	Height	4.258	.638	.694	6.670	.000

a. Dependent Variable: Weight