Statistics 2
First Midterm Exam
Spring 2000

Printed Name _____
(Please also print your name at the top of each page)

Signature _____

Student ID #_____

Circle your TA: Susan Alber Nicola Armstrong Tony Hua Pawel Lasieki Michael Roberts

There are 6 problems on the exam

1	2	3	4	5	6	total

Show your work. No credit will be given for correct answers without justification. A correct answer with no justification or incorrect reasoning will receive no credit.

[4]

Tall Guys Luckier in Love, Scientists Confirm

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If it seemed as if the tall guys got all the girls in high school, it wasn't your imagination. New research suggests that taller men are more likely to marry and tend to have more children than short guys.

What's behind the phenomenon — whether women prefer taller men or those men are simply more outgoing — is up for debate. But the numbers clearly stack up against shorter guys.

Polish and British scientists studied the medical records of about 3,200 Polish men ages 25 to 60 and found that childless men were on average 1.2 inches shorter than men who had at least one child.

Bachelors were about an inch shorter on average than married men. That was true even after researchers took into account the fact that men's heights increased in recent decades because of better nutrition and health care.

The records, which were collected in Wroclaw, Poland, from 1983 to 1989, showed that tall men in their 20s, 30s and 40s all had more children than their shorter peers. Height didn't seem to matter for men in their 50s. Robin I.M. Dunbar of the University of Liverpool said that is because those men came of age after World War II — a catastrophe that claimed the lives of many Polish men and reduced women's mating options.

However, Dunbar said the numbers clearly show that women favor taller men — something that other research suggests is true across all cultures.

"Basically, height is a proxy for other variables that women find desirable — men who can protect them, provide them with resources, have good social status and aren't easily dominated by other men," said Dunbar, a professor of evolutionary psychology and the study's co-author.

The findings were published in today's issue of the journal Nature.

Out of the military service records of 4,400 men, the researchers excluded men who were abnormally short or tall. The average height of the 3,200 men whose records were part of their final sample was 5 foot 6.

While other studies have shown that taller-than-average men have higher incomes and social status than shorter men, this study is the first to demonstrate a link between height and reproductive success, said David Buss, a professor of psychology at the University of Texas at Austin.

Dunbar said he undertook the research after noticing that in personal ads men advertise their height only if they are tall or taller than average.

"You didn't see any advertisements saying, 'I'm 5 foot 3, give me a call,' " he said.

Does the study demonstrate persuasively that height is a factor that causes women to marry men? Answer *Yes* or *No* and briefly explain.

2. A table for monthly rent in a certain city is shown below, based on prices of 200 rental units. The table shows, for example, that 30 rental units were in the range \$600 to \$800. All the rents in the city were between \$600 and \$2000.

Rent (in dollars)	Number of units
600-800	30
800-1000	120
1000-1500	40
1500-2000	10

(a) [4] Graph the histogram, labeling and marking the horizontal and vertical axes clearly.

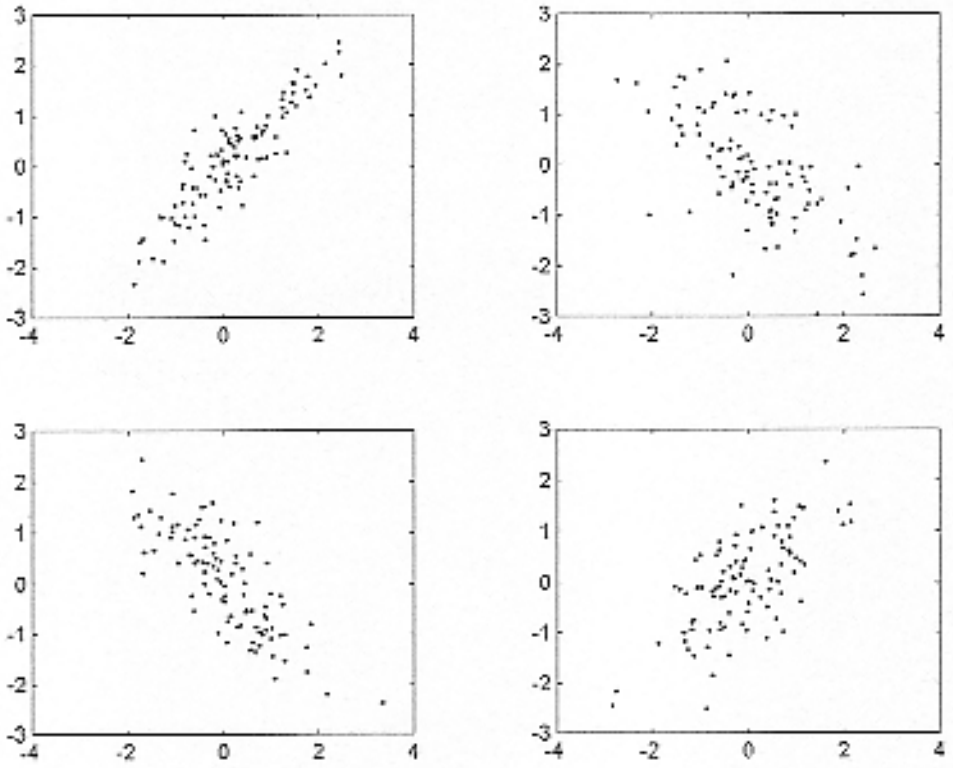
(b) [2] A reasonable estimate for the median rent is _____. Explain your answer briefly.

(c) [2] The upper quartile is about _____. Explain your answer briefly.

(d) [2] The SD of the rents is about (circle one): 50 100 300 1000. Explain your answer briefly.

3. [4] In a study of men aged 18 to 26, a histogram of systolic blood pressure was found to follow the normal curve closely. The median pressure was 120 mm and the lower quartile was 108. What was the 90^{th} percentile, approximately? Show your work.

4. [4] Which of this list of correlation coefficients go with which of the figures: .90, .75, -.60, -.85. Write the correlation coefficient in each box. Explain your reasoning briefly.



5. The following table shows the percentage of alcohol drinkers at each of several ages in a small mid-western town.

Age (years)	20	30	40	50
Percent drinkers	44%	38%	20%	11%

(a) [2] Is the correlation between age and the percentage of *non-drinkers* positive, negative, or zero? Why?

(b) [2] If age were recorded in months instead of years the correlation between age and percentage of drinkers would: *decrease* *increase* *remain the same.*
Circle one and explain briefly.

(c) [2] The table shows that as a person ages he is less likely to drink. True or false and why?

6. A law school finds the following relationship between LSAT scores and first-year scores. The scatter diagram was football shaped.

Average LSAT Score = 32 SD = 6
Average First-Year Score = 68 SD=15
Correlation = .60

(a) [2] What would you predict to be the first-year score of someone who obtained 28 on the LSAT?

_____

(b) [2] Copy your answer for (a) into the blank below. Is this statement true or false and why?

"If someone scored _____ in the first year, it would be reasonable to estimate that person's score on the LSAT to be 28 points."

(c) [2] Of people in the 75th percentile of LSAT scores, approximately what proportion are at or above the 75th percentile in first year score?

1. No. This is an observational study, not a controlled experiment. The association could be confounded with other variables, such as health, for example

2 (a)

Interval	height
600-800	.075
800-1000	.30
1000-1500	.04
1500-2000	.01

(b) Around the middle of the interval 800-1000, say $900
(c) $1000 since 25% of the data are greater than $1000
(d) $300 since the range of the data is a little more than 4 SD. The other choices give either too many or too few SD for the total range of the data

3. The 90th percentile is about 144.The interquartile range, 108-132, contains 50% of the data and corresponds to a z score of plus or minus .65. So SD = 18.46. To find the 90th percentile look for 80% central area, which gives z=1.3.

4. Labeling across the rows: .90, -.60, -.85, .75

5. (a) positive. (b) remain the same since changing units doesn't change the correlation. (c) False, since this is cross sectional data not longitudinal data

6. (a) 28 is 2/3 SD less than average. For first year predict .6 x (2/3) SD less than average or 6 points less than average. So prediction is 62.

(b) The statement is false, since there are two regression lines.

(c) The 75th percentile corresponds to a z-score = .65. The predicted z-score in the first year is .6 x .65 = .39. This corresponds to a first year score of 68 + .39 x 15 = 73.85.

In that vertical strip, the average is 73.85 and the SD is the RMS error = 12 (using the formula). The 75th percentile of first year scores is 68 + .65 x 15 = 77.75. 77.75 – 73.85 = 3.9 which equals 0.325 SD. The area to the right of z = 0.325 is about 37.5%.

So of those who were in the 75th percentile on the LSAT, about 37.5% were in the 75th percentile in the first year.