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Student ID# _____

AMS 102 ELEMENTS OF STATISTICS**FALL 2008****MIDTERM EXAM 1****OCTOBER 16**

Problem	1	2	3	4	5	Total
Max Score	20	20	20	20	20	100

Problem 1. National Guard Recruits

The following table contains some basic demographic information about 20 National Guard recruits as well as their Armed Forces Qualifying Test scores

Name	Gender	Education	Age	AFQT Score
Chen	Female	High School	20	62
Cohen	Male	High School	19	39
Davis	Female	College	24	73
DeLuca	Female	Some College	23	53
Douglas	Female	Some College	33	49
Gonzales	Male	College	31	66
Hernandez	Male	High School	19	51
Jackson	Male	College	26	79
Keyes	Female	Vocational	28	44
Li	Male	Some College	25	67
Luke	Male	High School	22	38
Nguyen	Male	College	29	86
Parker	Male	Vocational	26	48
Rodriguez	Female	College	24	65
Romano	Female	Some College	29	55
Sanchez	Male	Vocational	27	45
Smith	Male	Some College	37	49
Wayne	Male	Vocational	30	43
White	Male	High School	21	54
Zhang	Female	Vocational	28	36

(Problem 1 continues on the following page.)

Problem 1 (cont.)

(a) With regard to the given collection of data state what are *the population*, *the individuals*, what are *the variables*, and what is their type.

(b) Use data from this example to illustrate four main types of diagrams used to visualize single variable distributions.

Problem 2. Zambrandlandia Testing.

Majority of graduating seniors in Zambrandlandia high schools take the standardized Zambrandlandia Knowledge Test (ZKT). According to testing authorities the scores are approximately Normally distributed with the mean 600 and the standard deviation 100.

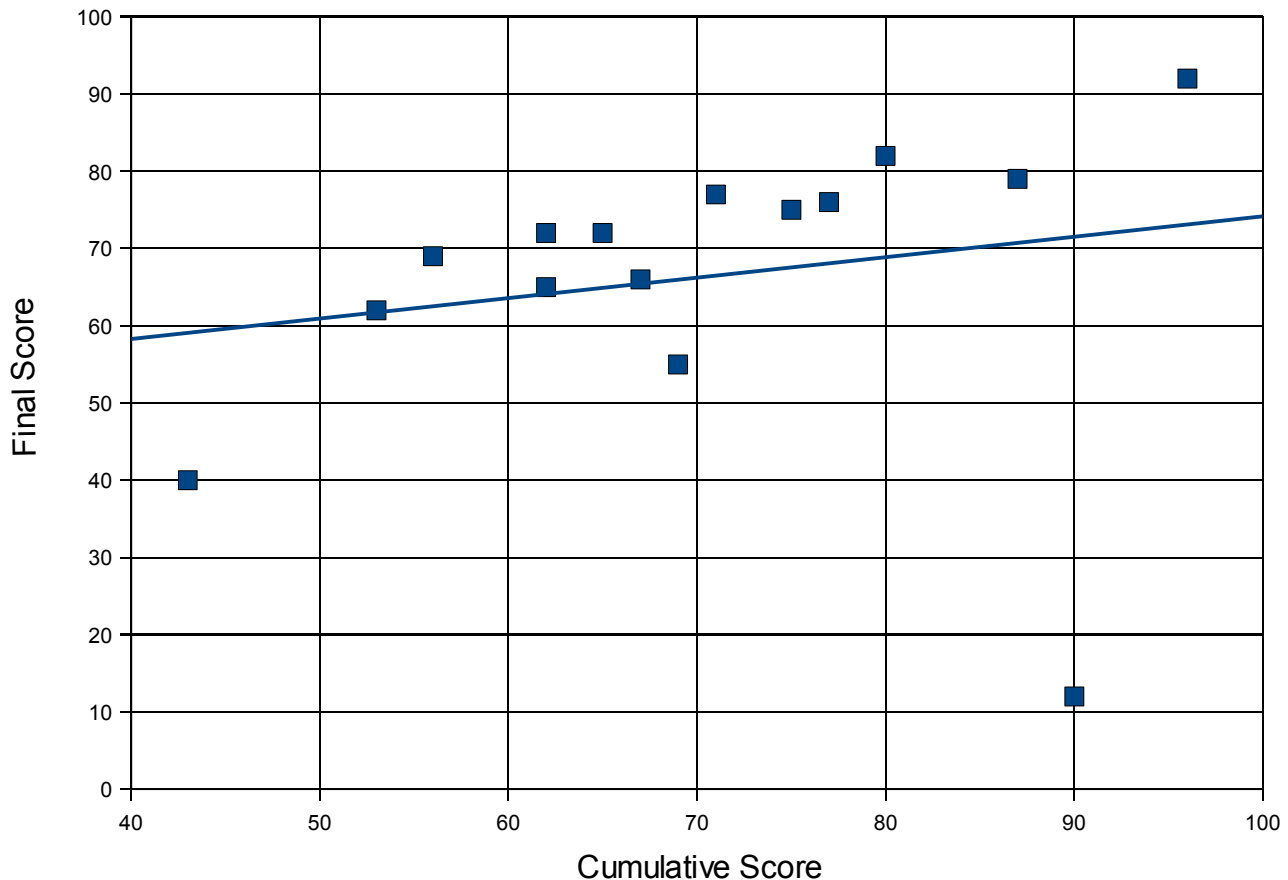
(a) Students who score 700 or more on ZKT are eligible to receive government scholarship to attend a college of their choice. Determine what proportion of those tested qualifies for the stipend?

Recently a computer – based version of the test, ZKT – C has been introduced. According to the authorities, the ZKT – C scores are approximately Normally distributed with the mean 200 and the standard deviation 50. Moreover, it is assumed that ZKT – C ranks the students the same way ZKT does.

(b) The university admission committee reviews applications of two students. Ambrilgo scored 825 on ZKT while Barlindo scored 325 on ZKT – C. Who among the two is better qualified, based on the scores?

Problem 3. Final Exam Score Prediction.

Professor Smith plotted final scores of the students in her statistics class against the cumulative scores prior to the final. The scatterplot, along with the regression line, is shown below.



(a) Mary had a fever on the day of the final and performed very poorly. Identify the corresponding point on the scatterplot. If Mary did not come to the final, what the regression line would look like? (Sketch its approximate location on the plot.)

(b) Jim is a member of the college basketball team. He missed the final because of away game. Prof. Smith offered to assign Jim's score based on regression model prediction. Suppose that Jim's score before the test was 60. What score would the model predict? How would the result be different if Mary did not take the test?

Problem 4. Antibiotics and Influenza.

Jane, a medical graduate student wants to learn whether antibiotics speed up recovery of influenza patients.

(a) For her initial research project Jane obtained access to records of the student health clinic in her University. She studied record of those students who checked – in with flu – like symptoms. Specifically, she compared recovery times of those who were prescribed antibiotics and those who were not. Is this an observational study or an experiment? Explain your reasoning.

(b) Subsequently Jane was cleared to access records of all patients in 10 public health clinics of her state. Assuming that it would be unfeasible to examine records of every patient, explain how Jane should collect the data for her research. Carefully describe the population, the sample, the individuals, and the variables. Suggest possible lurking variables.

(c) With the new flu season approaching Jane obtained funds to recruit students who will turn to the clinic for a research study. Recommend a possible experiment design. Be sure to describe the population, the subjects, and the treatments.

Problem 5. Packaging Charcoal.

Coals R-Us is a small business company producing charcoal. The charcoal is sold in bags labeled as containing 20 lbs of charcoal. In fact, it would be prohibitively expensive to ensure all the bags weigh the same. Therefore the packaging equipment is tuned up in such a way that on average each bag contains 20.2 lbs of charcoal with the standard deviation of .1lbs.

(a) Explain why this practice is fair to the customers. That is, suppose that package weight follows a Normal distribution and estimate the probability that a bag bought by a customer weighs less than the advertised 20 lbs.

(b) Every week the owner randomly selects 100 bags and weighs their content. If their average weight turns out to be either less than 20.19 lbs or more than 20.21 a technician is called to inspect and if necessary tune-up the equipment. Suppose that any variations in package weight are due only to chance, not malfunction. Estimate approximately how often the technician would be called.