NAME _____; Upon placing your signature in this space you are indicating that you have not violated any statute of your respective Honor Codes by completing the following quiz.

MEASUREMENT STATISTICS

Dominey **Due: Sept. 12, 2000** Problem Set 1

1. On a final examination in mathematics, assume that the scores will follow a normal probability distribution with a mean of 75 and a standard deviation of 18. The test is scored on a 10-point scale, so that scores above 90 receive A's, scores between 80 and 90 receive B's, etc. Using *z*-tables, calculate the probability that a given student will receive a letter grade of (a) A (b) B (c) F. **Note**: assume that the test score can assume any value, not just integer values.

2. Measurements of the pH of a buffer solution follow a normal probability distribution with a mean, μ, of 6.5 and a standard deviation, σ, of 0.45. Calculate a *range* of possible pH readings, centered on the mean, that will contain any future pH measurement with a probability of 0.80. [For example, your final answer could be something like "There is a 0.80 probability that a measurement will fall between a pH of 6 and 7".]

3. One of the goals of the use of statistics is to draw general conclusions from your data. These conclusions can have serious consequences, so it is important that you develop good statistical skills. The following is adapted from Marilyn vos Savant's column "Ask Marilyn" in the April 28, 1996, issue of *Parade Magazine*.

   A company decided to expand, so it opened a factory generating 455 jobs. For the 70 white-collar positions, 200 males and 200 females applied. Of the females who applied, 20% were hired, while 15% of the males were hired. Of the 400 males applying for the blue-collar positions, 75% were hired, while 85% of the female applicants were hired.

   A federal Equal Employment Opportunity enforcement official reviewing the hiring practices noted that many more males were hired at the factory than females, so he decided to investigate. The government official produced his own statistics, which showed that a female applying for a job at the factory had a better than 58% chance of being denied employment, while male applicants only had a 45% denial rate. As current law is written, this evidenced a violation.

   (a) *Both sets of figures are correct*; explain (with numbers) how this can be true.

   (b) Pretend that you are an expert witness called to give testimony in this trial due to your well-known expertise in statistics. The judge asks your opinion: do these numbers truly indicate a bias against hiring females? How do you answer? Note that, according to the story in the column, the factory was shut down. Obviously, interpretation of statistics is an important issue!