

Math 8.1, Probability and Statistics
FINAL EXAMINATION
26 May 2005 **Professor John A. Velling**

Show all work and justify your answers. Partial credit will be given, so show work to justify your conclusions. Give all solutions either algebraically or as decimals accurate to three places. The exam is worth 200 points, with each problem worth 25. Good luck and do well.

1. A random sample of 80 motorists showed that 12% had lapsed driver's licenses. Can we be 95% confident that no more than 20% of all motorists have lapsed licenses?
2. A collection of 12 experimental cows was fed a special diet for 3 weeks. The following weight gains (in pounds) were observed: 30, 22, 32, 26, 24, 40, 34, 36, 32, 33, 28, 30.
 - (a) Find the sample mean for the observed weight gain.
 - (b) Find the sample standard deviation for the observed weight gain.
3. Given that X is a random variable having a normal distribution with $\mu = 20$ and $\sigma = 3$, determine
 - (a) $P(X > 25)$, and
 - (b) $P(17 < X < 24)$.
4. Years of data collection have shown that stalk height distribution in corn production is a random variable with normal distribution having $\sigma = 10$ cm. If 80% of all stalks have height greater than 2 meters, what is the mean height?
5. In comparing grape yields from two vineyard fields, a sample of 20 vines from the first field shows that these vines produced on average 625 grapes with a standard deviation of 23, while a sample of 25 vines from the second field shows that these vines produced on average 580 grapes with standard deviation 21. Estimate with 99% confidence the maximum and minimum difference in grape yields from the two fields. Assume that the actual yields from the two fields are random variables with normal distributions.

6. If the average number of customers arriving at a market checkout stand during a 5 minute interval is 10, and if it is assumed that the number of such arrivals is random variable with a Poisson distribution, what is the probability that at least one minutes will go by without any customers arriving?
7. A group of businessmen consists of 40% Democrats and 60% Republicans. We know that 30% of the Democrats smoke cigars and 50% of the Republicans smoke cigars.
 - (a) What is the probability that a cigar smoking businessman from the group is a Republican?
 - (b) What is the probability that a member of the group is not a cigar smoker?
8. In a game of chance, three dice are thrown. If all three dice show the same value, the player wins \$2. If precisely two of the dice show the same value, the player wins \$1. If none of the dice show the same value, the player loses \$1. What is the expected value of this game to the player?