Midterm Examination Number Two
Administered: Wednesday, October 6, 2004

In all relevant problems: WRITE DOWN THE FORMULA YOU USE, BEFORE YOU USE IT.

Problem 1. (10 points)
We are in the business of manufacturing injection-molded plastic fenders to automobile makers. We claim that our fenders will remain intact under head-on impact with a standard concrete pylon up to an average speed of 25 mph with a standard deviation of 3 mph. Our competitor claims that they have developed a new additive to their plastic which allows their bumpers to remain intact under the same conditions up to an average speed of 30 mph with a standard deviation of 5 mph. We want to test their claim. We test 12 fenders, half with our fenders and half with the competition's fenders. From this sample, we find that our bumpers do not fracture until 25.2 mph with a standard deviation of 2.9 mph. From the competition's sample, we find that their bumpers do not fracture until 30.1 mph with a standard deviation of 10 mph.
(a) Find a 98% confidence interval for the difference in the two companies' product's average life-times, assuming the claimed population standard deviations are believable.
(b) Does the claimed average life-time difference fall within this confidence interval?
(c) Find a 98% confidence interval for the difference in the two companies' product's average life-times, assuming the claimed population standard deviations are not believable.
(d) Does the claimed average life-time difference fall within this confidence interval?
(e) Does the test in (c) allow for the possibility that our product has a higher mean than the competition?

Problem 2. (4 points)
In working out a multiple choice test with choices A, B, C & D, we run out of time with 10 questions left. We fill all the remaining questions out with C. If the probability that the correct answer is A, B, C or D is the same and is independent of all other problems, find the following probablilities.
(a) What is the probability that we got 5 of the last 10 questions right?
(b) What is the probability that we got more than 8 of the last 10 questions right?

Problem 3. (4 points)
Driving to school each morning, we encounter 5 traffic lights. Each traffic light stays green for 45 seconds, yellow for 5 seconds, and red for 50 seconds.
(a) Assuming that there is absolutely no synchronization among the streetlights and assuming that we don't run yellow lights, find the probability that in a single morning, we hit 2 green lights, 2 yellow lights, and 1 red lights.
(b) What is the average time spent waiting on lights on a single morning? Assume your arrival time is uniformly distributed among the lights.