MATH 20, SPRING 2011
HOMEWORK #6

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This assignment will be due on Wednesday, May 18 at 12:30 p.m. in the box outside 105 Kemeny. Look for the boxes labeled "Math 20, Spring 2011" and put your assignment in the left ("IN") box.

Remember to show your work. A correct answer with no work shown will receive minimal credit. Your solutions should be detailed enough that any of your classmates could understand them simply by reading them.

(1) (from last week) Please read this question carefully! Suppose that Dartmouth wants to enroll no more than 1100 students in the Class of 2016, and the admissions office wants some information based on previous years' admissions data. Look at the website http://www.dartmouth.edu/admissions/facts/admissions.html. On it, you will find admissions statistics for your class year.
- Use the "Total Admitted" and "Total Enrolled" data *for your class year* to estimate the probability p that an admitted student will accept Dartmouth's offer.

Now assume that the acceptances can be modeled by Bernoulli trials. Given the probability you just calculated and the total number of students admitted *in your year*, what is the probability that Dartmouth would have had too many acceptances in your year? (Keep in mind that the Dartmouth admissions office didn't have access to the p you calculated above when they sent out your letters.)

(2) (Section 9.1, #14, from last week) A restaurant feeds 400 customers per day. On the average, 20 percent of the customers order apple pie.
  (a) Give a range (called a 95% confidence interval) for the number of pieces of apple pie ordered on a given day such that you can be 95% sure that the actual number will fall in this range. (Assume that everyone who orders apple pie orders exactly one piece.)
  (b) How many customers must the restaurant have, on the average, to be at least 95% sure that the number of customers ordering apple pie on that day falls in the 19-21% range?

(3) A biologist wants to estimate ℓ, the life expectancy of a certain type of insect. To do so, he takes a sample of size n and measures the lifetimes from birth to death of each insect. Then he finds the average of these numbers. If he believes that the lifetimes of these insects are independent random variables with variance 1.5 days, how large a sample should he choose to be 98% sure that his average is accurate to within ± 0.2 days according to the Central Limit Theorem?

(4) (Section 9.2, #6) A bank accepts rolls of pennies and gives 50 cents credit to a customer without counting the contents. Assume that a roll contains 49 pennies 30% of the time, 50 pennies 60% of the time, and 51 pennies 10% of the time.

(a) Find the expected value and the variance for the amount that the bank loses on a typical roll.
(b) Estimate the probability that the bank will lose more than 25 cents in 100 rolls.
(c) Estimate the probability that the bank will lose exactly 25 cents in 100 rolls.
(d) Estimate the probability that the bank will lose any money in 100 rolls.
(e) How many rolls does the bank need to collect to have a 99% chance of a net loss?

Suggested problems: Section 9.2: 1, 3, 5, 7, 10-12