

STAT/MA 41600
In-Class Problem Set #41: December 2, 2015

- 1a.** Suppose that, in a certain course, the expected value of a student's grade is 0.80. Even without knowing anything else about the distribution of the grade, find an upper bound on the probability that a student earns 0.95 or higher in the course.
- 1b.** In addition to knowing that the expected value of a student's grade is 0.80, suppose that you also know that the standard deviation of a student's grade is 0.05. Find a bound on the probability that the student's grade is in the range between 0.73 and 0.87.
- 2.** A box of cereal contains, on average, 22oz of cereal inside (and, therefore, this is the amount claimed on the box), with standard deviation of 0.3oz. Use X to denote the amount of cereal in such a box.
- 2a.** Find a bound on the probability that the stated weight is wrong by 0.5oz or more. I.e., find a bound on $P(|X - 22| \geq 0.5)$.
- 2b.** Can you find a bound on the probability that the box of cereal has at least 24oz of cereal?
- 2c.** Without knowing more about the problem, can we definitively use Markov's inequality to give a bound on $P(X > 21)$? Why or why not?
- 3.** An agricultural consultant has determined that the number of bees that should appear at noon in a certain flowerbed, on a randomly chosen day in the summertime, has an expected value of 15 bees, with standard deviation of 3 bees.
- 3a.** Find a bound on the probability that 20 or more bees are present on such a day.
- 3b.** Find a bound on the probability there are between 10 to 20 bees (inclusive) on such a day.
- 4.** The number of customers in a large sandwich restaurant is randomly distributed. Over time, the manager has estimated that the average number of customers at lunchtime is 30, with standard deviation of 5.
- 4a.** Find a bound on the probability that there are between 20 to 40 customers (inclusive) at lunchtime.
- 4b.** Find a bound on the probability that there are at least 40 customers at lunchtime.
- 4c.** Find a bound on the probability that there are at least 50 customers at lunchtime.
- 4d.** Find a bound on the probability that there are at least 60 customers at lunchtime.