

Introduction to Probability—Final Exam
(Take-Home part, due Monday, May 6)

1. Four buses carrying 160 students from the same school arrive at a football stadium. The buses carry, respectively, 20, 30, 50, and 60 students. One of the students is randomly selected. Let X denote the number of students that were on the bus carrying the randomly selected student. One of the 4 bus drivers is also randomly selected. Let Y denote the number of students on her bus.
 - (a) Compute $E[X]$.
 - (b) Compute $E[Y]$.

2. Three coins are to be flipped. The first coin will land on heads with probability 0.3, the second with probability 0.7, and the third with probability 0.6. Assume that the results of the flips are independent, and let X equal the total number of heads that result.
 - (a) Find $P\{X = 1\}$.
 - (b) Determine $E[X]$

3. A sample of 3 items is selected at random from a box containing 25 items of which 5 are defective. Find the expected number of defective items in the sample.

4. A box contains 10 red and 10 blue marbles. Two marbles are withdrawn randomly. If they are the same color, then you win \$5.10; if they are different colors, then you lose \$5.00 (or “win” $-\$5.00$). Calculate
 - (a) the expected value of the amount you win.
 - (b) the variance of the amount you win.

5. On a multiple-choice exam with 5 possible answers for each of the 4 questions, John answered all the questions by guessing.
 - (a) Find the probability that John will get 3 or more correct answers.
 - (b) Find the expected number of questions that he got the correct answers.