Worksheet 7.4 and 8.1

Max's Lecture

MATH 55

July 23, 2019

Exercise A.   1. What is the variance of the random variable X with $X(t) = 1$ if Bernoulli trial is a sucess and and $X(t) = 0$ is the Bernoulli trial is a failure, where p is the probability of success and q is the probability of failure?

2. Use the above to find the variance of the number of successes in scenario 1 of exercise D.

Exercise B. You do 100 bernoulli trials (with the chance of success being 1/2 for each trial). The random variable X records the number of successes. What is the expected value of X? Give an **upper bound** on the probability that $X(s)$ differs from the expected value by at least 25?

(NOTE: the question was phrased incorrectly on the version that I handed out in class, I want an upper bound on the probability, not the actual probability)

Exercise F. ind a recurrence relation for the following counting scenarios:

1. The number of bit strings of length n that have a pair of consecutive zeros.

2. The number of ways to tile an $n \times 2$ board using dominos.

3. C_n, where C_n is the number of ways to parenthesize the product of $n + 1$ numbers, $x_0, x_1, \ldots x_n$, to specify the order of multiplication. For example, $C_3 = 5$ because we can write: $((x_0 \cdot x_1) \cdot x_2) \cdot x_3$, $\quad (x_0 \cdot (x_1 \cdot x_2)) \cdot x_3$, $\quad (x_0 \cdot x_1) \cdot (x_2 \cdot x_3)$, $x_0 \cdot ((x_1 \cdot x_2) \cdot x_3)$, and $x_0 \cdot (x_1 \cdot (x_2 \cdot x_3))$