

SAAS CX Homework 5

GILBERT FENG AND JADE PAN

Spring 2022

Problem 0.1. Suppose we have a set of $n = 5$ items, (let's label them A , B , C , D , and E) and would like to choose $k = 3$ items.

1. How many ways can we select 3 items from the set, if order matters (e.g., selecting (A, B, C) and (B, A, C) in those respective orders should be counted as distinct)?
2. How many ways can we select 3 items from the set, if order doesn't matter (now, (A, B, C) and (B, A, C) should be counted for only once)?
3. Extend the above two parts for general n and k .

Problem 0.2. Suppose we flip 4 coins.

1. What is the probability we get exactly one head?
2. What is the probability we get exactly one head, or exactly one tail?
3. What is the probability we get at least one head?
4. What is the probability we get at least one head, or at least one tail?

Problem 0.3. Select a number uniformly at random from the integers between 0 and 999, inclusive. What is the probability this number has a digit equal to 9?

Problem 0.4. We are trying to forecast the weather. On days when it rains, we forecast that it rains correctly with 80% probability. On sunny days, we forecast that it is sunny properly with 90% probability. If it is sunny on 60% of days, then what is the probability our forecast is correct on an arbitrary day?

Problem 0.5. Let's flip 8 pennies, 4 nickels, 6 dimes and 1 quarter. Let X be the amount of money that lands heads facing up.

1. Compute the mean $\mu = \mathbb{E}[X]$.
2. Compute the standard deviation $\sigma = \sqrt{\text{Var}(X)}$.
3. If we make the rough approximation of X as a Gaussian $\mathbb{N}(\mu, \sigma^2)$, compute the interval centered at μ in which we would expect X to fall within 95% of the time. This is known as the 95%-confidence interval.