

Ma 3b Practical – Recitation 1

February 27, 2025

Exercise 1. How many ways to order n distinct elements? Given 10 black, 20 white balls, how many ordering do they have?

Exercise 2. Suppose there are 10 black and 20 white balls in a box.

1. Randomly take 5 balls out of the box without replacement, then what is the probability that 2 are black and 3 are white?
2. Now we consider drawing with replacement. What is the probability in this case?

Exercise 3. Draw 10 cards from 52 cards without replacement. What is the probability that the second A appears at the 10th place?

Exercise 4. (Optional*) How many friends do you need to expect having a birthday party every day? The answer is at least 2365. We will see later in the recitation 3 that this can be calculated by linearity of expectation

$$E(x_1 + x_2) = E(x_1) + E(x_2)$$

Exercise 5. (Optional*)

1. Randomly put 2 different points in a two different urns (S^0), what is the probability that the two points fall into the same urn?
2. Randomly put 3 different points on a circle (S^1), then what is the probability that they will fall on the same half of circle? How about 4 points? How about n points?
3. Randomly put 4 different points on a sphere (S^2), then what is the probability that they will fall on the same hemisphere?¹

¹ Interested students may find an intuitive explanation on YouTube, 3Blue1Brown: "The hardest problem on the hardest test"