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1 Probability Basics

1.1 Social Groups

Suppose there is a group of 5 people and every pair of them is equally likely to be friends or non-friends. Find the probability of the event that there are at least three people who are mutual friends.

1.2 Counting Cards

I have 10 red and 10 blue cards. I shuffle the cards (all possibilities equally likely) and then label the cards based on their orders: I write the number one on the first card, the number two on the second card, and so on. What is the probability that

a.) All red cards are assigned numbers less than or equal to 15? **(2)**

b.) Exactly 8 red cards are assigned numbers less than or equal to 15? **(1.5)**

c.) Exactly 5 red cards are assigned numbers greater than 12 and exactly 4 green cards are assigned numbers less than 7. **(1.5)**

1.3 Random Particle

Suppose you have a particle on a 2D plane starting at the origin $(0, 0)$. After every second its position changes either in the x-coordinate or in the y-coordinate by exactly 1 (change cannot happen in both together). All the four possibilities are equally likely. What is the probability that the particle comes back to the origin in 6 secs? What is the probability that the particle comes back to the origin in 8 secs by remaining only in the first quadrant (ie $x, y \geq 0$ for all time)?