

1. Rolling Dice

Say I have a standard 6-sided dice. I generate a sequence of 5 numbers by tossing this dice 5 times, and writing down the result after each toss.

- (a) How many possible distinct sequences of 5 numbers can I generate this way?
- (b) True or False: In the above procedure, the sequence of numbers 6,6,6,6,6 is less likely to come up than the sequence 6,5,6,6,5.
- (c) True or False: In the above procedure, the sequence of numbers 6,6,6,6,6 is less likely to come up than some sequence of the form x_1, x_2, x_3, x_4, x_5 , where each $x_i \in \{5, 6\}$.
- (d) How many sequences generated by the procedure above have the form 6,6,6,6,6?
- (e) How many sequences generated by the procedure above are of the form x_1, x_2, x_3, x_4, x_5 , where each $x_i \in \{5, 6\}$?
- (f) What is the probability of my generating the sequence 6,6,6,6,6?
- (g) What is the probability of my generating the sequence 6,5,6,6,5?
- (h) What is the probability of my generating a sequence of the form x_1, x_2, x_3, x_4, x_5 , where each $x_i \in \{5, 6\}$?

2. Socks, Socks, and More Socks

Suppose that my 5 friends are roommates, and that they also share a sock drawer. In this sock drawer they have 10 pairs of socks. Each pair of socks is a different color, but it is folded together so that no roommate is ever wearing two different colors of socks.

- (a) How many distinct roommate-sock combinations are there?

- (b) Each day, the roommates record the combination of sock colors that they are all wearing in a special scrapbook. How many such combinations are possible?

- (c) Assuming that the roommates randomly choose their socks each morning, what is the probability that the red, teal, orange, pink, and magenta socks are all worn by the roommates on a specific day?

- (d) Say that one roommate decides he likes the pink, red, and teal socks more than all of the rest, and decides to jealously hoard them so that no one else can ever wear them (but he can still also wear the other 7 colors of socks). Now, how many distinct roommate-sock combinations are there?

- (e) The other roommates grow frustrated with the hoarding roommate and tell him that if he does not return the pink, red, and teal socks, then he is not allowed to wear the other colors of socks. The hoarding roommate does not relent. Now, how many distinct roommate-sock combinations are there?

- (f) How many color combinations of socks are now possible in the scrapbook?