

Problem 1. Bridge

A bridge hand consists of 13 cards from a standard 52 card deck.

- a) How many bridge hands contain exactly five spades?
- b) How many bridge hands contain all 4 aces?
- c) How many bridge hands contain exactly 5 spades and all 4 aces?
- d) How many bridge hands contain either 4 aces or 5 spades (or both)?

Problem 2. Crooked dice For this problem, please evaluate all

answers numerically. A gambler has two dice in his pocket. One is fair, and the other is weighted to give a “6” 50% of the time.

- a) If he rolls the fair die 5 times, what is the probability of his getting a “6” exactly twice? If he rolls the weighted die 5 times, what is the probability of getting a “6” exactly twice.
- b) The gambler randomly selects a die (50-50 chance of each die being chosen) and rolls it 5 times. What is the probability that he gets a “6” exactly twice.
- c) If the gambler picks a die at random, rolls it 5 times, and gets a “6” twice, what is the probability that he was rolling the weighted die?

Problem 3. Urns

Two identical urns are filled with balls. One urn has 30 black balls and 20 white balls. The other urn has 2 black balls and 8 white balls.

- a) An urn is picked at random, and then a ball is drawn (at random) from that urn. What is the probability that the ball is black?
- b) An urn is picked at random, and then four balls are drawn from that urn, without replacement. What is the probability that exactly two of the four balls are black?
- c) An urn is picked at random, and then four balls are drawn from that urn, WITH replacement. (That is, a ball is drawn and thrown back in, then another ball is drawn and thrown back in, etc.) What is the probability that exactly two of the four balls are black?

Problem 4. Political grab bag

- a) How many words (nonsense or real) can be made by rearranging the letters of the word GERRYMANDER? How many begin and end with the letter R? How many begin with the letters DEM?
- b) A government official is supposed to award 5 defense contracts. There are three companies competing for these contracts. If the contracts are all different, in how many ways can the contracts be awarded? If the contracts are all the same (so all a company cares about is how MANY contracts it gets), how many ways are there of awarding contracts?