

## SDS 321 Worksheet 2

1. Bob has a peculiar pair of four-sided dice. When he rolls the dice, the probability of any particular outcome is proportional to the sum of the results of each die. All outcomes that result in a particular sum are equally likely.
  - a. What is the probability of the sum being even?
  - b. What is the probability of Bob rolling a 2 and a 3, in any order?
2. Two dice are rolled, find the probability that the sum is  $\leq 1$   $\geq 1$   $\leq 4$   $\geq 4$   $\leq 13$   $\geq 13$
3. Prove: Bonferoni's inequality,  $P(E \cap F) \geq P(E) + P(F) - 1$
4. In a class of 30 students, there are 17 girls and 13 boys. Five are A students, and three of these students are girls. If a student is chosen at random, what is the probability of choosing a girl or an A student?
5. The probability that a randomly-selected U.S. household owns a pet is 0.39. Given that a household owns a pet, the probability that it owns a dog is 0.67 and the probability that it owns a cat is 0.24.
  - a) Given that a household owns a pet, what is the probability that the pet is not a cat or dog?
  - b) What is the probability that a household randomly selected from among all U.S. households owns a pet and it is a cat?
  - c) What is the probability that a household randomly selected from among all U.S. households owns a pet and it is a dog?
6. Two cards are randomly selected from a set of regular playing cards.
  - a) What is the probability that both cards are queens?
  - b) What is the probability that the second card is a queen given the first was a queen?
  - c) What is the probability that the second card is a queen?
7. A seed randomly blows around a complex habitat. It may land on any of three different soil types: a high-quality soil that gives a 0.8 chance of seed survival, a medium-quality soil that gives a 0.3 chance of survival, and a low-quality soil that gives only a 0.1 chance of survival. These three soil types (high, medium, and low) are present in the habitat in proportions of 30:20:50, respectively. The probability that a seed lands on a particular soil type is proportional to the frequency of that type in the habitat. Draw the probability tree.
  - a) What is the probability that the seed lands in a low-quality habitat and survives?
  - b) What is the probability of survival of the seed, assuming it lands?
  - c) If you know that a seed survived, what is the probability that it landed in a low-quality environment?