

# Probabily Homework

Michael Padilla

June 11, 2024

## Exercises for Section 5.1

1. A card is randomly selected from a deck of 52 cards. What is the chance that the card is red or a king?  
 $|S| = 52$ , red = 26, kings = 4,  $|E| = 28$   
 $P(E) = \frac{28}{52}$
- 5 Toss a dice 5 times in a row. What is the probability that you will get the same number on each roll?  
 $|S| = 6x6x6x6x6 = 6^5$ ,  $|E| = \{all1, all2, all3, all4, all5, all6\} = 6$   $p(E) = \frac{6}{6^5}$
- 7 You have a pair of dice, a white one and a black one. Toss them both. What is the probability that they show the same number?  
 $|S| = 6x6$ ,  $|E| = \{11, 22, 33, 44, 55, 66\} = 6$   
 $p(E) = \frac{6}{6x6}$
- 11 Toss a coin 8 times. Find the probability that the first and last tosses are heads.  
 $|S| = 2^8$ ,  $|E| = 1x2x2x2x2x2x2x1 = 1^2x2^6$   
 $P(E) = \frac{2^6}{2^8}$
- 13 Five cards are dealt from a shuffled 52-card deck. What is the probability of getting three red cards and two clubs?  
 $|S| = C_{52}^5$ ,  $|E| = C_{26}^3xC_{13}^2$   
 $P(E) = \frac{C_{26}^3xC_{13}^2}{C_{52}^5}$
- 15 Alice and Bob each randomly pick an integer from 0 to 9.  $|S| = 10x10$ 
  - What is the probability that they pick the same number?  
 $|E| = 10$ ,  $P(E) = \frac{10}{10x10}$
  - What is the probability that they pick different numbers?  
 $|E^c| = 100 - 10 = 90$ ,  $P(E^c) = \frac{90}{10x10}$

## Exercises for Section 5.2

1. A card is taken off the top of a shuffled 52-card deck. What is the probability that it is black or an ace?  
 $|S| = 52$ ,  $p(black) = \frac{26}{52}$ ,  $p(ace) = \frac{4}{52}$ ,  $p(A \cap B) = \frac{2}{52}$   
 $p(A \cup B) = 4/52 + 26/52 - 2/52 = \frac{28}{52}$
- 3 What is the probability that a 5-card hand dealt off a shuffled 52-card deck contains at least one red card?  
 $|S| = C_{52}^5$ ,  $|E| = C_{26}^5$ ,  $p(E^c) = 1 - \frac{C_{26}^5}{C_{52}^5}$
- 7 Two cards are dealt off a shuffled 52-card deck. What is the probability that the cards are both red or both aces?  
 $|S| = C_{52}^2$ ,  $|A| = C_{26}^2$ ,  $|B| = C_4^2$ ,  $|A \cap B| = 1$   
 $p(A \cup B) = \frac{C_4^2}{C_{52}^2} + \frac{C_{26}^2}{C_{52}^2} - \frac{1}{C_{52}^2}$
- 11 A dice is rolled 5 times. Find the probability that not all of the tosses are even.  
 $|S| = 5^5$ ,  $|E| = 3^5$ ,  $|E^c| = 5^5 - 3^5$   
 $p(E^c) = \frac{5^5 - 3^5}{5^5}$
- 17 In a shuffled 52-card deck, what is the probability that neither the top nor bottom card is a heart?  
 $|S| = 52x51$ ,  $|E| = 39x38$   
 $p(E) = \frac{39x38}{52x51}$

## Exercises for Section 5.3

- 2 A box contains six tickets: A A B B B E . You remove two tickets, one after the other. What is the probability that both tickets are vowels?  
 $|S| = 6x5$ ,  $|E| = 3x2$ ,  $p(E) = \frac{3x2}{6x5}$
- 4 A card is drawn off a 52-card deck. Let A be the event “The card is a heart.” Let B be the event “The card is a queen.” Are these two events independent or dependent?  
 $|S| = 52$ ,  $p(A) = 13/52 = 1/4$ ,  $p(B) = 4/52 = 1/13$ ,  $p(A|B) = 1/4$ ,  $p(B|A) = 1/13$   
**They’re independent**
- 7 Say A and B are events with  $P(A) = 2/3$ ,  $P(A|B) = 3/4$ , and  $P(B|A) = 1/2$ . Find  $p(B)$ .  
 $p(A) \cdot p(B|A) = p(A \cap B) = p(B) \cdot p(A|B)$   
 $2/3 \cdot 1/2 = p(B) \cdot 1/4$   
 $p(B) = \frac{4}{9}$
- 9 A box contains 2 red balls, 3 black balls, and 4 white balls. One is removed, and then another is removed. What is the probability that no black balls were drawn?  
 $|S| = 9x8$ ,  $|E| = 6x5$ ,  $p(E) = \frac{6x5}{9x8}$
- 11 A coin is flipped 5 times, and there are more tails than heads. What is the probability that the first flip was a tail?  
 $|S| = 2^5 = 32$ ,  $A = \text{more tails}$ ,  $B = \text{first tail}$ ,  $p(B|A) = p(A \cap B)/p(A)$   
 $|A \cap B| = C_4^2 + C_4^3 + C_4^4 = 11$ ,  $|A| = C_5^3 + C_5^4 + C_5^5 = 16$   
 $p(B|A) = \frac{11}{16}$

## Exercises for Section 5.5

1. fff
2. fff
3. fff