

Section 7.1 homework

Note: Use the formula $p(E) = |E|/|S|$ for all problems below. (See Definition 1 on page 446 of the textbook.)

1. What's the probability that a card selected at random from a deck of cards is ...
 - (a) an ace? $= 4/52 = 1/13$
 - (b) a heart? $= 13/52 = 1/4$
 - (c) an ace or a heart? $A \cup H = A + H - A \cap H = 1/13 + 1/4 - 1/52 = (4+13-1)/52 = 16/52 = 4/13$
2. A pair of dice is tossed. What's the probability that the sum on the dice is a multiple of 4? $p(4)+p(8)+p(12)$
 $|S| = \{1, 2, 3, \dots, 12\} = 12, |E| = \{4, 8, 12\} = 3 \Rightarrow p = 3/12 = 1/4$
3. Suppose a class contains five women and six men (including Bob). **Total = 11 people**
 - (a) What's the probability that a person selected at random is a woman?
 - (b) A group of four people is selected at random. What's the probability that ...
 - i. ... the group contains an equal number of men and women?
 - ii. ... the group contains at least one woman?
 - iii. ... Bob is in the group?
4. A coin is tossed six times. $|S|=2^6=64$
 - (a) What's the probability that heads occurs an equal number of times as tails in the sequence of flips?
 - (b) What's the probability that heads occurs more times than tails in the sequence of flips?
5. An urn contains 7 blue marbles (labeled $1, 2, \dots, 7$) and 5 red marbles (labeled A, B, C, D, E). Suppose that three marbles are selected at random, one at a time, without replacement.
 - (a) What's the probability exactly two of the marbles are blue?
 - (b) What's the probability that one of the marbles is the red "C" marble?

Note: "Without replacement" means that the marbles aren't put back into the urn after being selected. That is, after the first marble is removed, the second marble is picked from the remaining 11 marbles. After that, the third marble is picked from the remaining 10 marbles.

3.
 - (a) $|S| = 11, |E| = 5 \Rightarrow p(E) = 5/11$
 - (b)
 - i. $|S|=C(11,4); E:(2 \text{ men} + 2 \text{ women}) \Rightarrow |E| = C(6,2) * C(5,2) = 150$
 $\Rightarrow p(E) = 150/330 = 5/11$
 - ii. $|E| = |(1 \text{ woman})| + |(2 \text{ women})| + |(3 \text{ women})| + |(4 \text{ women})|$
 $C(5,1)*C(6,3)+C(5,2)*C(6,2)+C(5,3)*C(6,1)+C(5,4)*C(6,0)/330 = 21/22$
4.
 - (a) $|E|=C(6,3)=20 \Rightarrow p(E) = 20/64 = 5/16$
 - (b) $|0 \text{ tail}| + |1 \text{ tail}| + |2 \text{ tails}| = 1 + C(6,1) + C(6,2) = 22 \Rightarrow p(E) = 22/64 = 11/32$

Answers

1. (a) $1/13$
(b) $1/4$
(c) $4/13$
2. $1/4$
3. (a) $5/11$
(b) i. $5/11$
ii. $21/22$
iii. $4/11$
4. (a) $5/16$
(b) $11/32$
5. (a) $21/44$
(b) $1/4$