

1. A box contains 3 marbles, 1 red, 1 green, and 1 blue. Consider an experiment that consists of taking 1 marble from the box, then replacing it in the box and drawing a second marble from the box. Describe the sample space. Repeat when the second marble is drawn without first replacing the first marble.
2. A die is rolled continually until a 6 appears, at which point the experiment stops. What is the sample space of this experiment? Let E_n denote the event that n rolls are necessary to complete the experiment. What points of the sample space are contained in E_n ? What is $\left(\bigcup_1^{\infty} E_n\right)^c$?
9. A retail establishment accepts either the American Express or the VISA credit card. A total of 24 percent of its customers carry an American Express card, 61 percent carry a VISA card, and 11 percent carry both. What percentage of its customers carry a credit card that the establishment will accept?
15. If it is assumed that all $\binom{52}{5}$ poker hands are equally likely, what is the probability of being dealt
 - (a) a flush? (A hand is said to be a flush if all 5 cards are of the same suit.)
 - (b) one pair? (This occurs when the cards have denominations a, a, b, c, d , where a, b, c , and d are all distinct.)
 - (c) two pairs? (This occurs when the cards have denominations a, a, b, b, c , where a, b , and c are all distinct.)
 - (d) three of a kind? (This occurs when the cards have denominations a, a, a, b, c , where a, b , and c are all distinct.)
 - (e) four of a kind? (This occurs when the cards have denominations a, a, a, a, b .)
16. Poker dice is played by simultaneously rolling 5 dice. Show that
 - (a) $P\{\text{no two alike}\} = .0926$;
 - (b) $P\{\text{one pair}\} = .4630$;
 - (c) $P\{\text{two pair}\} = .2315$;
 - (d) $P\{\text{three alike}\} = .1543$;
 - (e) $P\{\text{full house}\} = .0386$;
 - (f) $P\{\text{four alike}\} = .0193$;
 - (g) $P\{\text{five alike}\} = .0008$.
20. Suppose that you are playing blackjack against a dealer. In a freshly shuffled deck, what is the probability that neither you nor the dealer is dealt a blackjack?
24. If two dice are rolled, what is the probability that the sum of the upturned faces equals i ? Find it for $i = 2, 3, \dots, 11, 12$.
26. The game of craps is played as follows: A player rolls two dice. If the sum of the dice is either a 2, 3, or 12, the player loses; if the sum is either a 7 or an 11, he or she wins. If the outcome is anything else, the player continues to roll the dice until he or she rolls either the initial outcome or a 7. If the 7 comes first, the player loses; whereas if the initial outcome reoccurs before the 7, the player wins. Compute the probability of a player winning at craps.
 Hint: Let E_i denote the event that the initial outcome is i and the player wins. The desired probability is $\sum_{i=2}^{12} P(E_i)$. To compute $P(E_i)$, define the events $E_{i,n}$ to be the event that the initial sum is i and the player wins on the n th roll. Argue that $P(E_i) = \sum_{n=1}^{\infty} P(E_{i,n})$.

50. In a hand of bridge, find the probability that you have 5 spades and your partner has the remaining 8.

54. Compute the probability that a bridge hand is void in at least one suit. Note that the answer is not

$$\frac{\binom{4}{1} \binom{39}{13}}{\binom{52}{13}}$$