

## Examples

1. Success probability of some task is  $1/100$ . What is the probability of at least one success out of 100 trials ? (combination of the multiplication principle and the complement principle)  $(1 - (99/100)^{100})$
2. **Pennsylvania lottery:** Choose 7 numbers from 1 through 80. The state chooses 11, randomly. You win if all 7 of your numbers are among the state's 11. What are your chances of winning? (The state can pick the 11 numbers in  $\binom{80}{11}$  ways so there are  $\binom{11}{7}$  possible winning choices of 7 numbers. There are  $\binom{80}{7}$  overall choices, so your chances of winning are  $\binom{11}{7}/\binom{80}{7}$  )
3. **Card problems:** We pick 5 cards at random from a standard deck of 52 playing cards. There are thirteen values, from 2 to 10, and then J, K, Q, and A. Each value has four cards, one each of Spades, Hearts, Clubs, and Diamonds.
  - (a) What is the probability that you will get four cards of the same value?  $(13 \cdot \binom{4}{4}) / \binom{52}{5}$
  - (b) What is the probability that you will get three cards of one value and two of another value?  $(13 \cdot 12 \cdot \binom{4}{2} \binom{4}{3}) / \binom{52}{5}$
  - (c) What is the probability that you will get three cards of one value, but not have one of the combinations in (a) and (b)?  $(13 \cdot \binom{4}{3} \binom{48}{1} \binom{44}{1}) / \binom{52}{5}$