Example 1: You are taking a multiple-choice test that has ten questions. Each of the questions has four answer choices, with one correct answer per question. If you select one of these four choices for each question and leave nothing blank, in how many ways can you answer the questions? Ans: 4^{10}

Example 2: Telephone numbers in the United States begin with three- digit area codes followed by seven-digit local telephone numbers. Area codes and local telephone numbers cannot begin with 0 or 1. How many different telephone numbers are possible?

Example 3: You and 19 of your friends have decided to form a business. The group needs to choose three officers– a CEO, an operating manager, and a treasurer. In how many ways can those offices be filled?

Example 4: How many three-person committees could be formed from 8 people?

Example 5: In December, 2011, the U.S Senate consisted of 51 Democrats and 47 Republicans and 2 Independents. How many distinct five-person committees can be formed if each committee must have 3 Democrats and 2 Republicans?

Example 6: Probability and Combinations: Winning the Lottery:
Powerball is a multi-state lottery played in most U.S. states. It is the first lottery game to randomly draw numbers from two drums. The game is set up so that each player chooses five different numbers from 1 to 59 and one Powerball number from 1 to 35. Twice per week 5 white balls are drawn randomly from a drum with 59 white balls, numbered 1 to 59, and then one red Powerball is drawn randomly from a drum with 35 red balls, numbered 1 to 35. A player wins the jackpot by matching all five numbers drawn from the white balls in any order and matching the number on the red Powerball. With one $2 Powerball ticket, what is the probability of winning the jackpot?

Example 7: A club consists of five men and seven women. Three members are selected at random to attend a conference. Find the probability that the selected group consists of 3 men.

Example 8: If you are dealt one card from a standard 52-card deck, find the probability that you are not dealt a queen.

Example 9 : If one card is randomly selected from a deck of cards, what is the probability of selecting a king or a queen?

Example 10: You roll a single, six-sided die. Find the odds in favor of rolling a 2

Example 11: The odds in favor of a particular horse winning a race are 2 to 5. What is the probability this horse will win the race?

Example 12: A U.S. roulette wheel has 38 numbered slots (1 through 36, 0, and 00). 18 are black, 18 are red, and 2 are green. The ball can land on any slot with equal probability. What is the probability of red occurring on 2 consecutive plays?

Example 13: If the probability that South Florida will be hit by a hurricane in any single year is 5/19. What is the probability that South Florida will be hit by a hurricane in three consecutive years?

Example 14: Three people are randomly selected, one person at a time, from 5 freshmen, 2 sophomores, and 4 juniors. Find the probability that the first two people selected are freshmen and the third is a junior.

Example 15: A letter is randomly selected from the letters of the English alphabet. Find the probability of selecting a vowel, given that the outcome is a letter that precedes h.

Example 16: Mammography Screening on 100,000 U.S. Women, Ages 40 to 50	Breast Cancer	No Breast Cancer	Total
Positive Mammogram	720	6,944	7,664
Negative Mammogram	80	92,256	92,336
Total	800	99,200	100,000

Assuming that these numbers are representative of all U.S. women age 40 to 50, find the probability that a woman in this age range has a positive mammogram, given that she does not have breast cancer.