b. What is the probability of randomly selecting the card's position and finding that it is incorrectly inserted on the first attempt, but it is correctly inserted on the second attempt?

c. How many random selections are required to be absolutely sure that the card works because it is inserted correctly?

31. DNA Nucleotides DNA (deoxyribonucleic acid) is made of nucleotides. Each nucleotide can contain any one of these nitrogenous bases: A (adenine), G (guanine), C (cytosine), T (thymine). If one of those four bases (A, G, C, T) must be selected three times to form a linear triplet, how many different triplets are possible? All four bases can be selected for each of the three components of the triplet.

32. World Cup Soccer Tournament Every four years, 32 soccer teams compete in a world tournament.

a. How many games are required to get one championship team from the field of 32 teams?

b. If you make random guesses for each game of the tournament, find the probability of picking the winner in every game.

33. Powerball As of this writing, the Powerball lottery is run in 42 states. Winning the jackpot requires that you select the correct five numbers between 1 and 59 and, in a separate drawing, you must also select the correct single number between 1 and 39. Find the probability of winning the jackpot.

34. Mega Millions As of this writing, the Mega Millions lottery is run in 42 states. Winning the jackpot requires that you select the correct five numbers between 1 and 56 and, in a separate drawing, you must also select the correct single number between 1 and 46. Find the probability of winning the jackpot.

35. Designing Experiment Clinical trials of Nasonex involved a group given placebos and another group given treatments of Nasonex. Assume that a preliminary phase I trial is to be conducted with 10 subjects, including 5 men and 5 women. If 5 of the 10 subjects are randomly selected for the treatment group, find the probability of getting 5 subjects of the same sex. Would there be a problem with having members of the treatment group all of the same sex?

36. Area Codes *USA Today* reporter Paul Wiseman described the old rules for the three-digit telephone area codes by writing about "possible area codes with 1 or 0 in the second digit. (Excluded: codes ending in 00 or 11, for toll-free calls, emergency services, and other special uses.)" Codes beginning with 0 or 1 should also be excluded. How many different area codes were possible under these old rules?

4-6 Beyond the Basics

37. Computer Variable Names A common computer programming rule is that names of variables must be between one and eight characters long. The first character can be any of the 26 letters, while successive characters can be any of the 26 letters or any of the 10 digits. For example, allowable variable names are A, BBB, and M3477K. How many different variable names are possible?

38. Handshakes

a. Five managers gather for a meeting. If each manager shakes hands with each other manager exactly once, what is the total number of handshakes?

b. If n managers shake hands with each other exactly once, what is the total number of handshakes?

c. How many different ways can five managers be seated at a round table? (Assume that if everyone moves to the right, the seating arrangement is the same.)

d. How many different ways can n managers be seated at a round table?