**37. Nielsen Rating** CBS televised a recent Super Bowl football game between the New Orleans Saints and the Indianapolis Colts. That game received a rating of 45, indicating that among all U.S. households, 45% were tuned to the game (based on data from Nielsen Media Research). An advertiser wants to obtain a second opinion by conducting its own survey, and a pilot survey begins with 12 randomly selected households.

**a.** Find the probability that none of the households is tuned to the Saints/Colts game.

**b.** Find the probability that at least one household is tuned to the Saints/Colts game.

**c.** Find the probability that at most one household is tuned to the Saints/Colts game.

**d.** If at most one household is tuned to the Saints/Colts game, does it appear that the 45 share value is wrong? Why or why not?

**38. Overbooking Flights** When someone buys a ticket for an airline flight, there is a 0.0995 probability that the person will not show up for the flight (based on data from an IBM research paper by Lawrence, Hong, and Cherrier). The Beechcraft 1900C jet can seat 19 passengers. Is it wise to book 21 passengers for a flight on the Beechcraft 1900C? Explain.

**39. XSORT Method of Gender Selection** When testing a method of gender selection, we assume that the rate of female births is 50%, and we reject that assumption if we get results that are unusual in the sense that they are very unlikely to occur with the 50% rate. In a preliminary test of the XSORT method of gender selection, 14 births included 13 girls.

**a.** Assuming a 50% rate of female births, find the probability that in 14 births, the number of girls is 13.

**b.** Assuming a 50% rate of female births, find the probability that in 14 births, the number of girls is 14.

**c.** Assuming a 50% rate of female births, find the probability that in 14 births, the number of girls is 13 or more.

**d.** Do these preliminary results suggest that the XSORT method is effective in increasing the likelihood of a baby being a girl? Explain.

**40. Challenged Calls in Tennis** In a recent U.S. Open tennis tournament, among 20 of the calls challenged by players, 8 were overturned after a review using the Hawk-Eye electronic system. Assume that when players challenge calls, they are successful in having them overturned 50% of the time.

**a.** Find the probability that among 20 challenges, exactly 8 are successfully overturned.

**b.** The probability that among 20 challenges, 8 or fewer are overturned is 0.252. Does this result suggest that the success rate is less than 50%? Why or why not?

**Composite Sampling.** ***Exercises 41 and 42 involve the method of composite sampling, whereby a medical testing laboratory saves time and money by combining blood samples for tests so that only one test is conducted for several people. A combined sample tests positive if at least one person has the disease. If a combined sample tests positive, then individual blood tests are used to identify the individual with the disease.***

**41. HIV** The probability of a randomly selected adult in the United States being infected with the human immunodeficiency virus (HIV) is 0.006 (based on data from the Kaiser Family Foundation). In tests for HIV, blood samples from 24 people are combined. What is the probability that the combined sample tests positive for HIV? Is it unlikely for such a combined sample to test positive?

**42. STD** Based on data from the Centers for Disease Control, the probability of a randomly selected person having gonorrhea is 0.00114. In tests for gonorrhea, blood samples from