## Exercises

**1** Let $S_{100}$ be the number of heads that turn up in 100 tosses of a fair coin. Use the Central Limit Theorem to estimate

   (a) $P(S_{100} \leq 45)$.

   (b) $P(45 < S_{100} < 55)$.

   (c) $P(S_{100} > 63)$.

   (d) $P(S_{100} < 57)$.

**2** Let $S_{200}$ be the number of heads that turn up in 200 tosses of a fair coin. Estimate

   (a) $P(S_{200} = 100)$.

   (b) $P(S_{200} = 90)$.

   (c) $P(S_{200} = 80)$.

**3** A true-false examination has 48 questions. June has probability 3/4 of answering a question correctly. April just guesses on each question. A passing score is 30 or more correct answers. Compare the probability that June passes the exam with the probability that April passes it.

**4** Let $S$ be the number of heads in 1,000,000 tosses of a fair coin. Use (a) Chebyshev's inequality, and (b) the Central Limit Theorem, to estimate the probability that $S$ lies between 499,500 and 500,500. Use the same two methods to estimate the probability that $S$ lies between 499,000 and 501,000, and the probability that $S$ lies between 498,500 and 501,500.

**5** A rookie is brought to a baseball club on the assumption that he will have a .300 batting average. (Batting average is the ratio of the number of hits to the number of times at bat.) In the first year, he comes to bat 300 times and his batting average is .267. Assume that his at bats can be considered Bernoulli trials with probability .3 for success. Could such a low average be considered just bad luck or should he be sent back to the minor leagues? Comment on the assumption of Bernoulli trials in this situation.

**6** Once upon a time, there were two railway trains competing for the passenger traffic of 1000 people leaving from Chicago at the same hour and going to Los Angeles. Assume that passengers are equally likely to choose each train. How many seats must a train have to assure a probability of .99 or better of having a seat for each passenger?

**7** Assume that, as in Example 9.3, Dartmouth admits 1750 students. What is the probability of too many acceptances?

**8** A club serves dinner to members only. They are seated at 12-seat tables. The manager observes over a long period of time that 95 percent of the time there are between six and nine full tables of members, and the remainder of the