

**Part One:** *Quick and Easy...*

1. If you draw a random card from a standard deck of cards, what is the probability that it is either a face card or black suited?
2. If you roll two standard dice, what is the probability that either the sum is seven or both numbers are odd?
3. A couple plans to have six children. What is the probability that the couple will have at least one boy?
4. If roll a standard die five times, what is the probability that all the rolls will be even? What is the probability that at least one of the rolls will be odd?
5. It is known in a certain country that 20% of mothers use spanking as a method of disciplining their children. Eighty-five percent of the mothers that spank their children use valium, while 25% of mothers that don't use spanking use valium. Does this data suggest that valium causes mothers to spank their children? Explain.

**Part Two:** *Not So Quick and Easy...*

Suppose a company wants to do random drug testing of its employees and that 2% of the employees use illegal drugs. If the test for detecting drug use is given to people who use illegal drugs, it returns a positive result 99% of the time. When the test is given to people who do not use drugs, it returns a positive result 3% of the time.

- (a) What is the probability that a random employee tested for drugs will test positive for drugs?
- (b) If an employee has a positive test result, what is the probability that the employee does not use drugs?
- (c) In order to be sure that you aren't firing a clean employee, anyone that tests positive undergoes a second test. What is the probability that such a person will test positive for drugs?
- (d) If an employee has a positive second test result, what is the probability that the employee does not use drugs?
- (e) Would it be reasonable to fire people based on the results of the first drug test? The second drug test? How will the probabilities change with each successive drug test?
- (f) If you were looking to improve the drug test, would you try to decrease the number of false-negatives or the number of false-positives? Would your answer depend if you were using the drug test for employment purposes or diagnostic purposes?