

Exploring The Web

Chapter 13

13.60 SAT Mathematics scores. The website <http://research.collegeboard.org/programs/sat/data> presents data for high school seniors who participated in the SAT program from both the current year and previous years. Under Data, click on the link for COLLEGE BOUND SENIORS for the most recent year given. In the window that opens, click on the link for TOTAL GROUP REPORT for this year. The Total Group Profile Report presents data for high school graduates who participated in the SAT program that year. Students are counted only once, no matter how often they are tested, and only their latest scores are summarized. Suppose a high school graduate is selected at random. Use the information in the tables available to answer the following questions.

- What is the probability that the selected student is female?
- What is the probability that the selected student scores 600 or over on the Mathematics section of the SAT?
- What is the conditional probability that the selected student scores 600 or over on the Mathematics section given that the student is male?
- What is the conditional probability that the selected student scores 600 or over on the Mathematics section given that the student is female?
- Are scoring over 600 on the Mathematics section and sex independent? If not, explain in a simple sentence the nature of the dependence.

13.61 Let's make a deal. The Monty Hall Problem is an example of a simple probability problem with an answer that is counterintuitive. The problem was made popular when Marilyn vos Savant published it in her *Parade Magazine* column. Here is the setup:

Suppose you're on a game show, and you're given a choice of three doors: Behind one door is a car; behind the others, goats. You pick a door, say number 1, and the host, who knows what's behind the doors, opens another door, say number 3, which has a goat.

The host now asks if you want to switch from door 1, your original choice, to door 2. Will you improve your chances of winning if you switch doors?

- Go to the website www.grand-illusions.com/simulator/montysim.htm. The three question marks correspond to the three doors. After you click on one of the three doors, one of the remaining two doors which has a goat will open. You can now stick with the original door you selected by clicking on the door with a "!", or switch doors by clicking on the door with a "?". Choose the door with the "?". Did you win? Play again to make sure you understand how the game works. Once you are comfortable with the rules, click CLEAR RESULT, set run to 1000 and make sure that the choice is set to "change." Click on START. What percent of the time did you win by switching? What percent of the time would you have won if you didn't switch? Based on your simulation does it seem better to switch or stay with your initial choice?
- The probability of winning if you switch is $\frac{2}{3}$, and if you don't switch it is $\frac{1}{3}$. Try and convince yourself why it is better to switch. How well do these probabilities agree with the proportions you found in your simulation?