KEY TERMS

expected payoff (186)
expected value (197)
opponent's indifference property (194)

EXERCISES

1. "When a game has a mixed-strategy equilibrium, a player's equilibrium mixture is designed to yield her the same expected payoff when used against each of the other player's pure strategies." True or false? Explain and give an example of a game that illustrates your answer.

2. In Figures 7.2 and 7.3 of the text, you saw how to derive Navratilova's best-response rule in the tennis-point game in two different ways. Draw figures similar to Figures 7.2 and 7.3 to show how to derive Evert's best-response rule in the same two ways. Use the algebraic approach to finding the best-response rule to verify the equilibrium value of p for Evert and the payoff that she receives in the mixed-strategy equilibrium.

3. Find Nash equilibria in mixed strategies for the following games. In each case, verify your answer by using a second method to recalculate the equilibrium mixtures for each player.
(a)

		COLUMN	
		Left	Right
ROW	Up	4	−1
	Down	1	2

(b)

		COLUMN	
		Left	Right
ROW	Up	3	2
	Down	1	4

4. Many of you will be familiar with the children's game Rock–Scissors–Paper. In Rock–Scissors–Paper, two people simultaneously choose either "Rock," "Scissors," or "Paper," usually by putting their hands into the shape of one of the three choices. The game is scored as follows. A person choosing Scissors beats

a person choosing Paper (because scissors cut paper). A person choosing Paper beats a person choosing Rock (because paper covers rock). A person choosing Rock beats a person choosing Scissors (because rock breaks scissors). If two players choose the same object, they tie. Suppose that each individual play of the game is worth 10 points. The following matrix shows the possible outcomes in the game:

		PLAYER 2		
		Rock	Scissors	Paper
PLAYER 1	Rock	0	10	−10
	Scissors	−10	0	10
	Paper	10	−10	0

(a) Suppose that Player 2 announced that she would use a mixture in which her probability of choosing Rock would be 40%, her probability of choosing Scissors would be 30%, and her probability of Paper, 30%. What is Player 1's best response to this strategy choice of Player 2? Explain why your answer makes sense, given your knowledge of mixed strategies.

(b) Find the mixed-strategy equilibrium of this Rock–Scissors–Paper game.

5. Consider a slightly different version of Rock–Scissors–Paper in which Player 1 has an advantage. If Player 1 picks Rock and Player 2 picks Scissors, Player 1 wins 20 points from Player 2 (rather than 10). The new payoff matrix is:

		PLAYER 2		
		Rock	Scissors	Paper
PLAYER 1	Rock	0	20	−10
	Scissors	−10	0	10
	Paper	10	−10	0

(a) What is the mixed-strategy equilibrium in this version of the game?

(b) Compare your answer here with your answer for the mixed-strategy equilibrium in Exercise 4. How can you explain the differences in the equilibrium strategy choices?

6. In baseball, pitchers and batters have conflicting goals. Pitchers want to get the ball *past* batters but batters want to *connect* with pitched balls. The following table shows the payoffs for a hypothetical game between a pitcher and a batter. The payoffs take into account the fact that fastballs, when anticipated and hit by a batter, yield better hits (more bases) than do similarly anticipated and hit curve balls.