Counterintuitive Probabilities

EXAMPLE 5 Finding a Counterintuitive Probability

On the game show *Let's Make a Deal*, the contestant is given the choice of three doors. Behind two of the doors are goats. Behind the other door is a new car.

Monty Hall hosted the game show *Let's Make a Deal* for many years. In 1990, Marilyn vos Savant, a columnist at *Parade* magazine, published the solution of the "Monty Hall Problem." The magazine received about 10,000 responses, most of which said that Marilyn was wrong. She was, however, correct.

Step 1: The contestant randomly chooses one of the doors.

Step 2: The game show host knows the location of the car. After the contestant chooses a door, the host reveals the goat behind one of the remaining doors. Then the host asks the contestant, "Do you want to switch doors?"

Step 3: The contestant either switches or stays with his or her first choice.

Based on probability, what should the contestant do?

SOLUTION

On the show, many contestants stay with their original choice. However, consider the table. Because it is irrelevant, assume the contestant chooses door 1.

Door 1	Door 2	Door 3	Result if switching	Result if staying
Car	Goat	Goat	Goat	**Car**
Goat	Car	Goat	**Car**	Goat
Goat	Goat	Car	**Car**	Goat
			Win: 2 out of 3	**Win: 1 out of 3**

So, by switching, the contestant doubles the likelihood that he or she wins the car. For most people, this result seems counterintuitive.

Checkpoint

Help at Math.andYOU.com

Play the *Monty Hall Game* at *Math.andYou.com* 20 times by staying and 20 times by switching. Do your outcomes agree with the probabilities in the example?