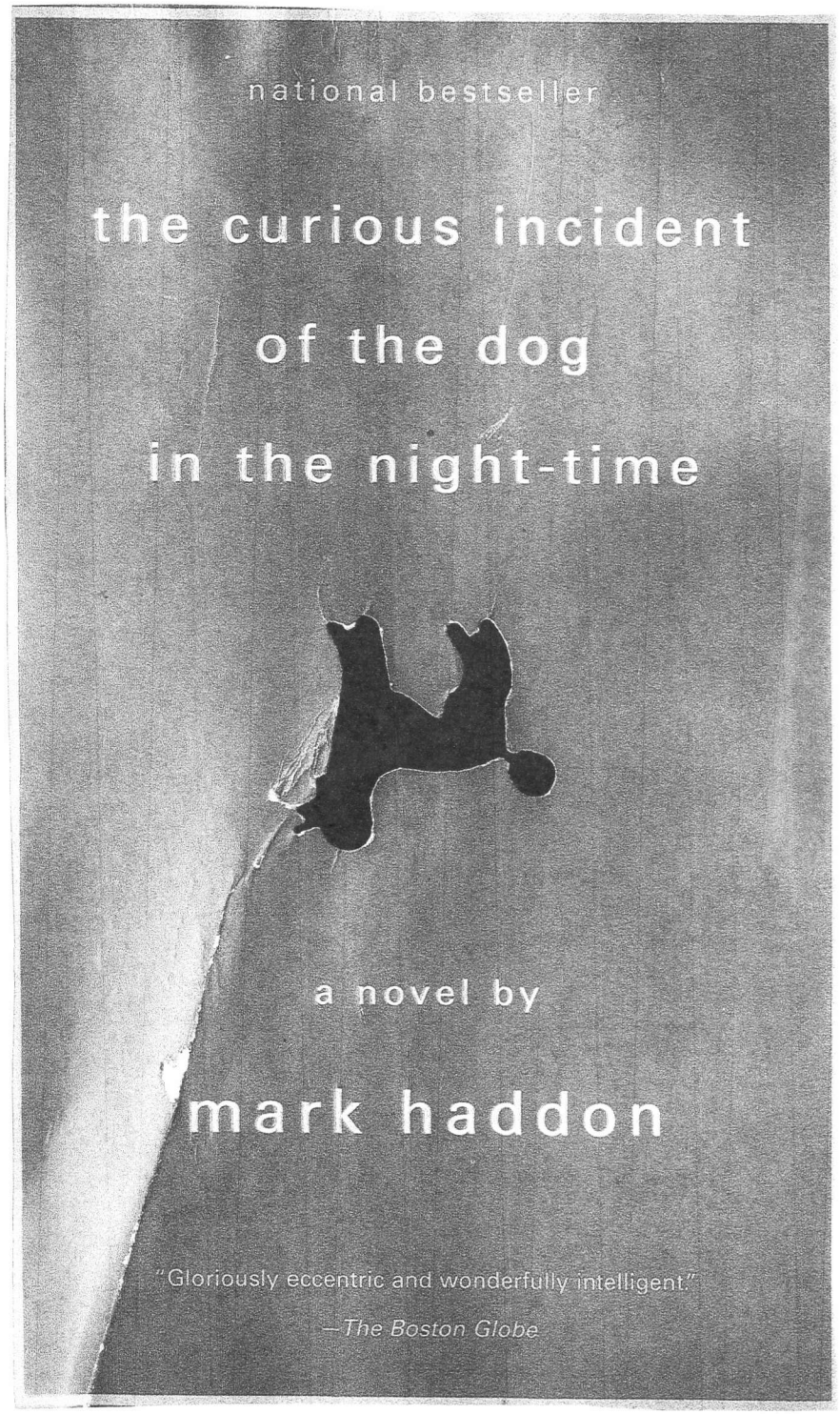


straightforward answers at the end. I know he meant this because this is what he said.

This is because Mr. Jeavons doesn't understand numbers.

Here is a famous story called **The Monty Hall Problem** which I have included in this book because it illustrates what I mean.

There used to be a column called ***Ask Marilyn*** in a magazine called ***Parade*** in America. And this column was written by Marilyn vos Savant and in the magazine it said that she had the highest IQ in the world in the ***Guinness Book of World Records Hall of Fame.*** And in the column she answered maths questions sent in by readers. And in September 1990 this question was sent in by Craig F. Whitaker of Columbia, Maryland (but it is not what is called a direct quote because I have made it simpler and easier to understand)

> *You are on a game show on television. On this game show the idea is to win a car as a prize. The game show host shows you three doors. He says that there is a car behind one of the doors and there are goats behind the other two doors. He asks you to pick a door. You pick a door but the door is not opened. Then the game show host opens one of the doors you didn't pick to show a goat (because he knows what is behind the doors). Then he says that you have one final chance to change your mind before the doors are opened and you get a car or a goat. So he asks you if you want to change your mind and pick the other unopened door instead. What should you do?*

Marilyn vos Savant said that you should always change and pick

the final door because the chances are 2 in 3 that there will be a car behind that door.

But if you use your intuition you think that chance is 50 50 because you think there is an equal chance that the car is behind any door.

Lots of people wrote to the magazine to say that Marilyn vos Savant was wrong, even when she explained very carefully why she was right. Of the letters she got about the problem, 92% said that she was wrong and lots of these were from mathematicians and scientists. Here are some of the things that they said

I'm very concerned with the general public's lack of mathematical skills. Please help by confessing your error.

Robert Sachs, Ph.D., George Mason University

There is enough mathematical illiteracy in this country, and we don't need the world's highest IQ propagating more. Shame!

Scott Smith, Ph.D., University of Florida

I am in shock that after being corrected by at least three mathematicians, you still do not see your mistake.

Kent Ford, Dickinson State University

I am sure you will receive many letters from high school and college students. Perhaps you should keep a few addresses for help with future columns.

W. Robert Smith, Ph.D., Georgia State University

You are utterly incorrect... How many irate mathematicians are needed to get you to change your mind?

E. Ray Bobo, Ph.D., Georgetown University

If all those Ph.D.'s were wrong, the country would be in very serious trouble.

Everett Harman, Ph.D., U.S. Army Research Institute

But Marilyn vos Savant was right. And here are 2 ways you can show this.

Firstly you can do it by maths like this

Let the doors be called X, Y and Z.

Let C_x be the event that the car is behind door X and so on.

Let H_x be the event that the host opens door X and so on.

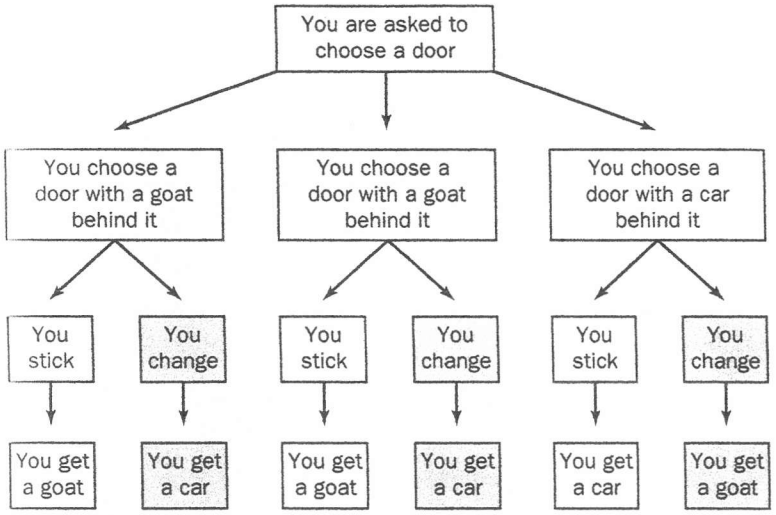
Supposing that you choose door X, the possibility that you win a car if you then switch your choice is given by the following formula

$$P(H_Z \wedge C_Y) + P(H_Y \wedge C_Z)$$

$$= P(C_Y) \cdot P(H_Z \mid C_Y) + P(C_Z) \cdot P(H_Y \mid C_Z)$$

$$= (\tfrac{1}{3} \cdot 1) + (\tfrac{1}{3} \cdot 1) = \tfrac{2}{3}$$

The second way you can work it out is by making a picture of all the possible outcomes like this



So if you change, 2 times out of 3 you get a car. And if you stick, you only get a car 1 time out of 3.

And this shows that intuition can sometimes get things wrong. And intuition is what people use in life to make decisions. But logic can help you work out the right answer.

It also shows that Mr. Jeavons was wrong and numbers are sometimes very complicated and not very straightforward at all. And that is why I like **The Monty Hall Problem.**

103. When I got home Rhodri was there. Rhodri is the man who works for Father, helping him do heating maintenance and boiler repair. And he sometimes comes round to the house in the evening to drink beer with Father and watch the television and have a conversation.

Rhodri was wearing a pair of white dungarees which had