



The Monty Hall Controversy

Marilyn vos Savant is a columnist for *Parade* magazine, who bills herself as the person with the “highest IQ” ever recorded, a whopping 228 according to *The Guinness Book of World Records*. She sports a wedding ring made of pyrolytic carbon, a special material used in the Jarvik artificial heart, which was invented by her husband, Robert Jarvik. In 1993, vos Savant earned the ire of mathematicians for her book *The World’s Most Famous Math Problem* in which she questioned Andrew Wiles’ recent proof of Fermat’s Last Theorem and Einstein’s theory of relativity.



MARILYN VOS SAVANT

Her column, which is called “Ask Marilyn”, is read by millions and often tackles tricky mathematical puzzles. On September 9, 1990 Vos Savant answered a famous mathematical brain teaser posed by one of her readers, that was based on Monty Hall’s classic game show *Let’s Make a Deal*.

The question was as follows: Suppose you’re on a game show and you’re given the choice of three doors. Behind one door is a car, behind the other two, goats. You choose, say, door 1, and the host, knowing which door the car is behind, opens another door, revealing a goat. He then gives you the option of sticking with door number 1, or switching to the other door. What should you do?

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In her column Marilyn advised her readers to switch doors. She argued that sticking with the first choice gives a $1/3$ chance of winning, while switching doors double the probability of winning, that is, it gives you a $2/3$ chance of winning. This answer is counter intuitive. Most people believe you have a 50-50 chance of the car being behind the door you initially chose and the other door, so switching doesn’t increase your chances of winning. In fact, Marilyn received many angry letters from mathematicians. Scott Smith, a PhD mathematician at the University of Florida wrote,

You blew it, and you blew it big! Since you seem to have difficulty grasping the basic principle at work here, I’ll explain. After the host reveals a goat, you now have a one-in-two chance of being correct. Whether you change your selection or not, the odds are the same. There is enough mathematical illiteracy in this country, and we don’t need the world’s highest IQ propagating more. Shame!



Unfortunately for Dr. Smith, he was the one that was blew it big! To see why, we can play through the six games that exhaust all the possibilities. First, we see what happens if you choose door 1 and “stay” each time.

	Door 1	Door 2	Door 3	Outcome
Game 1	Car	Goat	Goat	Win
Game 2	Goat	Car	Goat	Lose
Game 3	Goat	Goat	Car	Lose

So we have a $1/3$ chance of winning, as we expected. Now, let's do the same thing, only this time we choose door 1 and "switch" to whichever door the host doesn't open.

	Door 1	Door 2	Door 3	Outcome
Game 1	Car	Goat	Goat	Lose
Game 2	Goat	Car	Goat	Win
Game 3	Goat	Goat	Car	Win

In this case, we have a $2/3$ chance of winning. Basically, by switching you win if the car is behind door 2 or door 3, while if you stay, you only win if the car is behind door 1.

Problems of the Week

Below are three problems of the week. The problem with three stars is considered the most difficult, while the problem with one star is considered to be the least. Students that correctly solve a problem will have their names printed in the next Monday Math Mania. Have fun and good luck!

(★) If you put one penny in your piggy bank on December 1st, and each day thereafter you put twice as many pennies in your bank as you did the previous day, how much will you have in your piggy bank on December 31st?

(★★) Suppose you have balance scale and 12 coins, one of which is counterfeit. Although all of the coins look the same, the counterfeit coin has a different weight than the others. Using the scale, can you determine which coin is counterfeit in only 3 weighings?

(★★★) Suppose a clock's second hand is exactly on a second mark and exactly 18 second marks ahead of the hour hand. What time is it?

Solutions to each week's problems will be posted at www.stmichaelsmathmania.net after a successful solution has been given by a student.

Submit your solutions to Mr. Lafferty or Mrs. Gould by 12:40 on Friday, or email your solution to contact@stmichaelsmathmania.net by 11:59pm Friday.