May 1998
Regulars

Solution to Puzzle No. 4 − three doors

For the question see "Puzzle No. 4 − three doors" in issue 4.

The answer is that the contestant *should* switch doors.

Here's a nice explanation submitted by *Nigel Mudd* from Leeds Grammar School:

If you swap, you win when your initial guess was wrong, probability 2/3.
If you stick, you only win when your initial guess was correct, probability 1/3

Surprised?

The most common mistake is to assume that the prize is equally likely to be behind the two remaining unopened doors. If this was the case then switching would make no difference.

It seems that this logical trap is caused by the superficial similarity between the two doors. They may look the same but their chances of hiding the prize are not.

PASS Maths received lots of responses to the "three doors" puzzle and many of these were wrong. Don't worry if you were one of the people to fall into this trap, PASS Maths' resident problem solver is not too ashamed to admit that on first hearing he made a fool of himself too. We're in good company...

Monty Hall

This problem has been around for many years. A similar problem was published in Scientific American about 40 years ago. The author, Martin Gardner, went on to say that "in no other branch of mathematics is it so easy for experts to blunder as in probability theory".

This observation couldn't have been closer to the truth. Although the problem was picked up in 1975 and published in the *American Statistician* it did not become famous until 1990 when Marilyn vos Savant, reputedly the most intelligent person in the world, wrote about it in the American *Parade Magazine*.

In her column she described an American TV game show called *Let's Make a Deal* in which the compère, *Monty Hall*, presents the contestant with three doors. Behind one of them is a car, behind the others a goat.

Once the contestant has chosen a door Monty Hall opens one of the other two doors to reveal a goat and then offers the switch.

Marilyn was inundated with thousands of letters, many from professional mathematicians, disputing her solution. Feelings ran so high that eventually Monty Hall himself became involved. It turns out that in the *real* show he wasn't obliged to offer the switch at all. If the contestant chose a door with a goat he might open it straight away − too bad! Even if he did offer the switch, he would use bribes to trick the contestant into taking the goat. "They'd think the odds on their door had now gone up to 1 in 2, so they hated to give up the door no matter how much money I offered." he said.

Still, if these ambiguities seem like an excuse then think again. People still get the problem wrong, even when it is stated carefully. The problem has spread from one discussion forum to another, it has appeared in numerous places on the Internet and has recently been discussed in the British magazine New Scientist and even featured in the Royal Institution Christmas lectures televised in December.

If there's one thing about probability theory that *is* certain, it's that the Monty Hall puzzle will be making fools of people for many years to come.
