

## *Which Alice?*

It all started at Alice's birthday party. Not the Alice in Wonderland, but my friend Alice. How the other Alice entered the story will soon be apparent. Of course Alice's younger brother, Tony, was there, as well as her friends Michael, Lillian, and several others.

After many games and magic tricks, the whole company wanted to hear some logic puzzles.

"Here's a nice one," I said. "There are two identical twins. One of them always lies and the other one always tells the truth."

"What are their names?" asked Tony.

"One of them is named *John*," I replied.

"Such a common name!" exclaimed Michael. "It seems that just about every Tom, Dick and Harry is called *John*!"

I could not help being somewhat puzzled by this remark.

"What is the name of the other brother?" asked Tony.

"I don't remember," I replied.

"Why don't you remember?" asked Michael.

"I have no idea *why* I don't remember," I answered, "and the name of the other brother doesn't matter."

"Is John the one who lies, or is it his brother?" asked Lillian.

"Good question," I answered, "but unfortunately no one knows whether it is John or his brother who lies."

"Then what is the problem?" asked Alice.

"The problem is this: Suppose you meet the two brothers and you

wish to find out which one is John. You may ask only one question to one of them, and the question must be answerable by *yes* or *no*. Furthermore, the question may not exceed three words. What would you ask?"

"Three words!" cried Michael in astonishment.

"Yes, three words," I replied. "Actually," I continued, "this makes the problem easier; there are not that many three-word questions!"

"I have it!" said one of Alice's friends. "Ask one of them, 'Are you John?'"

"That won't work," said Michael. "Suppose he answers yes. What would that prove? Nothing at all; he might be lying or telling the truth."

"I have it!" said another. "Ask one of them, 'Is water wet?'"

The group thought about this for a moment.

"That won't work," said Alice. "If he answers yes, you'll know that he tells the truth, and if he answers no, you'll know that he is the one who lies, but you still won't know whether or not he is John."

"Exactly!" I replied.

"But you'll know whether or not he lies," said Tony.

"True," I replied, "but that's not the problem. The problem is not to find the liar, but to find out which one is John."

"I have an idea!" said another. "How about asking the question 'Do you lie?'"

"That's a useless question!" said Lillian. "You should know in advance that the answer you will get will be no—regardless of whether you addressed the liar or the truth-teller."

"Why is that?" asked another.

"Because," replied Lillian, "a truth-teller would never lie and claim to be a liar, and a liar would never truthfully admit he is a liar. So in either case you will get no for an answer."

"Very good," I said.

"Then what question will work?" asked Tony.

"Ah, that's the puzzle you are to solve!"

Well, the group bandied the problem about for a while, and finally came up with a three-word question which does work. Can you find such a question? (The solution is given in the back of the book.)

\* \* \*

After they solved the problem, Alice asked, "Suppose that instead of trying to find out which one is John, you wanted to find out whether John is the liar or the one who tells the truth. Could this be done with only one question?"

"Oh, certainly!" I replied.

"But not with a three-word question," suggested Tony.

I thought about this for a moment.

"As a matter of fact there is a three-word question that will do this," I finally responded.

Can the reader find a three-word question that will determine not which one is John, but whether John lies?

After the refreshments were served, the company all wanted some more logic puzzles.



"In one of your books," said Alice, "you had some puzzles about Alice in the Looking-Glass. Can you tell us some more?"

"I wrote about *you* in the Looking-Glass?" I asked.

"No, not *me!*" said Alice excitedly. "The other Alice!"

"Which Alice was that?" I asked.

"The one in the Looking-Glass!"

"Oh, in other words your reflection!"

"No, no, no!" shouted Alice. "Not *my* reflection. It had nothing at all to do with *me*. It was the Alice of Lewis Carroll's story!"

"Oh!" I answered innocently.

"Well, will you tell us some more of those stories?"

I thought for a moment. "How about some stories about Alice in Wonderland?" I asked.

"I was never *in* Wonderland," Alice replied.

"No! No! No!" I shouted excitedly. "I didn't mean *you*—I meant the other Alice!"

"Which Alice?" asked Alice.

"Why, the one in the story!" I answered, still excited. (At this point all the company laughed with delight that Alice had just succeeded in playing the same trick on me that I had played on her!)

"I was only kidding," said Alice, laughing, "just like you were. Anyway, I'd love to hear some of your stories about Alice in Wonderland."

This got us started.

## Chapter 1

WHICH ONE IS JOHN? To find out which brother is John, ask one of them, "Is John truthful?" If he answers yes, then he must be John, regardless of whether he is lying or telling the truth. If he answers no, then the other one is John. This can be proven in the following manner.

If he answers yes, he is asserting that John is truthful. If his assertion is true, then John really is truthful, and since the speaker is being truthful, he must be John. If his assertion is a lie, then John is not really truthful; John then lies just like the speaker, hence again the speaker must be John. This proves that regardless of whether the speaker is telling the truth or lying, he must be John (assuming he answers yes).

If he answers no, he is asserting that John is not truthful. If his assertion is true, then John is not truthful; if his assertion is a lie, then John is truthful. In either case the speaker is unlike John, hence must be John's brother. Thus a No answer indicates that the speaker is not John.

Of course, the question "Does John lie?" serves equally well: A Yes answer then indicates that the speaker is *not* John, and a No answer indicates that he is John.

These are the only three-word questions I can think of that must work. I wonder if there are any others?

\* \* \*

For the second puzzle—to find a question that will determine whether John lies—you have merely to ask, “Are you John?”

Suppose he answers yes. Either he is telling the truth or he isn't. Suppose he is. Then he really is John, and since he is telling the truth, John is truthful. On the other hand, suppose he is lying. Then he is not really John (since he is claiming he is). Then he is lying and is not John, so John must be the truthful brother. This proves that if he answers yes, then, regardless of whether he is lying or telling the truth, John must be truthful.

Suppose he answers no. Either he is lying or telling the truth. Suppose he is telling the truth. Then he really isn't John; John must be the other brother, and (since he is telling the truth), John must be the one who lies. On the other hand, suppose he is lying. Then (since he is claiming not to be John), he must be John, and so in this case John lies. This proves that if he answers no, then, regardless of whether he is telling the truth or lying, John must be the one who lies.

There is a pretty symmetry between the solutions to these two puzzles: To find out whether he (the one addressed) is John, you ask, “Does John lie?” To find out whether John lies, you ask, “Are you John?”

## *Chapter 2*

♣1

**THE FIRST TALE** The Hatter said, in effect, that either the March Hare or the Dormouse stole it. If the Hatter lied, then neither the March Hare nor the Dormouse stole it, which means that the March Hare didn't steal it, hence was speaking the truth. Therefore, if the Hatter lied, then the March Hare didn't lie, so it is impossible that the Hatter and the March Hare both lied. Therefore the Dormouse spoke the truth when he said that the Hatter and March Hare didn't both lie. So we know that the Dormouse spoke the truth. But we are given that the Dormouse

MATHEMATICS/RECREATIONS & GAMES

Raymond M. Smullyan

# Alice in Puzzle-Land

Introduction by Martin Gardner

Illustrations by Greer Fitting

Alice and her friends return for another romp through Wonderland and the Looking-Glass with these eighty-eight puzzles, paradoxes, and logic problems. Raymond M. Smullyan's characters speak and behave like the originals, and their puzzles abound in typical Carrollian word play, logic problems, and dark philosophical paradoxes. Isaac Asimov described this book as "amusing, entertaining, and surprisingly educational. And it might just send you back to reread Alice."

Readers of all ages will delight in the charming stories and the wealth of ingenious puzzles. Written by a distinguished mathematician and creator of popular puzzle books, this volume requires no background in formal logic. The puzzles become progressively more complex, and complete solutions appear at the end. Puzzle authority Martin Gardner provides an Introduction to the text, which is enhanced by sixty charming illustrations. "An ingenious book," declared the *Boston Globe*, "magnificent for those who like conundrums, amusing for those who don't, and a tribute in itself to the genius of Lewis Carroll."

Dover (2011) unabridged republication of the edition published by Penguin Books, New York, 1987.

See every Dover book in print at  
[www.doverpublications.com](http://www.doverpublications.com)

**\$12.95 USA** PRINTED IN THE USA

ISBN-13: 978-0-486-48200-2

ISBN-10: 0-486-48200-6

