

UW Math Circle

October 3, 2013

There is a secret hall at Hogwart's with magical closets. When you open a closet door, you might find Harry Potter, who will teach you everything there is to know about magic and wizardry. You could also find Voldemort, who...won't.

1. When you enter the secret hall, you encounter two closet doors, labeled with the following signs. Professor Snape refuses to tell you which sign goes on which door, but gives you a clue: "If Harry Potter is behind the first door, the sign on the first door should be true. If Voldemort is behind it, the sign should be false. But, for the second door, the opposite is true! If Harry Potter is behind the second door, the sign on the second door should be false. If Voldemort is behind it, the sign should be true."

Voldemort is in this room.

Voldemort is in both rooms.

Who is behind each door?

2. Professor Snape is now ready to give you his hardest test! You meet him in a hallway with 9 closet doors, and he gives you the following information:

- (i) Harry Potter is behind only one door.
- (ii) For the other 8 rooms, each one either contains Voldemort or is empty.
- (iii) The sign on the Harry Potter's room is true.
- (iv) If Voldemort is behind the door, the sign on the door is false.
- (v) If no one is behind the door, the sign can be either true or false.

After you've been working on the puzzle for a while, Professor Snape realizes he forgot to give you an important piece of information! "If I tell you what's behind door number 8, you'll be able to find Harry Potter."

I Harry Potter is in an odd-numbered room.	II This room is empty.	III Either sign V is right or sign VII is wrong.
IV Sign I is wrong.	V Either sign II is right or sign IV is wrong.	VI Sign III is wrong.
VII Harry Potter is not in room I.	VIII Voldemort is in this room and room IX is empty.	IX Voldemort is in this room and sign VI is wrong.

Who is behind each door?

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1. Simple Simon met a pieman going to the fair. "Peach pies cost \$6.49, apple pies cost \$5.15, and plum pies cost \$8.17," said the pieman. "That sounds great," said Simon, "Here is \$100.50 for the 15 pies I just put in my bag." "Sorry, friend," said the pieman, "you can't add." How did the pieman know?
2. Reid bought a new notebook for school. He numbered the pages of his notebook (in order) from 1 to 200, putting one number on the front and back of each page. If he rips out 25 pages of his notebook and adds up the numbers on the front and back of each page, could he get a sum of 1830?
3. You work for a taffy company, helping the owners make smart mathematical decisions. The taffy company uses big gears to stretch the taffy and the owners want to buy a new taffy-stretching machine with 11 gears arranged in a circle. Should they buy the machine?
4. Is there a number in the sequence 9, 16, 23, 30, ... 2006, 2013 that is divisible by 14? (Each number in the sequence is 7 more than the previous number.)
5. Take a regular chessboard and remove two squares on opposite corners. Is there a way to cover the modified chessboard with dominoes so that each square is covered exactly once?