

# Math Challenge

Washington Middle School  
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## Logic Puzzles

**Warm-up Problem:** Toby and Anton have the same amount of money. How much money should Anton give Toby if Toby ends up with ten dollars more than Anton?

**Warm-up Problem 2:** Dr. Reisner's pet shop sells parrots and parakeets. A parrot costs twice as much as a parakeet. Steve buys five parrots and three parakeets, and Toby buys three parrots and five parakeets. Steve spends \$20 more than Toby. How much does each bird cost?

**Instructions:**

Congratulations, you have been accepted to Hogwarts! ....almost

Before you can be enrolled in the school of magic and wizardry, you must pass Professor Snape's final test. There are two doors in his classroom. Behind each door, you will find either Harry Potter or Voldemort. Be careful! Harry Potter might be behind both doors or Voldemort might be behind both doors. This is a school of magic and wizardry after all!

If you find Harry Potter, he will teach you how to become the best wizard in the world! If you find Voldemort...you probably don't want to find Voldemort.

Professor Snape will put signs on each door, and you will have to use logical reasoning to try to find Harry Potter!

**Exercise 0:** Pretend that each of the following statements appears on one of Snape's signs and that you have decided that the statement is FALSE. Write what it means for each statement to be false.

1. Voldemort is behind the other door.
2. Harry Potter is behind this door, and Voldemort is behind the other door.
3. Harry Potter is behind one of the doors, and Voldemort is behind one of the doors.
4. Either Harry Potter is behind this door or Voldemort is behind the other door.

**Puzzle 1:** Professor Snape tells you that one of these signs is true and the other is false. Which door should you open?

Door 1

Harry Potter is behind this door, and Voldemort is behind the other door.

Door 2

Harry Potter is behind one of the doors, and Voldemort is behind the other.

**Puzzle 2:** Professor Snape changes the signs and tells you that they are either both true or both false. Which door should you open to find Harry Potter?

Door 1

Harry Potter is behind at least one of the doors.

Door 2

Voldemort is behind the other door.

**Puzzle 3:** Professor Snape has had enough of your craftiness, and has decided to make things more difficult. He is changing the rules.

- If Harry Potter is behind Door 1, then the sign on Door 1 is true. If Voldemort is behind Door 1, then the sign on Door 1 is false.
- If Voldemort is behind Door 2, then the sign on Door 2 is true. If Harry Potter is behind Door 2, then the sign on Door 2 is false.

Door 1

Harry Potter is behind both doors.

Door 2

Harry Potter is behind both doors.

Door 1

Harry Potter is behind at least one door.

Door 2

Harry Potter is behind the other door.

**Puzzle 3, continued**

The same rules apply. Where is Harry Potter?

Door 1

It doesn't matter  
which door you  
open.

Door 2

Harry Potter is  
behind the other  
door.

**Puzzle 4:** Three logicians are standing in a line, all facing forward. The Mad Hatter has three blue hats and two red hats, and he randomly puts one hat on each man's head. The logicians know that the Mad Hatter started with three blue hats and two red hats, but they do not know which hats are left over. Each person can only see the hats on the heads of the logicians in front of him but cannot see his own.

The man in the back of the line was asked if he could determine what color hat he was wearing, and he said he could not. The second man in line was asked if he could determine what color hat he was wearing, and he said he could not. The man in the front of the line was asked if he could determine what color hat he was wearing, and he said that he could. What color hat was he wearing, and how did he know?