November 7: Logic

To solve logic puzzles it helps to think about all the possibilities and to make tables.

1. A drawer has 24 red socks and 24 blue socks all mixed together. I am trying to get dressed in the dark. What is the least number of socks I need to get from the drawer so that I am sure to have a matching pair (two socks of the same color)?

   Answer:

   3

2. What if I am trying to find socks for my younger sister too? What is the least number of socks so I am sure to have two matching pairs?

   Answer:

   5

On the island of Logica, there are Knights and Knaves. Knights always tell the truth, and knaves always lie. Can you tell who is who?

2. Alice says "Bob says he is a knave." Is Alice a knight or a knave?

   Answer:

   No one will ever say they are a knave, so Alice must be a knave.

3. Bob says about himself and Carol, "At least one of us is a knave." Is Bob a knight or a knave? Is Carol?

   Answer:

   If Bob is a knave then he would telling the truth. So Bob must be a knight, and therefore Carol is a knave.

4. Amy says: "Either I am a knave or Bill is a knight." What is Amy? What is Bill?

   Answer:

   If Amy is a knave then she would be telling the truth, so she must be a knight. And therefore so is Bill.

5. There are three people, Aidan, Barb and Cathy. Aidan says: "All of us are knaves". Barb says: "Exactly one of us is a knight." What is Aidan? What is Barb? What is Cathy?

   Answer:

   Aidan must be a knave and not all are knaves. If Barb is a knight then Cathy must be a knave and it makes sense. If Barb were a knave then Cathy would have to be a knight, but then Barb would be telling the truth. So Barb is the only knight.

6. From Harry Potter and the Philosopher's Stone: where is the potion to move ahead?

   "Danger lies before you, while safety lies behind,
   Two of us will help you, whichever you would find,
   One among us seven will let you move ahead,
   Another will transport the drinker back instead,

Two among our number hold only nettle wine,
Three of us are killers, waiting hidden in line.

Choose, unless you wish to stay here for evermore,
To help you in your choice, we give you these clues four:

First, however slyly the poison tries to hide
You will always find some on nettle wine's left side;
Second, different are those who stand at either end,
But if you would move onwards neither is your friend;
Third, as you see clearly, all are different size,
Neither dwarf nor giant holds death in their insides;
Fourth, the second left and the second on the right
Are twins once you taste them, though different at first sight"
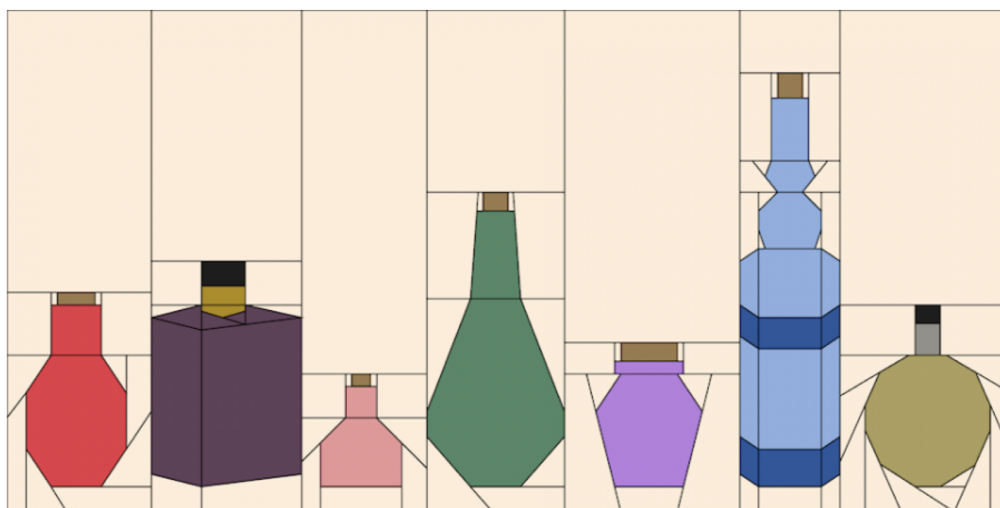
Here it helps to make a *table* where we keep track of what each bottle can be:

	1	2	3	4	5	6	7
Poison							
Wine							
Forward							
Back							

"Different are those who stand at either end, But if you would move onwards neither is your friend"

	1	2	3	4	5	6	7
Poison							
Wine							
Forward	X						X
Back							

"Neither dwarf (3) nor giant (6) holds death in their insides"

	1	2	3	4	5	6	7
Poison			X			X	
Wine							
Forward	X						X
Back							

"The second left and the second on the right are twins once you taste them." Since we know the second on the right is not poison, it must be nettle wine, and so must the other. Since there are only two wine bottles, that means everything else is not wine.

	1	2	3	4	5	6	7
Poison		X	X			X	
Wine	X	✓	X	X	X	✓	X
Forward	X	X				X	X
Back		X				X	

"You will always find [poison] on nettle wine's left side". So 1 and 5 are poison. And "different are those who stand at either end," so 7 is not poison.

	1	2	3	4	5	6	7
Poison	✓	X	X		✓	X	X
Wine	X	✓	X	X	X	✓	X
Forward	X	X			X	X	X
Back	X	X			X	X	

Since there are three poisons, 4 must be poison. And 7 can only be the "back" potion. Therefore, 3 must be the right "forward" potion.

	1	2	3	4	5	6	7
Poison	✓	X	X	✓	✓	X	X
Wine	X	✓	X	X	X	✓	X
Forward	X	X	✓	X	X	X	X
Back	X	X	X	X	X	X	✓