1. 1. Since all 10 positions are different, the manager can place 0 players on the field because he has 13 players to choose from and every player can play any position.
   2. If only three can pitch, then at least one of the three that can pitch needs to be on the field in the pitcher position, but one or both of the other two can also be on the field in other positions. That means that the manager has different ways of putting 10 players on the field.
   3. Since there needs to be at least one pitcher on the field and at least one left-handed player on the field, there are 2 different “at least one” problems. The number of possible ways to put 10 players on the field with at least one pitcher is. The number of possible ways to put 10 players on the field with at least one left-handed player is . So the total number of ways to put 10 players on the field with at least one left-handed player and at least one pitcher is []2.
2. 1. Placing one rook on an 8 x 8 board eliminates the row and column that the rook is positioned in, leaving 49 spaces left for the second rook to be places. The second rook can be placed in any one of the 49 spaces left because there is no way of it being directly vertical or horizontal from the first rook, thus making it impossible for the second rook to attack the first rook. That means that the second rook can be placed different ways. The first rook can be placed in any of the other 15 spaces, meaning that the first rook can be placed different ways. So both rooks can be placed different ways.
   2. The only way to place 8 rooks on a board without any of them attacking any other is diagonally. Each diagonal gives possibilities and there are 2 different 8-square diagonal options. That means that there are possible ways to arrange 8 rooks on a board without any of them attacking any other.
3. 1. There are P(562,4) different ways to draw four different numbers for the four prizes. Since there are 562 raffle tickets, each one of them label with a different number 1 through 562.
   2. To win the trip and only the trip, one of my numbers (1 through 27) must be picked for that prize. The other 3 prizes can be won by anyone else (those holding numbers 28 through 562), but not me. There are different ways for my number to be picked for the trip. There are different ways for the other 3 prizes to be won. So there are different ways for me to win just the trip.
   3. There are different ways to draw four different numbers so that I win at least one prize. There are different ways to choose four different numbers and there are different ways to choose four different numbers with none of them being one of my numbers. To find how many different ways four numbers need to be drawn with at least one being one of my numbers, you need to subtract the amount of ways that none of my numbers are drawn from the amount of ways any four numbered raffle tickets can be drawn.
4. False. 2 is a non-negative integer. 3 is a non-negative integer. and and . Therefore .
5. 1. There are 19 different books on the bookshelf so there are different ways to arrange the books on a bookshelf.
   2. There are different ways to arrange just the Discrete Math books. There are different ways to arrange just the Calculus books. There are different ways to arrange just the Modern Algebra books. Therefore there are different ways to arrange all the books with the books of the same topic groups together.
6. The number of different license plate possibilities prior to the change is , where is the possible license plates with two letters and is the possible license plates with one letter. After the change there are different license plate possibilities. So there are more possibilities after the change.