## Fresno Math Circle

Grades 7-8

## Combinatorics II Problems

1. How many ways are there to choose a team of 3 students out of a group of 30 ?
2. One student has 6 math books, and another has 8 books. How many ways are there to exchange 3 books belonging to the first student with 3 books belonging to the second student?
3. Corey and Tony are friends on the same basketball team. There are eight players on the team. How many starting groups of five players include Corey, Tony, or both?
4. A fair coin is flipped ten times. How many ways are there to flip more heads than tails?
5. A "word" is any sequence of letters. How many different "words" can be obtained by rearranging the letters in the word "MATHEMATICIAN"?
6. Six boxes are numbered 1 through 6. How many ways are there to distribute 10 identical balls among these boxes so that none of them is empty?
7. (a) How many 4-digit numbers have the product of their digits equal to 15 ?
(b) How many 5-digit numbers have the product of their digits equal to 50 ?
(c) How many 6-digit numbers have the product of their digits equal to 210 ?
(d) How many 7 -digit numbers have the product of their digits equal to 300 ?
8. (a) We want to join points $A$ and $B$ by a path that goes along the lines and has the shortest possible length (which is 7 ). How many ways are there to do this?

(b) How many ways are there to join points $A$ and $B$ by a path that goes along the lines and has the shortest possible length for the picture below?

(c) How many ways are there to join points $A$ and $B$ by a path that goes along the lines and has the shortest possible length for the picture below?

