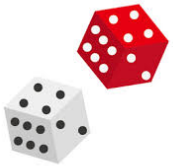
Combinatorics, Part 3

1 Warm-up

1. We have two dice, one red and one white. We roll them both. How many combinations of numbers can we get? For example, we could get 1 on the red die and 6 on the white die, or 2 on the red die and 3 on the white die.



2. What if we roll two dodecahedral dice? Each one has 12 faces.

3. A domino has two sides, and a number of dots on each side. The number of dots on each side can be 0 (blank), 1, 2, 3, 4, 5 or 6. How many dominoes come in a box? The box contains one domino of each type, with no repeats.

2 Clubs

1. There are 5 kids in cooking club. In how many different orders can they line up to wash their hands before cooking?

2. There are 20 kids in robotics club. How many ways are there to choose a president, vice president, and treasurer?

3. There are 12 kids in Model UN club. How many ways are there to pick a delegation of 3 to represent Russia?

Extra problem

4. If there are 3 people in a room, and everyone shakes everyone else's hand, how many handshakes take place? What if there are 4 people? 5 people? 15 people?

3 Books and Words

1. There are 5 books on a shelf. How many ways are there to arrange three of them in a stack on the floor?

2. How many ways are there to arrange the letters in the word "PART"? For example, one arrangement is APRT. (How many of these form a real word in the English language?!)
3. How many ways are there to arrange the letters in the word "SWEET"?
4. How many ways are there to arrange the letters in the word "CHEESE"?

Extra problem:

5. Dad has two apples, three pears, and four oranges. He will put one piece of fruit in his son's lunch box for 9 consecutive days. How many ways are there to do this?

4 Numbers and Letters

1. How many 3 digit numbers are there that have all odd numbers as digits? For example, 337 counts, but 352 does not.

2. How many 3 digit numbers are there that have at least one even digit? For example, 656 counts, but 137 does not.

3. How many 3 digit numbers have an even sum of their digits? For example, 125 counts, but 227 does not.

4. A school has 677 students. Explain why at least 2 students must have the same pair of initials (first and last initial).