

## Week 1 - Combinations

1. If  $n$  is a positive integer such that  $2\binom{n}{4} = \binom{n}{5}$ , find  $n$ .
2. A school needs to choose 3 teams out of 12 people: team Red, team Green, and team Blue, where each team has 4 people. If order does not matter, find the number of ways to pick the 3 teams.

3. If  $n$  and  $k$  are positive integers where  $n > k$  and  $\frac{nPk}{\binom{n}{k}} = 720$ , find  $k$ . ( $nPk$  is  $n$  permutation  $k$ ).

4. Find the smallest number  $n$  such that  $n > k$  and  $\binom{n}{k}$  is a multiple of 12.
5. A biker is on the intersection of 9th street and 12th avenue and needs to get to the intersection of 14th street and 16th avenue. Assuming that the streets are arranged in a grid and the biker cannot cut through streets, how many paths can they take?
6. Donald has 11 sticks. He arranges them into two piles, letting the number of sticks in the greater pile be  $n$  and the number of sticks in the smaller pile be

$k$ . He then calculates the value of  $\binom{n}{k}$ . Find the difference between the largest possible value he can get and the smallest possible value.

7. Croaky the Frog has 4 number blocks labeled 1, 2, 3, and 4. He arranges them to make 24 different 4-digit numbers. What is the 20th number on this list?