

# Combinatorics Exercises

1. An assembly plant wants to hire 5 male and 6 female workers. 6 men and 8 women apply for the job. How many ways can the desired workers be selected? (168)
2. A box contains 30 parts numbered from 1 to 30. How many ways can we select 6 parts such that among them there are 3 parts with specific numbers? (2,925)
3. A shipment contains 100 boxes: 75 are quality \$A\$ and 25 are quality \$B\$. How many ways can we select a 12-box sample in which the quality \$B\$ goods do not exceed 30%? (686,128,883,942,025)
4. 12 students rent three boats: one with 3 seats, another with 4 seats, and the third with 5 seats. In how many ways can they be seated in the boats? (27,720)
5. How many five-digit numbers starting with 15 can be formed using the digits \$1, 3, 5, 7, 9\$, if each digit can be used only once? (6)
6. In how many ways can the letters of the word \$MATHEMATICS\$ be arranged (i.e., permutations of the word)? (4,989,600)
7. How many four-digit even numbers can be formed using the digits \$0, 1, 2\$ (with repetition allowed)? (36)
8. 10 students qualified for the university sports day running competition. The first 3 will receive medals. How many different ways can the list of medalists be arranged? (720)
9. We roll a standard die four times in a row, and we write down the results of the rolls in order. How many different four-digit numbers can we obtain this way? (1,296)
10. How many three-digit numbers are there in which every digit is even? (100)
11. We will draw a total of 5 prizes among 15 students. A student can receive multiple prizes. How many different outcomes are possible for the drawing? (759,375)
12. How many subsets does a set with 6 elements have? (64)
13. 7 people meet at a party, and everyone shakes hands with everyone else. How many handshakes are there in total? (21)
14. 15 entries were submitted for a competition. 3 entries will be awarded, each with a 50 EURs. How many different ways can the prizes be awarded if they cannot be shared? (455)
15. How many subsets of the set \$\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}\$ have at least 7 elements? (176)
16. We have fabric in \$red\$, \$white\$, \$green\$, and \$blue\$ colors, and we want to make flags. Each flag consists of horizontal stripes, and adjacent stripes cannot be the same color. How many different flags can we make if:
  1. each flag must have two stripes? (12)
  2. each flag must have three stripes? (36)

17. After a graduation ceremony, each student received a photo from each of their classmates. How many students graduated if a total of 992 photos were exchanged? (32)
18. We placed a \$red\$, a \$white\$, and a \$black\$ dice in a box. We randomly draw two and roll them. How many possible outcomes are there for this experiment? (108)

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