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 in a student circle 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?