Problem set 7.: Permutations, variations, combinations

Question 1.
In how many ways can you arrange 1, 2, 3 or 5 distinct characters, respectively, into order?

Question 2.
(a) At a literary event 5 different poems are presented. In how many different orders can the poems be read out?
(b) In how many different orders can 6 people be seated along a bench?
(c) 12 students have agreed to have a meeting. In how many different orders can they arrive at the meeting if we assume that they all arrive at different times?
(d) How does the answer to question (b) change if instead of a bench, the 6 people are seated around a round table?

Question 3.
Into how many different orders can you arrange
(a) 3 red, 1 blue and 1 white
(b) 3 red, 2 blue and 1 white
balls?

Question 4.
A box contains 16 balls: 10 white, 4 red and 2 blue balls. We take the balls out of the box one-by-one. In how many different orders can the balls be removed from the box, if we do not distinguish between the balls of the same colour?

Question 5.
How many different 5-digit numbers can be formed using exactly the digits
(a) 1, 2, 3, 4, 5?
(b) 1, 1, 2, 3, 4?
(c) 1, 1, 2, 2, 2?
(Each digit has to be used exactly as many times as many times it appears in the list.)

Question 6.
15 students are taking part in a running race. How many different outcomes are possible for the first three places, if we assume that there are no equal finishes?

Question 7.
In how many different ways can we distribute 6 different books among six pupils if everyone can get *at most* one book?

Question 8.
How many different 5-digit numbers can be formed out of the digits 1, 2, 3, 4, 5, 6, 7, 8 if
(a) each digit can be used *at most* once?
(b) any digit can be used more than once?

Question 9.
How many 6-digit numbers exist consisting of pairwise distinct digits in the
(a) base-10   (b) base-8   (c) base-12   number system?

Question 10.
How many different outcomes are possible when
(a) flipping a coin 10 times,   (b) rolling a die 10 times,
if the order of the results matters?

Question 11.
A multiple choice test consists of 30 questions. For each question 5 possible answers are provided, out of which exactly one answer needs to be selected. In how many different ways can the test be completed?

Question 12.
In how many different ways can we distribute 6 identical books among 20 students, if each student can be given *at most* one book?

Question 13.
In how many different ways can 4 cards be handed out to a player from a deck of 32 cards? (It does not matter, what order the 4 cards are handed out.)

Question 14.
Hányféleképpen lehet kitölteni egy ötöslottó-szelvényt?

Question 15.
Consider the set A = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}.
(a) How many 3-element subsets does A have?
(b) How many 5-element subsets does A have which contains 7?
(c) How many 4-element subsets does A have which contains only odd numbers?
(d) How many subsets does A have in total?

Question 16.
We draw 6 cards from a deck of 32 cards (without replacement). How many different outcomes are possible
(a) if the order in which the cards are drawn matters?
(b) if the order in which the cards are drawn does not matter?

Question 17.
In how many different ways can we distribute 4 apples among 28 children, if any child can receive more than one apple?

Question 18.
In a post office 12 types of cards are sold. In how many different ways can we purchase 5 cards (we assume that the post office has at least 5 copies of each card in stock)?

Question 19.
In how many different orders can 4 couples sit along a bench if each person would like to sit next to his/her partner?

Question 20.
A company of 8 people would like to sit down at a round table. In how many different orders can they sit around the table, if two particular members of the group: Anna and Ignatious would like to sit next to each other?

Question 21.
Given that the number of permutations of $n + 2$ (distinct) element equals 20 times the number of permutations of n (distinct) elements, find the value of n.