Math 4b. Combinations.

Explanation:

There are 5 chairs and 5 kids in the room. In how many ways can the kids sit on these chairs? The first kid can choose any chair. The second kid can choose any of the 4 remaining chairs, the third child has a choice between the three chairs, and so on. Therefore, there are

 $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$ ways how all of them can choose their places. This expression can be represented as 5! (five factorial). By definition:

 $5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5!$ or $n \cdot (n-1) \cdot (n-2) \cdot ... \cdot 3 \cdot 2 \cdot 1 = n!$

How many different ways are there to choose 3 students to participate in the math Olympiad, essay competition, and history competition out of 8 students (one student in each competition)?

How many different ways are there to choose a team of 3 students out of 8 to participate in the math Olympiad?

In both cases, we have 8 possible choices for the first student, 7 possible choices for the second student, and 6 different choices for the third one. So, there are $8 \cdot 7 \cdot 6$

different possible groups of students?

What are the similarities in these two

problems? Can you see the difference between them?





Problems:

- There are 25 rows in a theater, 20 seats in each raw.
 a) If all tickets are sold, how many ways are there for all people to seat?
 b) If only 2 tickets are sold?
 - c) Only 10?
- 2. Mother has 2 apples and 3 pears. Each day she gives one fruit to her kid for lunch. How many different orders are there to give these fruits?
- 3. Peter took 5 exams at the end of the year. Grade for exams are A, B, C, D. How many ways are there to fill his report card?
- 4. There are red and green pencils in a box. How many pencils do you have to take out of the box without seeing them to be sure that you have at least 2 pencils of the same color?