

1 Assignment

Prove that the number of ways to order n items in a row is $n!$.

Hint: Use the multiplication principle we discussed in class. Practice writing it very nicely.

2 A possible solution

We can order n items in a row by choosing the first item, then the second, then the third, etc., placing them in a row as we choose them.

As there are n items when we begin, there are n ways to choose the first item.

There are then $n - 1$ ways to choose the second item (since one possibility has been removed).

There are then $n - 2$ ways to choose the third item.

Continuing in this way for all n items, we eventually find that there are 2 ways to choose the second-to-last item and only 1 way to choose the last item.

Combining all these steps by the multiplication principle, we have

$$n \cdot (n - 1) \cdot (n - 2) \cdot \dots \cdot 3 \cdot 2 \cdot 1 = n!$$

ways to order all n items in a row.

3 ChatGPT

This can be proven using the fundamental counting principle. If we have n items, we can choose the first item in n different ways, the second item in $n-1$ different ways, the third item in $n-2$ different ways, and so on, until we choose the n th item in 1 way.

The number of ways to order the n items is given by the product of the number of choices for each item: $n \cdot (n-1) \cdot (n-2) \cdot \dots \cdot 2 \cdot 1 = n!$.

This is the definition of n factorial, denoted by $n!$. It represents the total number of ways to order n items, and it grows rapidly as n increases. For example, $5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$, which means there are 120 different ways to order 5 items.

Comments on ChatGPT: the last paragraph isn't necessary; it is not part of the proof, it's just some surrounding information/background. Otherwise, this is not bad.