



Problem 1 – The Counting Principle

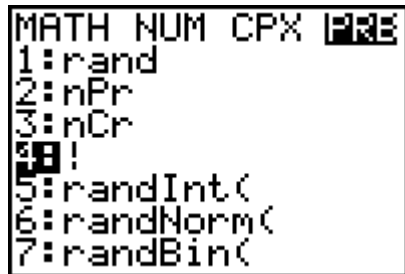
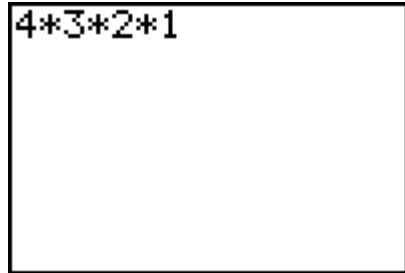
Rearrange the letters in the word MATH as many different ways as possible.

- How many different arrangements are possible?

A quicker way to find the number of arrangements is to use the counting principle. There are 4 choices for the first letter, 3 choices for the second letter, 2 choices for the third letter, and 1 choice for the fourth letter, so there are $4 \cdot 3 \cdot 2 \cdot 1$ choices in all.

Use your calculator to find the number of arrangements with the counting principle.

You can also write this expression as $4!$. Try it in your calculator. To type the factorial symbol $!$, go to **MATH** > PRB and choose it from the menu.



- Suppose you are determining the batting order for nine players on a baseball team. Use the counting principle to find how many different batting orders are possible. Evaluate your expression two ways.

Problem 2– Permutations and Combinations

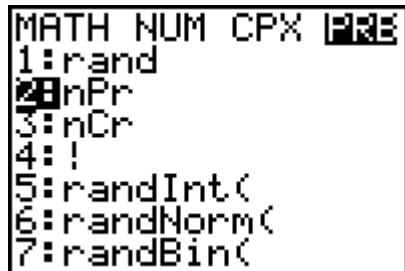
A permutation ${}_n P_r$ is an **ordered** group of objects. The number of permutations of r objects chosen from a group of n objects is given by the formula ${}_n P_r = \frac{n!}{(n-r)!}$.

The school is having tryouts for 8 leading roles for the spring musical. If 15 people audition, how many different ways can these roles be filled?

- What is n ? r ?

Use the permutations formula and the **nPr** command to answer the question. Type the number n , choose the **nPr** command from the **MATH** > PRB menu, and then enter the number r .

- How many different main casts could there be?





What's Your Combination?

A combination is an **unordered** group of objects. The number of combinations of r objects chosen from a group of n objects is given by the formula ${}_nC_r = \frac{n!}{r!(n-r)!}$.

How many different 5-card hands can be dealt from a 52-card deck?

- What is n ? r ?

Use the combinations formula and the **nCr** command to answer the question. Type the number n , choose the **nCr** command from the **[MATH]** > PRB menu, and then enter the number r .

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MATH NUM CPX PRB
1:rand
2:nPr
3:nCr
4:!
5:randInt(
6:randNorm(
7:randBin(
```

- How many different 5-card hands are possible?

Exercises

For each situation, decide whether to use the counting principle, the formula for the number of permutations, or the formula for the number of combinations. Then answer the question.

1. A mail-order company chooses 3 DVDs from a list of 40 to send you. How many different groups can they choose?
2. Information in the human genome is stored in four chemicals called bases, which can be represented by the letters A, T, G, and C. These bases are read in groups of three. How many different groups of 3 bases are possible?
3. How many different 13-card hands can be made from a 52-card deck?
4. Social Security Numbers can include any of the digits from 0-9 and are 9 digits long. How many different Social Security Numbers are possible?
5. In the Powerball lottery game, five balls are chosen from a container of balls numbered 1-55 and one ball, called the powerball, is chosen from a container of balls numbered 1-42. How many different winning numbers are possible?