Permutations - Part II

Preliminaries and Objectives

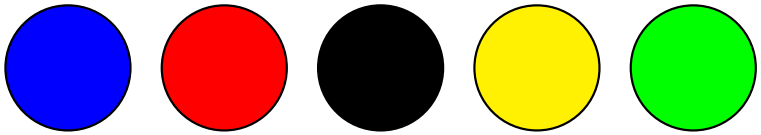
Preliminaries

- General Counting Principle
- Permutations
- Factorial Notation

Objectives

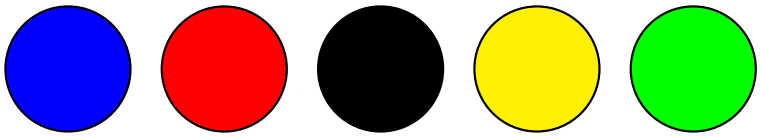
- Count the number of ways to put k out of n objects in order.
- Notations for calculating permutations.

Partial Permutations



From a collection of five colored marbles, in how many ways, can you place three marbles in order?

Partial Permutations



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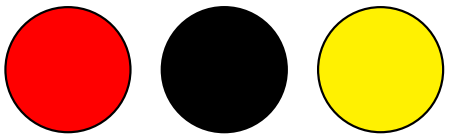

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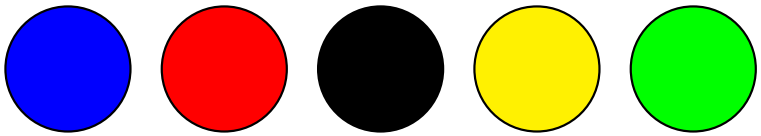

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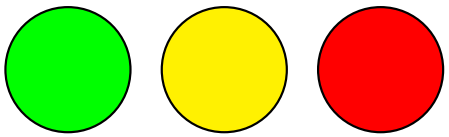

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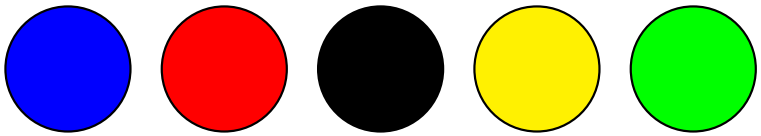

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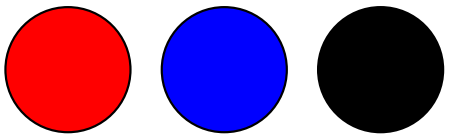

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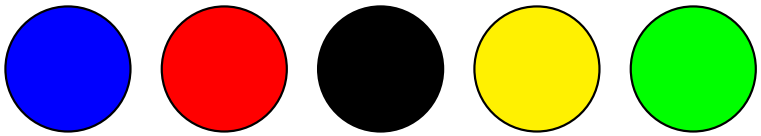

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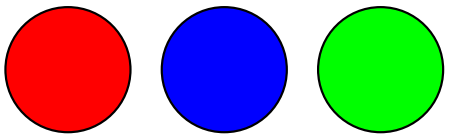

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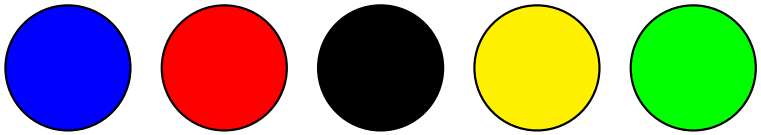

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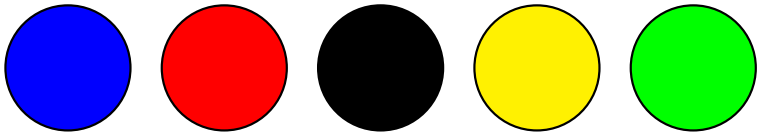
____ ____ ____

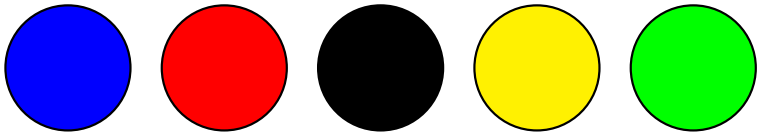
Partial Permutations



From a collection of five colored marbles, in how many ways, can you place three marbles in order?

5 ____ ____ ____

Partial Permutations



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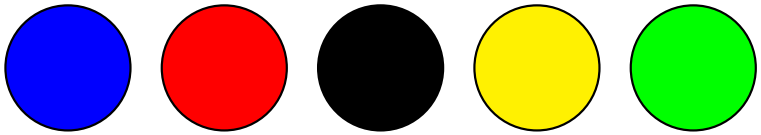
5 4 ____

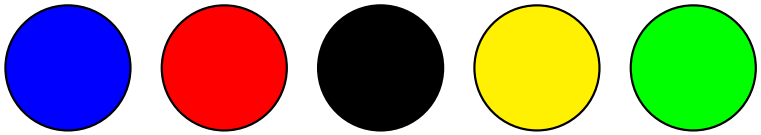
Partial Permutations



From a collection of five colored marbles, in how many ways, can you place three marbles in order?

5 _____ 4 _____ 3 _____

Partial Permutations



From a collection of five colored marbles, in how many ways, can you place three marbles in order?

$$\underline{5} \times \underline{4} \times \underline{3} = 60$$

Procedure for counting partial permutations

To place k out of n objects in order:

- Write k blanks.
- Put n in the first blank
- In each remaining blank, decrease the number by 1.
- Multiply the numbers in the blanks to get the final answer.

Factorial Formula for Permutations

How many ways are there to place 3 out of 5 objects in order?

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Answer : $5 \times 4 \times 3 = 60$

$$5 \times 4 \times 3 = \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} = \frac{5!}{2!}$$

Permutation Formula

How many ways are there to place k out of n objects in order?

$$\text{Answer: } \frac{n!}{(n-k)!}$$

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$$P(n,k) = {}_nP_k = (n)_k = \frac{n!}{(n-k)!}$$

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