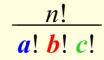
### 4.3 PermutationsWithIdenticalElements.notebook

## **4.3 Permutations with Identical Elements**

Sometimes permutations will occur where some items are **identical**. In other words, you cannot tell them apart.

The number of permutations of a set of *n* objects containing:

- *a* identical objects of one kind;
- **b** identical objects of another kind;
- c identical objects of a third kind.



and so on, if there are more identical objects.

Example 1: How many distinct permutations of the letters of the word

Example 2: How many distinct permutations of the letters of the word OTTAWA are there that begin and end with the letter T?

#### Example 3:

- a) A stuffed animal game machine has 15 identical monkeys, 10 identical bears, and 6 identical elephants. If you are guaranteed a prize for every game and you play the game until the machine is empty, how many arrangements of prizes could you win?
- Ex:
- (a) How many distinct seven digit numbers can be constructed from the digits 1, 2, 2, 3, 3, 4, 5?
- (b) How many of these would be *odd numbers*?
- b) If the question is reworded to become "a stuffed animal game machine has 15 distinct monkeys, 10 distinct bears, and 6 distinct elephants and if you are guaranteed a prize for every game and you play the game until the machine is empty, how many arrangements of prizes could you win?
- (c) How many of these would be less than 3,000,000?

# 4.3 PermutationsWithIdenticalElements.notebook

## Ex:

In how many ways can 6 friends line up for movie tickets if Brad must always be ahead of Sam and nobody can distinguish between the Simpson twins?

## Ex:

In how many ways can 9 friends line up for a photograph if James and Lee must stand next each other, and Harpreet and Fatima must not stand next to each other?