**4.4 Permutations When Objects Are Identical**

**By the end of the lesson you will be able to:**

1. Solve for the number of permutations when some objects are identical
2. Solve a permutation problem involving routes

When objects are identical, we can still solve for the number of permutations possible.

The number of permutations for *n* objects, where *a* are identical, another *b* are identical, another *c* are identical, and so on, is:

$$P= \frac{n!}{a!b!c!…}$$

For example, in a set of four objects: *a, a, b* and *b*, the number of different permutations, P, is

$$P= \frac{4!}{2!2!}= \frac{24}{2×2}=6$$

**Example 1 – Solving a permutation problem where objects are alike**

How many different arrangements can be made using 9 flags: 1 green, 1 yellow, 2 white, 3 blue and 2 red?

**Example 2 – Solving permutation problems with identical objects involving cases**

How many ways can the letters of the word CANADA be arranged, if the first letter much be N and the last letter must be C?

**Example 3 – Permutation problems involving routes**

Julie’s home is three blocks north and five blocks east of her school. How many routes can Julie take home from school if she always travels either south or east.



 

 

**Practice**: P. 266 #2, 3, 5-7, 9-10, 11b, 16, 18