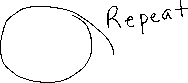
**4.4 Permutations When Objects Are Identical**



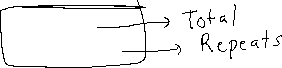
**By the end of the lesson you will be able to:**



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.

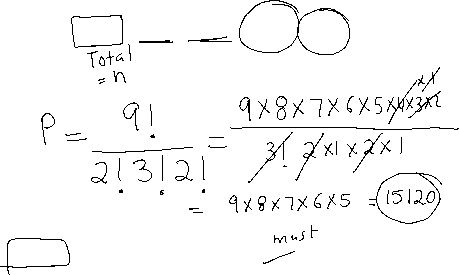
The number of permutations for *n* objects, where *a* are identical, another *b* are identical, another *c* are identical, and so on, is:



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

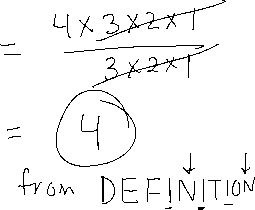
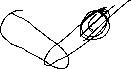
**Example 1 – Solving a permutation problem where objects are alike**

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

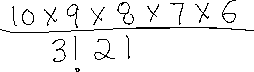
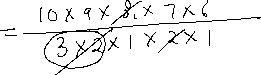


**Example 2 – Solving permutation problems with identical objects involving cases**

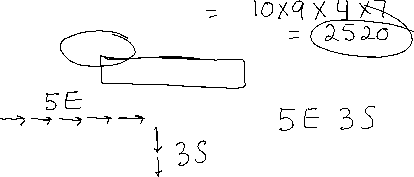
How many ways can the letters of the word CANADA be arranged, if the first letter much be N and the last letter must be C?

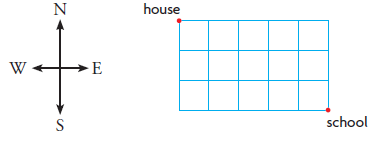


**Example 3 – Permutation problems involving routes**

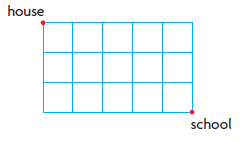


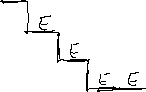
Julie’s home is three blocks north and five blocks east of her school. How many routes can Julie take home from school if she always travels either south or east.

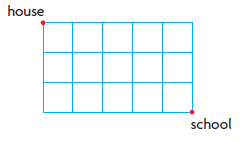


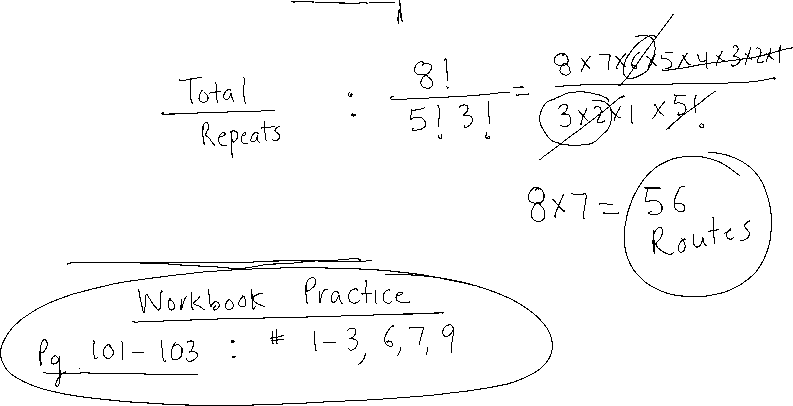












**Practice**: P. 266 #2, 3, 5-7, 9-10, 11b, 16, 18