**2.2 Factorial Notation and Permutations (continued)**

**Permutations**

**(1) Number of permutations of *n* distinct objects taken all at a time =**

There are 10 different books. How many ways can they be arranged on a shelf?

Determine the number of permutations of five candidates’ names on a ballot.

A baseball coach is determining the batting order for the nine players he is fielding. The coach has already decided that he wants the pitcher to hit last. How many different batting orders are possible?

**(2) Number of permutations of *n* distinct objects taken *r* at a time (r** $\leq $ **n)**

Use your calculator to determine 12P8

There are 10 different books. How many ways can 4 of these books be arranged on a shelf?

A popular rock group has written 30 songs, from which it selects to perform at a concert. How many different opening sequences of three songs can be performed?

Tania needs to create a password. It can use any digits from 0 to 9 and / or any letters of the alphabet. The password is case sensitive, so she can use upper- and lower-case letters. A password must be at least five and a maximum of seven characters long. Each character can only be used once in the password. How many different passwords are possible?

**(3) Number of permutations of *n* objects if *a* objects are alike, another *b* objects are alike, another *c* objects are alike… =**