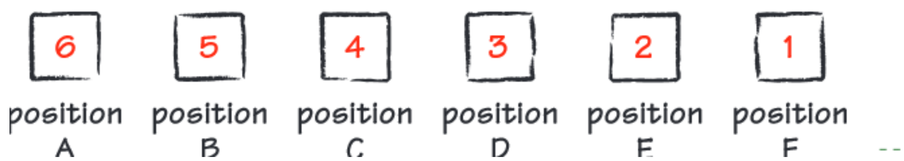
Section 2.2: Factorial Notation

Example 1:

There are 6 children in a group. How many different arrangements can be created as they form a line?

Idea: There are 6 different objects and 6 different positions to occupy.



Total number of permutations:

P =

Many examples involve arrangements where you multiply numbers decreasing by 1.

This is called FACTORIAL.

For example,

6 x 5 x 4 x 3 x 2 x 1, can be written as 6! and read as "6 factorial"

In general,

$$n! = n(n-1)(n-2)(n-3)........(2)(1) \text{ where } n \in N$$

$$0! = 1$$

Note the connection between the Fundamental Counting Principle and factorial notation n!

Example 2:

In how many different ways can a set of 5 books be arranged on a shelf?

Complete the table. What pattern do you notice?

n	$n!$	$n(n - 1)!$
1		
2		
3		
4		
5		

Example 3:

Evaluate the following:

NOTE: There is a factorial button on your calculator!

a) $7!$

b) $\frac{9!}{6!}$

c) $\frac{12!}{9!3!}$

d) $\frac{100!}{97!}$

Example 4:

Identify and correct the error in the student's solution.

$$\frac{640!}{638!\,4!}$$

$$\frac{640\times 639\times 638!}{638!\,4!}$$

$$\frac{640\times 639}{4!}$$

$$160\ \frac{\cancel{640}\times 639}{\cancel{4!}}$$

$$102\ 240$$

Example 5:

Simplify the following where $n \in N$:

a) $(n+3)(n+2)!$

b) $\dfrac{3!(n+1)!}{2!(n-1)!}$

c) $\dfrac{(2n+1)!}{(2n-1)!}$

d) $\dfrac{(n-5)!}{(n-3)!}$

Example 6:

Solve the following where $n \in N$:

a) $\dfrac{(n+2)!}{(n+1)!} = 10$

b) $\dfrac{n!}{(n-2)!} = 90$

Practice Questions:

p. 81-83, #5acef,3bc,4,6abef,11bcd,7,8,12,13,14