Factorials

The **factorial** of a number is **the product of all the whole numbers (except zero) that are less than or equal to that number.**

For example, to find the factorial of 7 you would multiply together all the whole numbers, except zero, that are less than or equal to 7.

7! = 7 x 6 x 5 x 4 x 3 x 2 x 1 = 5,040

The factorial of a number is shown by putting an exclamation point after that number. So, 7! is a way of writing "the factorial of 7" (or "7 factorial").

Here are some factorials:

1! = 1 = 1

2! = 2 x 1 = 2

3! = 3 x 2 x 1 = 6

4! = 4 x 3 x 2 x 1 = 24

5! = 5 x 4 x 3 x 2 x 1 = 120

6! = 6 x 5 x 4 x 3 x 2 x 1 = 720

7! = 7 x 6 x 5 x 4 x 3 x 2 x 1 = 5,040

Factorials on a TI-83 or 84 graphing calculator:

1. Type in the number that you are taking the factorial of
2. Press the **MATH** key
3. Press the *right arrow* key 3 times, **PRB** should be highlighted on the calculator screen.
4. Press the *down arrow* key 3 times, Option **4: !** should be highlighted on the calculator screen
5. Press the **ENTER** key twice and the value of your factorial will be calculated.

Factorials are useful because they can **show how many different ways there are to order or arrange a set** of things.

For example, if there are 5 books on a shelf, how many different ways can the books be ordered or arranged on the shelf? To solve, find the factorial of 5.

5! = 5 x 4 x 3 x 2 x 1 = 120

This shows that the books can be arranged 120 different ways.

Note : Mathematicians have decided that **the factorial of zero, or 0!, is 1.**

Why?

A set of nothing, an empty set, can only be arranged in just **one** way — as nothing — an empty set.