FACTORIAL

Factorial is an important topic in quantitative aptitude preparation. The factorial of a non negative integer n is denoted as n! The notation was introduced by Christian Kramp in 1808.n! is calculated as the product of all positive integers less than or equal to n.

i.e 6! = 1 * 2 * 3 * 4 * 5 * 6 = 720

n! = 1 when n = 0, and n! = (n-1)! * n if n > 0

n! is the number of ways we can arrange n distinct objects into a sequence.

2! = 2 means numbers 1, 2 can be arranged in 2 sequences (1, 2) and (2, 1).

We can arrange 0 in one way. So 0! = 1, not zero. Now we know why, and no need to say "its like that" if someone asks ;-)

Find the highest power of a prime number in a given factorial

The highest power of prime number p in n! = $[n/p^1] + [n/p^2] + [n/p^3] + [n/p^4] + \ldots$.. where $[n/p^1]$ denotes the quotient when n is divided by p

Solved Example:
The maximum power of 5 in 60!
Sol: 60! = 1 x 2 x 3 ....60 so every fifth number is a multiple of 5. So there must be 60/5 = 12
In addition to this 25 and 50 contribute another two 5's. so total number is 12 + 2 = 14
Short cut: $[60/5]+[60/5^2]=12+2=14$
Here [ ] Indicates greatest integer function.
Solved Example:
How many zero's are there at the end of 100!
Sol: A zero can be formed by the multiplication of 5 and 2. Since 100! contains more 2's than 5's, we can find the maximum power of 5 contained in 100!

For your understanding:
⇒100/2+100/4+100/8+100/16+100/32+100/64 = 50 + 25 + 12 + 6 + 3 + 1 = 97
⇒100/5+100/25=20+4=24