Problem 5

(2 points) Give an algorithm that given an integer n computes n!, that is n factorial, in time O(log n) on an EREW PRAM with n processors. Make the unrealistic assumption that a word of memory can store arbitrarily large integers.

Program FACT(int a, int b, processors P):
  1: **return** FACT(a, $\frac{b}{2}$, $\frac{P}{2}$) $\times$ FACT($\frac{b}{2} + 1$, b, $\frac{P}{2}$)

Intuitively, our base case will be when a = b and we will return this value (a or b, arbitrarily). Then on the level above, it is a single operation to multiply two items together.

Our initial base-call is then **FACT(1, n, P)**, which will produce the following tree.