Formula Documentation

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1 Intro and About

This program, `formula`, will read in an integer and display the $(1+x)^n$ binomial expansion using a combination of C integers and strings.

2 Data Structures

This program uses built in C ints as the data structure, so there it can only store up to $2^{31}-1$ for an integer. Anything larger will crash the program, and the program does not allow you to input 32 or above.

3 Run Time Analysis

The worst case of each function is the following:

- `nCr` - $O(n+r$

  This is always $O(n+r)$ where n is the integer n to choose the integer 4

- `Factorial` - $O(n)$

  This is always $O(n)$ where n is the number. 10 takes 10 steps, as it is $10*9*8*7*6*5*4*3*2*1$. It can be $O(1)$ if a zero is passed, in which case it returns 1.

- `Help` - $O(1)$

  This is always constant time because it prints a string.

- `Expand` - $O(n)$

  This is always $O(n)$ where n is the size to expand to.

4 Space Analysis

The program can only read up to $2^{31} - 1$, due to the constraints of the program. Afterword, pointers are freed using `free`. Anything larger than 12 gives overflow, and the program will display that these answers will not be correct.