Math 239 Peter Nelson MC 5134

Tutorial MC 2066 3:30 - 4:20 Tuesday Aaron Chan

Assignment 11 AM Wednesday (11 total, 10 used)

10/30/60 Assignment/Midterm/Final (midterm July 2.)

$\frac{1}{3}M + \frac{2}{3}F \geq 50\%$ to pass

Enumeration (counting)

- How many binary strings of length n are there?

  2^n 00101

  - How many do not contain "000" as a substr?

- How many ways are there to make change for \$1.00?

- How many k-element subsets are ther of $\{1, 2, \ldots, n\}$?

  $\binom{n}{k}$ $\left(= \frac{n!}{k!(n-k)!}\right)$

- How many orderings are there of $\{1, 2, 3, \ldots, n\}$?
  (Permutation) ↳ So that no two even numbers are adjacent

  $n!$

- How many ways are there, given 100 letters addressed to 100 different people, and 100 labeled envelopes, to put a letter in each envelope? 100!

- so that <u>everyone</u> gets the wrong letter?

(Disargements) $\frac{100!}{e}$ rounded.

- How many polyominos are there with n squares?

$n = 4$ ans: 7 $n = 50$?

- Given n right parentheses and n left parentheses, how many orderings are 'valid'?

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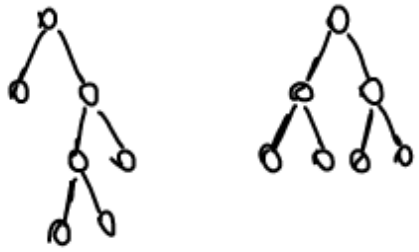
How many binary trees are there with n vertices?



- How many prime numbers p are there so that $p+2$ is also prime?

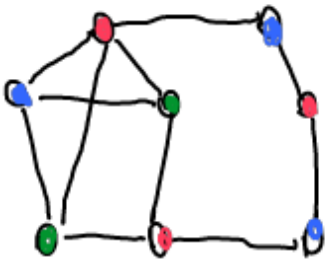
(Twin primes) Zhang: there is a prime between p, $p + 70\,000\,000$ indefinitely often.

- Roughly how big is the n^{th} Fibonacci number?

1, 1, 2, 3, 5, ...

Graph Theory

- Can the vertices of a graph G be coloured with 2/3/n colours so that adjacent vertices get different colours?



- Can a graph be drawn in the plane so that no two edges cross?

(Planarity) on a sphere surface or a torus

- What is important on the internet?

- Can we 'traverse' a given graph using each vertex/edeg exactly once, returning to the starting point?