

# Final Project Documentation

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Due 11:59 pm, Monday, May 25

## 1 Recurrence Relations/Dynamic Programming

### 1.1 Bell numbers

The Bell numbers represent the number of ways to count partitions of (or equivalently equivalence relations on) an  $n$  element set. The  $n$ -th bell number is given by the recurrence

$$B_n = \sum_{k=1}^n \binom{n-1}{k-1} B_{n-k}$$

### 1.2 Catalan numbers

### 1.3 Fibonacci numbers

The Fibonacci numbers, commonly denoted  $F_n$ , form a sequence such that each number is the sum of the two preceding ones, with  $F_0 = 0$ ,  $F_1 = 1$ , and the recurrence given by

$$F_n = F_{n-1} + F_{n-2}$$

- 1.4 Stirling numbers of the first kind
- 1.5 Stirling numbers of the second kind
- 2 Permutations and Combinations

- 2.1  $n$  choose  $k$
- 2.2  $n$  pick  $k$
- 2.3  $n$  choose  $k$ , repetition allowed
- 2.4  $n$  pick  $k$ , repetition allowed
- 2.5 Generate permutations of a string
- 2.6 Generate all bit strings of length  $n$

### 3 Relations

- 3.1 # of relations
- 3.2 # of transitive relations
- 3.3 # of (ir)reflexive relations
- 3.4 # of symmetric relations
- 3.5 # of antisymmetric relations
- 3.6 # of equivalence relations

### 4 Sets

- 4.1 Generate power set
- 4.2 Generate cartesian product

### 5 Default

No documentation provided.