

kreher-stinson

**Algorithms from the book implemented
in GAP**

Version 1.0

29 January 2016

**Rafael Villarroel-Flores
Citlalli Zamora-Mejía**

Rafael Villarroel-Flores Email: rvf0068@gmail.com
Homepage: <http://rvf0068.github.io>

Citlalli Zamora-Mejía Email: cizame@gmail.com

Copyright

© 2016 by Rafael Villarroel-Flores and Citlalli Zamora-Mejía

kreher-stinson package is free software; you can redistribute it and/or modify it under the terms of the [GNU General Public License](#) as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

Contents

1	Generating Combinatorial Objects	4
1.1	Subsets	4
2	Backtracking	5
2.1	Knapsack	5
2.2	Generating all cliques	5
2.3	Exact cover	6
2.4	Exercises	6
	Index	7

Chapter 1

Generating Combinatorial Objects

1.1 Subsets

1.1.1 KSSubsetLexRank

▷ `KSSubsetLexRank(number, subset)` (function)

Returns the rank of *subset* as a subset of the set of numbers from 1 to *number* (Algorithm 2.1).

1.1.2 KSSubsetLexUnrank

▷ `KSSubsetLexUnrank(number, rank)` (function)

Returns the subset of $\{1..number\}$ whose rank is *rank*. (Algorithm 2.2).

Chapter 2

Bactracking

2.1 Knapsack

2.1.1 KSCheckKnapsackInput

▷ `KSCheckKnapsackInput(profits, weights, capacity)` (function)

Checks for valid input data for the Knapsack problems (Problems 1.1-1.4).

2.1.2 KSKnapsack1

▷ `KSKnapsack1(profits, weights, capacity)` (function)

Implementation of Algorithm 4.1.

2.1.3 KSKnapsack2

▷ `KSKnapsack2(profits, weights, capacity)` (function)

Implementation of Algorithm 4.3.

2.2 Generating all cliques

2.2.1 KSAllCliques

▷ `KSAllCliques(graph)` (function)

Implementation of Algorithm 4.4. A graph G is defined by the list *graph*, which must be a list of subsets of $\{1, \dots, n\}$, for some integer n . The neighbors of vertex i are the elements of *graph*[i].

2.3 Exact cover

2.3.1 KSExactCover

▷ `KSExactCover(number, cover)` (function)

Finds an subcollection of *cover* (which is a set of subsets of $\{1, \dots, \textit{number}\}$) that is an exact cover of $\{1, \dots, \textit{number}\}$, if it exists.

2.4 Exercises

2.4.1 KSQueens

▷ `KSQueens(size)` (function)

Solves the n queens problem for a $\textit{size} \times \textit{size}$ board.

Index

KSAllCliques, [5](#)
KSCheckKnapsackInput, [5](#)
KSExactCover, [6](#)
KSKnapsack1, [5](#)
KSKnapsack2, [5](#)
KSQueens, [6](#)
KSSubsetLexRank, [4](#)
KSSubsetLexUnrank, [4](#)