58131 Data Structures
IV exercise, week 46/2003, English translation

Exercise IV.1: The quick sort algorithm can use counting sort for partitioning its input, even when the input does not consist of numbers.

(a) How? Give the pseudocode and its explanation.

(b) How would this be useful?

(c) How would this be harmful?

Exercise IV.2: Starting with an empty unbalanced search tree, add these numbers as keys in this order:
$$41, 38, 31, 12, 19, 8$$
Draw a sequence of pictures which shows the tree after each insertion. Explain each step.

Exercise IV.3: Do Exercise IV.2 again, this time using the red-black search tree instead.

Exercise IV.4: The lectures outlined how to insert into a 2-3-4 tree. Find out more about it, and do Exercise IV.2 again, this time using it instead.
One possible source is Chapter 18.2 with $t = 2$ of the course book:

> T. H. Cormen, C. E. Leiserson, R. L. Rivest, C. Stein: *Introduction to Algorithms. Second Edition.*

(This book is in the departmental library. The corresponding Chapter is 19.2 in its first edition.)

Exercise IV.5: In fact, a red-black tree can be easily converted into a 2-3-4 tree and vice versa. How?

Exercise IV.6: The lectures outlined how to insert into an AVL tree. Find out more about it, and do Exercise IV.2 again, this time using it instead.
One possible source in Chapter 9.2 of the following book:

> M. T. Goodrich, R. Tamassia: *Algorithms in Java. 2nd Edition.*

(This book is in the departmental library.)

(Total number of exercises: 6 pcs.)