Implementation of DBMS
Exercise Sheet 4
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1) We have a data file with 10^5 records. Records and blocks are like in task 3a) of Sheet 3. How many blocks do we need for the data file?
a) We use spanned storage.
b) We use unspanned storage.

2) We have a sequential file that consists of 5 primary blocks. The first block takes records with key values in the range 1-10, the second block takes records with key values in the range 11-20 and so on. Each block can store up to three records. In case of full blocks, we create overflow blocks. Initially all blocks are empty. We insert records with the following key values in the given order:
27, 32, 5, 24, 44, 26, 1, 15, 21, 3, 11, 47, 42, 22, 29, 19, 28, 41, 17, 25, 13, 49, 30, 45, 8, 12, 23, 14
How many overflow blocks does each primary block have?

3) Suppose that we handle insertions into a sequential data file of n records by creating overflow blocks as needed. Also, suppose that the data blocks are currently all half full. If we insert new records at random, how many records do we have to insert before the average number of data blocks (including overflow blocks if necessary) that we need to examine to find a record with a given key reaches 2? Assume that on a lookup we know in which chain of primary and overflow blocks the record we are looking for is located. We search the primary block first, and only search overflow blocks, in order, until we find the record, which is definitely in exactly one of the blocks of the chain.

4) We want to represent physical addresses for a hard disk. For a block address we need to identify the following entities: the cylinder, the track within a cylinder, and the block within a track. To each of these entities we allocate one or more bytes to identify it. Our disk has the following properties:

- 8192 cylinders
- 8 tracks in a cylinder
- 32 blocks in a track

a) How many bytes do we need for a block address?
b) We want construct a record address by adding the position of the byte within a block to the block - address of exercise a). The blocks of the disk consist of 4096 bytes How many bytes would we need for the record address?