Implementation of DBMS
Exercise Sheet 4
Klingemann, WS 2024 / 2025

1) Suppose that we have 4096-byte blocks in which we store records of 100 bytes. The block header consists of an offset table using 2-byte pointers to records within the block. Each day one record is deleted (if records are in the block) and afterwards two records are inserted. A deleted record must have its pointer in the offset table replaced by a tombstone. If the block is initially empty, for how many days can we insert records into a block?

2) We have a data file with 10^4 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.

a) (4096 – 40) bytes / (48 bytes / record) = 84 record
a block of 4096 bytes

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 search the primary block pointed to by the index first, and only search overflow blocks, in order, until we find the record, which is definitely in one of the blocks of the chain.

4) Suppose blocks hold either three records or ten key-pointer pairs. As a function of n, the number of records, at least how many blocks do we need to hold
a) the data file
b) a dense index
c) a sparse index
You can ignore inaccuracies that result from rounding.