



Exercise for Database Systems on Modern CPU Architectures Summer Term 2019

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<https://db.in.tum.de/teaching/ss19/moderndbs/>

Sheet Nr. 03

Exercise 1

We use a free space bitmap to find suitable pages to store data. The bitmap encodes the fill status of each 16 KByte page in 4 bits as follows: It uses the lower range of values (0 to 7) in logarithmic scale and the upper range (8 to 15) in linear scale.

page 1	page 2	page 3	page 4
0010	1001	1101	0100

Perform the following operations and write down the changes on the free space inventory.

- Insert a 50 Byte record
- Insert a 11 KByte record
- Delete a 4 KByte record from page 4

Use the following starting free information to calculate the resulting free space bitmap.

Page 1: 380 Byte

Page 2: 10 KByte

Page 3: 14 KByte

Page 4: 1542 Byte

Assume this free space inventory is for a relation with fixed-size tuples of 100 Byte. How much space is unused due to the implementation of the free space inventory? How much space would be unused when we would encode the whole range in linear scale?

Exercise 2

Draw an optimal record layout for the following schema:

```
CREATE TABLE students (  
  name VARCHAR(128) NOT NULL,  
  email VARCHAR(128) NOT NULL,  
  major_program INT NOT NULL,  
  semester SMALLINT NOT NULL,  
  minor INT,  
  matriculation_no BIGINT NOT NULL PRIMARY KEY  
);
```

Make sure that you have constant time access, minimum size, and optimal alignment.