

1) a)

~~120 + 8 + 12 + 4 + 1~~

~~148 + 1~~ → 149

Avg Rot Delay = 0,5 · rotations · rotational Speed

0,5 · ~~10000 r~~
1 s

~~10000 r~~ ... 1 r / 60 s / 60000 ms
6 ms

• Avg → 3 ms

Seek = time to reach the track

rotational delay = time to reach the sector

transfer time = total read/write time

~~200ms~~ ~~3ms~~ + time to read

130 mb / 1s

130 mb

1000 ms

133120 kb

1000ms

assumed 4 KB
Sector size

→ 8 kb

0,6 ms

512 kb

3,846 ms

64 kb

0,48 ms

Avg seek time

Avg rot delay

avg-total = 4ms + 3ms + time-to-read

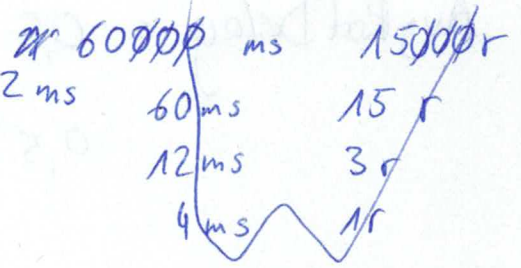
= 7,06ms

1) b)

20 random blocks

~~20 x 8 kb = 160 kb~~

$$20 \times \text{total_time} = 20 \cdot 7,06 = 141,2 \text{ ms}$$



20 consecutive blocks

$$20 \times 8 \text{ kb} = 160 \text{ kB} = 1 \text{ track}$$

$$1 \times \text{seek} + 1 \times \text{rot Delay} + 20 \times \text{read_time} =$$

$$4 + 3 + 20 \cdot 0,06 = 8,2 \text{ ms}$$

1) c) $120 + 8 + 12 + 4 + 1 = 145$ bytes

1) d) blocking factor

$$\frac{8 \text{ k}}{145} = 56,497 = \frac{\text{block length}}{\text{record length}} = \underline{\underline{56}}$$

~~1) e)~~ unspanned

$$1 \text{ block} = 56 \text{ records}$$

$$\rightarrow \frac{40000 \text{ records}}{56 \text{ records/block}} = 715 \text{ blocks}$$

$$\text{wasted per block} = 8192 - (56 \cdot 145) = 72 \text{ bytes}$$

1) e) 715 blocks
 8 k / block
 512 k / track

→ 11,17 tracks ⇒ 12 tracks

$$\begin{aligned} \text{search_time} &= 1 \times \text{seektime} + (12 \times \text{rotDelay} + 11 \times \text{track_to_track} + \\ &\quad \text{read_time}) / 2 \\ &= 4 + (12 \times 3 + 11 \times 0,2 + 42,969) / 2 = 44,585 \text{ ms} \end{aligned}$$

$$715 \times 8k = 5720 \text{ kB}$$

$$\begin{array}{r} 133120 \text{ kB} \\ 5,720 \text{ kB} \\ \hline 1000 \text{ ms} \\ 42,969 \text{ ms} \end{array}$$

$$\text{search_non_cont.} = 715 \times \text{total_time} = 715 \times 7,06 = \underline{\underline{5047,9 \text{ ms}}}$$

$$\begin{aligned} 1) f) \quad \log(n) \cdot \text{total_time} &= \\ &= \log(715) \cdot 7,06 = \underline{\underline{46,40 \text{ ms}}} \end{aligned}$$

~~Assumptions~~ ∃ x ∈ {Assumptions}

2) a)

	$R_E = 65 \times n_E = 125000$	block 16k
seqScan E =	8125000 b	→ 252 records/block → 497 blocks → 7952k = 16384 b
	$R_P = 120 \times n_P = 2000$	
seqScan P =	240000 b	→ 136 records/block → 15 blocks → 240k
	$R_W = 14 \times n_W = 55000$	
seqScan W =	770000 b	→ 1170 records/block → 48 blocks → 768k

seqScan E = ~~125~~ × 64k blocks = 8000k
 seqScan P = 4 × 64k blocks = 256k
 seqScan W = 12 × 64k blocks = 768k
9024k

348160k 1000ms
 9024k 25.919ms

2) b)

idx → 3	18kB idx	18 kB
	+ 3x read R_P	+ 3 × 64 kB
	+ 1x SeqScan P	+ 256 kB
	+ 1x SeqScan E	+ 8000 kB
		<u>8338</u>
		128
		<u>8466</u>
		<u>8466 kB</u>
348160k	1000ms	
8466k	<u>18.572ms</u>	

3)a) 8 groups, 4000 records \Rightarrow 500 bucket height



$$3)b)i) \frac{3 \times 500 + \frac{4}{7} \cdot 500}{4000} = 0,446 \approx 44,6\%$$

$$3)a)ii) \frac{(\cancel{175-133}) - (\cancel{140-133})}{4000} = \frac{(175-133) - (175-140)}{4000} = \frac{(175-140) \cdot 500}{4000} = 0,104 \approx 10,4\%$$

$$3)b)i) \frac{1}{180} \cdot 4000 = 0,005 \approx 0,5\%$$

$$3)b)ii) \left(1 - \frac{1}{180}\right) \cdot 4000 = 0,994 \approx 99,4\%$$

} ANALYZE
 \rightarrow outdated?

$\rightarrow 5 \rightarrow 11\%$, $!9 \rightarrow 92\%$ \rightarrow see 3)c)

3)c)i)

5:	11%	\rightarrow 440
9:	8%	\rightarrow 320
15:	8%	\rightarrow 320
26:	3%	\rightarrow 120

choose

choose not

uniform

$$\begin{array}{l} 5: 440 \\ 15: + 320 \\ 26: + 120 \\ \hline 880 \end{array}$$

320

+ 320

$$= \frac{4000 - 1200}{2800} \rightarrow \frac{2800}{(180-4)} = 15,91$$

$$\Rightarrow (30-4) \cdot 15,91 = 413,66$$

$$\Rightarrow 880 + 413,66 = \underline{\underline{1293,66}} \Rightarrow 0,323 \approx \underline{\underline{32,3\%}}$$

3)c) ii)

15: 8% 320

~~4000~~ $(180-50) \cdot 15.91 = 2068.3$

$(180-50) \cdot 15.91 = 2068.3$

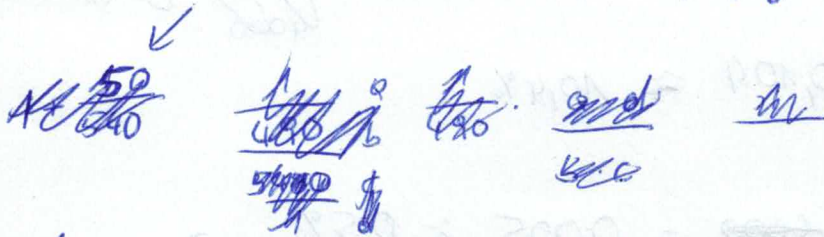
$$\begin{array}{r} 320 \\ + 2068.3 \\ \hline 2388.3 \end{array}$$

$$\frac{2388.3}{4000} = 0.597 \approx \underline{\underline{59.7\%}}$$

3)d)

Selection course

Filter: coursename = "ADBS" OR ects > 6



$$\frac{1}{490} \cdot 540$$

$$\frac{540}{5} = 108 / \text{group}$$

~~$$\frac{1}{490} \cdot 540$$~~

$$3 \cdot 108 + \frac{1}{3} \cdot 108$$

1.102 rows

360 rows

$$= \underline{\underline{361.102}}$$

$$\approx \frac{361.102}{540} \approx \underline{\underline{66.9\%}}$$

selection room

filter: capacity < 300 AND building != "Freihaus"

Capacity $\left\{ \begin{array}{l} 180 \\ 170 \\ 160 \\ 150 \\ 140 \\ 130 \\ 120 \\ 110 \\ 100 \\ 90 \\ 80 \\ 70 \\ 60 \\ 50 \\ 40 \\ 30 \\ 20 \\ 10 \\ 0 \end{array} \right. \frac{1700}{5} = 340 / \text{group}$

$$\frac{300-120}{480-300} = \frac{180}{180} = 1$$

$$\frac{480-120}{360} = \frac{360}{360} = 1$$

$$4 \cdot 340 + 340 \cdot \frac{1}{2} = 1360 + 170 = \frac{1530}{1700} \approx \underline{\underline{90\%}}$$

building $\frac{10}{11} \cdot 1700 = 1545.45 \Rightarrow \frac{1545.45}{1700} \approx 0.909 \approx \underline{\underline{90.9\%}}$

min(90%, 90.9%)

3)d)

Hash Join:

Hash Cond: (reservation.room = room.name)

→ Hash Join

Hash Cond: (reservation.course = course.courseid)

→ Seq Scan on reservation

→ Hash

→ Seq Scan on course

Filter: ((coursename)::text = "ADBS"::text)

→ Hash

→ Seq Scan on room

Filter: ((capacity)::int < 300::int AND (building)::text != "Freihaus"::text)

3)e)