

Homework 3

CS386D Database Systems

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1 Part A

14.7.1

Speed	Bitmap
1.42	001000000000
1.86	000000000010
2.00	000000001000
2.10	010000000000
2.20	000000110000
2.66	100000000000
2.80	000100000101
3.20	000011000000

Speed	Bitmap
1.42	1010
1.86	11101011
2.00	11101001
2.10	01
2.20	11011100
2.66	00
2.80	101111010101
3.20	11010000

Ram	Bitmap
512	011010000000
1024	100101101001
2048	000000010110

Ram	Bitmap
512	010001
1024	0010100100011010
2048	1101110100

HD	Bitmap
80	001000000000
160	000000000011
200	000000100000
250	110110011000
300	000000000100
320	000001000000

HD	Bitmap
80	1010
160	1110101000
200	110110
250	00000100101000
300	11101001
320	110110

14.7.3a

$\frac{1000000m}{8}$ bytes. m bits per record. $1000000m$ total bits, $\frac{1000000m}{8}$ bytes.

2 Part B

1.

- a) I could go all the way to y without getting a false positive.
- b) I would expect the same results.

2.

- a) A bit is 0 with probability $(1 - \frac{1}{50})^3$, so the probability that we get a hit on all 3 hashes is $(1 - (1 - \frac{1}{50})^3)^3 = .00020338$.
- b) A single bit is 0 with probability $(1 - \frac{1}{50})^{3*20}$. The the probability that we get a false positive is $(1 - (1 - \frac{1}{50})^{3*20})^3 = .3466$
- c) False. Definitely not there.

3.

Given m, n , to minimize the probability of a false positive, we use $k = \ln 2 \times m/n$. Since $m = 50$ and $k = 3$, we have $3 = \ln 2 \times 50/n$. Solving for n , we get $n = 50/\frac{3}{\ln 2} = 11.55 \approx 12$ keys.

3 Part C

3.1 1.

5.1.1

$$\pi_{speed}(PC) = SET$$

speed
2.66
2.10
1.42
2.80
3.20
2.20
2.00
1.86
3.06

Average Value = 2.36667

BAG

speed
2.66
2.10
1.42
2.80
3.20
3.20
2.20
2.20
2.00
2.80
1.86
2.80
3.06

Average Value = 2.48462

5.1.2

$\pi_{hd}(PC) =$
SET

hd
250
80
260
320
200
300
160

Average Value = 224.29

BAG

hd
250
250
80
250
260
320
200
250
250
300
160
160
80

Average Value = 216.15384

16.2.2 b, c

b)

Set difference

Relation R		Relation S	
Attribute A	Attribute B	Attribute A	Attribute B
1	3	1	2
2	5	2	5
4	1	5	2

$\pi_A(R - S)$
Attribute A
1
4

$\pi_A(R) - \pi_A(S)$
Attribute A
4

Bag difference

Relation R		Relation S	
Attribute A	Attribute B	Attribute A	Attribute B
1	3	1	2
2	5	2	5
4	1	5	2
1	3	1	3
5	1	1	2

$\pi_A(R - S)$
Attribute A
4
1
5

$\pi_A(R) - \pi_A(S)$
Attribute A
4

c)

Relation R	
Attribute A	Attribute B
1	3
1	5
1	3

$\delta(\pi_A(R))$
Attribute A
1
$\pi_A(\delta(R))$
Attribute A
1
1

3.2 2.

i.

```
select * from HW3_R where joinKey1 = 101;
```

key	name	joinKey1
1	Andrea	101

ii.

```
select * from HW3_R where joinKey1 != 101;
```

key	name	joinKey1
5	John	106

iii.

```
select * from HW3_R where joinKey1 is null;
```

key	name	joinKey1
2	David	NULL
3	David	NULL
4	Dan	NULL

iv.

```
select [name], joinKey1 from HW3_R;
```

name	joinKey1
Andrea	101
David	NULL
David	NULL
Dan	NULL
John	106

v.

```
select joinKey1 from HW3_R;
```

joinKey1
101
NULL
NULL
NULL
106

vi.

```
select * from HW3_R join HW3_S on joinKey1 = joinKey2;
```

```
select * from HW3_R cross join HW3_S where joinKey1 = joinKey2
```

```
select * from HW3_R full outer join HW3_S on joinKey1 = joinKey2 where
    joinKey1 = joinKey2
```

key	name	joinKey1	key	romanNumeral	joinKey2
1	Andrea	101	6	V	101

vii.

```
select * from HW3_R join HW3_S on joinKey1 != joinKey2
```

```
select * from HW3_R cross join HW3_S where joinKey1 != joinKey2
```

```
select * from HW3_R full outer join HW3_S on joinKey1 != joinKey2 where  
    joinKey1 != joinKey2
```

key	name	joinKey1	key	romanNumeral	joinKey2
5	John	106	6	V	101
1	Andrea	101	8	L	105
5	John	106	8	L	105

viii.

```
select * from HW3_R full outer join HW3_S on joinKey1 = joinKey2
```

```
select * from HW3_R right outer join HW3_S on joinKey1 = joinKey2  
UNION  
select * from HW3_R left outer join HW3_S on joinKey1 = joinKey2
```

key	name	joinKey1	key	romanNumeral	joinKey2
1	Andrea	101	6	V	101
2	David	NULL	NULL	NULL	NULL
3	David	NULL	NULL	NULL	NULL
4	Dan	NULL	NULL	NULL	NULL
5	John	106	NULL	NULL	NULL
NULL	NULL	NULL	7	X	NULL
NULL	NULL	NULL	8	L	105

ix.

```
select * from HW3_R left outer join HW3_S on joinKey1=joinKey2
```

```
select * from HW3_R full outer join HW3_S on joinKey1=joinKey2 where not  
    (HW3_R.[key] is null and [name] is null and joinKey1 is null)
```

key	name	joinKey1	key	romanNumeral	joinKey2
1	Andrea	101	6	V	101
2	David	NULL	NULL	NULL	NULL
3	David	NULL	NULL	NULL	NULL
4	Dan	NULL	NULL	NULL	NULL
5	John	106	NULL	NULL	NULL

x.

```
select * from HW3_R where joinKey1 in (select joinKey2 from HW3_S)
```

```
select * from HW3_R where joinKey1 in (select joinKey2 from HW3_S where  
joinKey1 = joinKey2)
```

key	name	joinKey1
1	Andrea	101

xi.

```
select * from HW3_R where not exists (select joinKey2 from HW3_S where  
joinKey1 = joinKey2)
```

```
select * from HW3_R where joinKey1 in (select joinKey1 from HW3_R except  
select joinKey2 from HW3_S) or joinKey1 is null
```

key	name	joinKey1
2	David	NULL
3	David	NULL
4	Dan	NULL
5	John	106