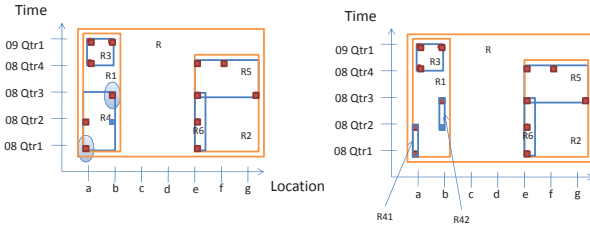




## 4. Indexes

Solutions

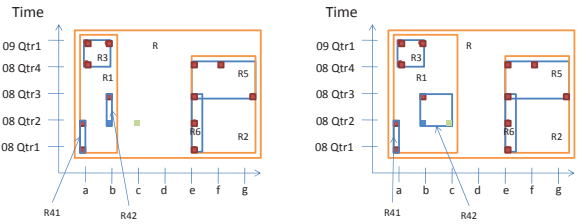
### Exercise 4. a



## 4. Indexes

Solutions

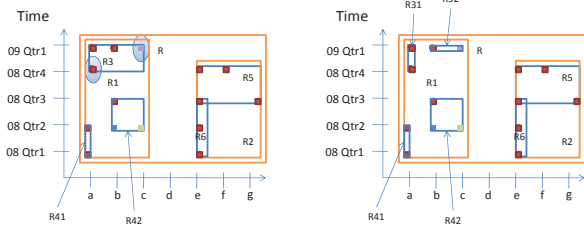
### Exercise 4. a



## 4. Indexes

Solutions

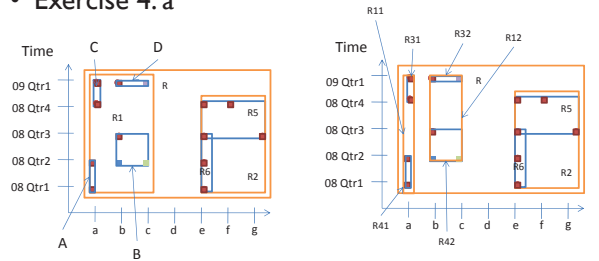
### Exercise 4. a



## 4. Indexes

Solutions

### Exercise 4. a



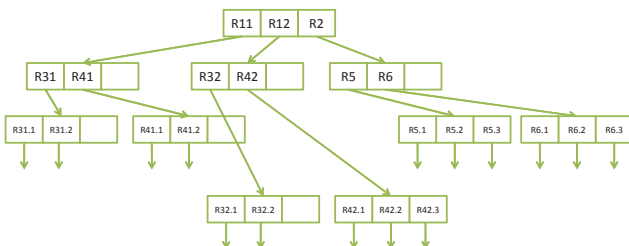
On X, highest minimum rectangles are B and D = 'b', and lowest maximum are A and C = 'a'  
 On Y, highest minimum rectangle is D = '09Qtr1', and lowest maximum is A = '08Qtr2'  
 $Dx = 1/3; Dy = 3/5; \Rightarrow D$  and A will create the new split nodes



## 4. Indexes

Solutions

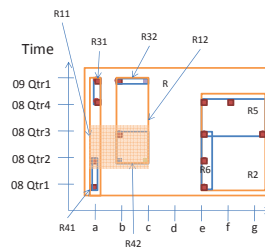
### Exercise 4. b



## 4. Indexes

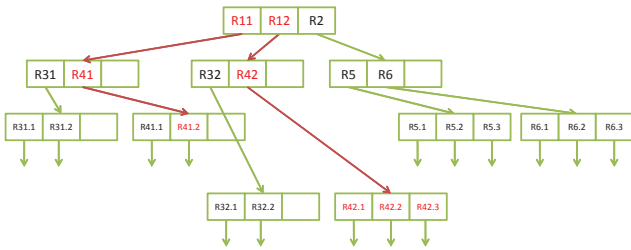
Solutions

### Exercise 4. c



## 4. Indexes *Solutions*

### Exercise 4. c



## 4. Indexes *Solutions*

| ID | Qty | ID_Prod | ID_Day |
|----|-----|---------|--------|
| 1  | ... | 5       | 1      |
| 2  |     | 2       | 1      |
| 3  |     | 3       | 1      |
| 4  |     | 2       | 2      |
| 5  |     | 1       | 3      |
| 6  |     | 3       | 2      |
| 7  |     | 8       | 1      |
| 8  |     | 7       | 1      |
| 9  |     | 5       | 2      |
| 10 |     | 6       | 1      |
| 11 |     | 5       | 3      |
| 12 |     | 3       | 3      |
| 13 |     | 2       | 3      |
| 14 |     | 8       | 4      |
| 15 |     | 6       | 2      |
| 16 |     | 7       | 2      |
| 17 |     | 5       | 4      |
| 18 |     | 3       | 4      |
| 19 |     | 4       | 1      |
| 20 |     | 2       | 4      |
| 21 |     | 1       | 4      |

| ID | Product          | Group       | Category    |
|----|------------------|-------------|-------------|
| 1  | Nokia N8         | Cell Phones | Electronics |
| 2  | BlackBerry Bold  | Cell Phones | Electronics |
| 3  | BlackBerry Storm | Cell Phones | Electronics |
| 4  | Apple Iphone     | Cell Phones | Electronics |
| 5  | Samsung UE46     | TV          | Electronics |
| 6  | Panasonic TX50   | TV          | Electronics |
| 7  | Philips 46PFL    | TV          | Electronics |
| 8  | Panasonic TX46   | TV          | Electronics |

| ID | Qtr | Year |
|----|-----|------|
| 1  | Q1  | 2010 |
| 2  | Q2  | 2010 |
| 3  | Q3  | 2010 |
| 4  | Q4  | 2010 |

## 4. Indexes *Solutions*

### Exercise 5

– Start by building the Z-Curve with the indexes of the dimensions through interleaving

- We have 2 dimensions, Products with 8 products ordered by category and group, and Time, with 4 quarters
- Cell [0][0] represents product with id 1 sold in the first quarter, and so on, hence the mapping!

• Since Nokia N8 was not sold in Q1 there is no mapping hence the empty field, but that is the first element on the Z curve

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|---|---|----|----|----|----|----|----|----|
| 0 |   | 1  | 4  | 5  | 16 | 17 | 20 | 21 |
| 1 |   | 3  | 6  | 15 | 18 | 19 | 22 | 23 |
| 2 |   | 8  | 11 | 12 | 24 | 25 |    |    |
| 3 |   | 10 | 11 | 14 | 26 |    |    | 31 |

## 4. Indexes *Solutions*

### Exercise 5

- On selection of mobile phones over first 2 quarters, one needs to read just [0;3] on Products and [0;1] on Time
- In our 2D space this is from [0][0] to [1][3]
- On Z-Curve this is from  $\text{interleave}(0,0)$  which is 0, to  $\text{interleave}(1, 3)$  which is 7
- So we need to read from 0 to 7 since our region (block) is of size 5, we need to read exactly 2 regions/blocks
- With no index we need to read everything

|   | 0 | 1  | 2  | 3  | 4  | 5  | 6  | 7  |
|---|---|----|----|----|----|----|----|----|
| 0 |   | 1  | 4  | 5  | 16 | 17 | 20 | 21 |
| 1 |   | 3  | 6  | 15 | 18 | 19 | 22 | 23 |
| 2 |   | 8  | 11 | 12 | 24 | 25 |    |    |
| 3 |   | 10 | 11 | 14 | 26 |    |    | 31 |