Relational algebra

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| --- | --- | --- |
| 1. | σ in\_stock ← count(book\_id) (book ⋈ book\_author ⋈ author⋈ book\_storage) | select  (case when *count*(b.book\_id) > 0 then true else false end) as in\_stock from book b  join book\_author ba using (book\_id)  join author a using (author\_id)  join book\_storage where b.book\_name like '%? %' or a.first\_name like '%?%' or a.last\_name like '%?%' |
| 2 | π first\_name, last\_name (client) τ created\_date | select  first\_name,  last\_name from client order by created\_date limit 1; |
| 3 | π book.book\_name, editorial\_book.publication\_year, book\_copy.weight, book\_copy.amount\_pages, book\_translation.language\_name, book\_storage.start\_date (σ ¬ book\_storage.end\_date = null) (book\_copy ⨝ book\_storage ⨝ editorial\_book ⨝ book ⨝ book\_translation) τ book\_storage.start\_date | select  b.book\_name,  eb.publication\_year,  weight,  amount\_pages,  bt.language\_name,  bs.start\_date from book\_copy  join book\_storage bs using (book\_copy\_id)  join editorial\_book eb using (editorial\_book\_id)  join book b using (book\_id)  join book\_translation bt using (book\_id) where end\_date is null order by bs.start\_date limit 1; |
| 4 | π book.book\_name, client.first\_name, client.last\_name, oorder.created\_date ((σ communication.communication\_id = null) (oorder ⨝ communication ⨝ book ⨝ client) γ created\_date)) | select  b.book\_name,  c2.first\_name,  last\_name,  oo.created\_date from oorder oo  left join communication c using (order\_id)  join book b using (book\_id)  join client c2 using (client\_id) where communication\_id is null order by oo.created\_date; |
| 5 | σ count(book\_sale.sale\_id) (σ(book.book\_name = "?" ∨ author.first\_name = "?" ∨ author.last\_name = "?") (sale ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book ⨝ book ⨝ book\_author ⨝ author)) | select *count*(bs.sale\_id) from sale  join book\_sale bs using (sale\_id)  join book\_copy copy2 using (book\_copy\_id)  join editorial\_book eb using (editorial\_book\_id)  join book b using (book\_id)  join book\_author ba using (book\_id)  join author a using (author\_id) where b.book\_name like '%?%' or a.first\_name like '%?%' or a.last\_name like '%?%'; |
| 6 | π author.first\_name, author.last\_name ((σ sale.created\_date > '?' ∧ sale.created\_date < '?') (sale ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book ⨝ book\_author ⨝ author)  γ author.author\_id  τ count(book\_sale.book\_sale\_id) | select  a.first\_name,  a.last\_name from sale  join book\_sale bs using (sale\_id)  join book\_copy copy2 using (book\_copy\_id)  join editorial\_book book using (editorial\_book\_id)  join book\_author ba using (book\_id)  join author a using (author\_id) where created\_date > ? and created\_date < ? group by author\_id order by *count*(book\_sale\_id) desc limit 1; |
| 7 | π client.first\_name, client.last\_name (sale ⨝ client) γ client.client\_id τ count (sale.sale\_id) | select  c.first\_name,  c.last\_name from sale  join client c using (client\_id) group by c.client\_id order by *count*(sale\_id) desc limit 3; |
| 8 | π book.book\_name (book ⨝ book\_translation) γ book.book\_id τ count (book.book\_id) | select  b.book\_name from book b  join book\_translation translation using (book\_id) group by b.book\_id order by *count*(b.book\_id) desc limit 1; |
| 9 | π sale.created\_date, ρfinal\_price(book\_copy.original\_price + book\_copy.profit), book.book\_name ((σ client.first\_name = '?' ∧ client.last\_name = '?') (sale ⨝ client ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book ⨝ book)) τ client.created\_date | select  s.created\_date,  (copy2.original\_price + copy2.profit) as final\_price,  b.book\_name  from sale s  join client c using (client\_id)  join book\_sale using (sale\_id)  join book\_copy copy2 using (book\_copy\_id)  join editorial\_book book2 using (editorial\_book\_id)  join book b using (book\_id) where first\_name = '?' and last\_name = '?' order by c.created\_date; |
| 10 | 1. ρorders\_with\_com(π oorder.order\_id (σ client\_id = '?' (oorder ⨝ communication))) 2. ρorders\_with\_sale(π oorder.order\_id (σ client\_id = '?' ∧ sale.created\_date > oorder.created\_date (oorder ⨝ sale ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book))) 3. π book.book\_name, oorder.created\_date, ρwas\_found(σ order\_id != null (orders\_with\_com)), ρwas\_aquired(σ order\_id != null (orders\_with\_sale)) ((σ oorder.client\_id = '?') (oorder ⨝ orders\_with\_com ⨝ orders\_with\_sale ⨝ book)) | select  book\_name, created\_date,  (CASE  WHEN orders\_with\_com.order\_id is null  THEN false  ELSE true  END) as was\_found,  (CASE  WHEN orders\_with\_sale.order\_id is null  THEN false  ELSE true  END) as was\_aquired from oorder  left join (  select oorder.order\_id  from oorder  join communication c on oorder.order\_id = c.order\_id  where client\_id = 1  ) as orders\_with\_com  using (order\_id)  left join (  select oo.order\_id  from oorder oo  join sale s using (client\_id)  join book\_sale bs using (sale\_id)  join book\_copy copy2 using (book\_copy\_id)  join editorial\_book book2 using (editorial\_book\_id)  where s.created\_date >= oo.created\_date  and oo.client\_id = ?  ) as orders\_with\_sale  using (order\_id)  join book b on oorder.book\_id = b.book\_id where client\_id = ?; |
| 11 | 1. ρdelivery\_by\_book(σ (book ⨯ delivery\_type)) 2. π delivery\_by\_book.book\_name, delivery\_by\_book.delivery\_name, delivery\_by\_book.company\_name, ρdelivery\_price(delivery\_by\_book.price\_per\_kilo \* editorial\_book.weight)  (delivery\_by\_book ⨝ editorial\_book) | select  delivery\_by\_book.book\_name,  delivery\_by\_book.delivery\_name,  delivery\_by\_book.company\_name,  *TRUNCATE*((delivery\_by\_book.price\_per\_kilo \* eb.weight), 2) as delivery\_price from (select \*  from book b, delivery\_type d) delivery\_by\_book  join editorial\_book eb using (book\_id); |
| 12 | 1. ρsplitted\_deliveries (π count(book\_sale.book\_sale\_id), sale.sale\_id (σ sale.client\_id = '?' (book\_sale ⨝ book\_sale\_delivery ⨝ delivery ⨝ sale))) 2. π book\_name, tracking\_number, delivery\_name, company\_name, delivery\_status\_name (delivery ⨝ book\_sale\_delivery ⨝ delivery\_type ⨝ delivery\_status ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book ⨝ book ⨝ splitted\_deliveries) | select  book\_name,  tracking\_number,  delivery\_name,  company\_name,  delivery\_status\_name from delivery  join book\_sale\_delivery delivery2 on delivery.delivery\_id = delivery2.delivery\_id  join delivery\_type t on delivery.delivery\_type\_id = t.delivery\_type\_id  join delivery\_status s on delivery.delivery\_status\_id = s.delivery\_status\_id  join book\_sale sale on delivery2.book\_sale\_id = sale.book\_sale\_id  join book\_copy copy2 on sale.book\_copy\_id = copy2.book\_copy\_id  join editorial\_book book2 using (editorial\_book\_id)  join book b using (book\_id)  join (  select  *count*(bs.book\_sale\_id),  sale\_id  from book\_sale bs  join book\_sale\_delivery delivery on bs.book\_sale\_id = delivery.book\_sale\_id  join delivery d on delivery.delivery\_id = d.delivery\_id  join sale using (sale\_id)  where client\_id = ?  group by sale\_id  having *count*(bs.book\_sale\_id) > 1  ) splitted\_deliveries using (sale\_id); |
| 13 | π delivery\_status.delivery\_status\_name (σ delivery.tracking\_number = '?' (delivery\_status ⨝ delivery)) | select delivery\_status\_name from delivery\_status  join delivery d using (delivery\_status\_id) where tracking\_number = ‘?’; |
| 14 | π count(\*) (σ delivery.company\_name = 'XPress' ∧ month(sale.created\_date) = '?' (book\_sale\_delivery ⨝ book\_sale ⨝ delivery ⨝ delivery\_type ⨝ sale)) | select *count*(\*) from book\_sale\_delivery  join book\_sale sale on book\_sale\_delivery.book\_sale\_id = sale.book\_sale\_id  join delivery d on book\_sale\_delivery.delivery\_id = d.delivery\_id  join delivery\_type t on d.delivery\_type\_id = t.delivery\_type\_id  join sale s on sale.sale\_id = s.sale\_id  where company\_name = 'XPress'  and *month*(s.created\_date) = ? |
| 15 | π ρtotal (sum(profit + original\_price)) (σ payment\_type = 'Bit' ∧ month(sale.created\_date) = ? (book\_sale ⨝ book\_copy ⨝ sale ⨝ payment\_type)) | select *TRUNCATE*(*IFNULL*(*sum*(profit + original\_price), 0), 2) as total from book\_sale bs  join book\_copy copy2 on bs.book\_copy\_id = copy2.book\_copy\_id  join sale s using (sale\_id)  join payment\_type t2 using (payment\_type\_id) where payment\_name = 'Bit'  and *month*(s.created\_date) = ?; |
| 16 | 1. ρaverage (π avg(profit) (book\_sale ⨝ book\_copy ⨝ sale ⨝ payment\_type)) 2. π book.book\_name, client.first\_name, client.last\_name, (ρfinal\_price(book\_copy.profit + book\_copy.original\_price)) ((σ sale.created\_date < NOW ∧ sale.created\_date > NOW - 12 MONTHS ∧ book\_copy.profit > average)) | select  book\_name,  *CONCAT*(*CONCAT*(first\_name, ' '), last\_name),  (profit + original\_price) as final\_price from book\_sale bs  join book\_copy copy2 using (book\_copy\_id)  join sale s using (sale\_id)  join payment\_type t2 using (payment\_type\_id)  join editorial\_book eb using (editorial\_book\_id)  join book b using (book\_id)  join client c using (client\_id) where s.created\_date < *NOW*() and s.created\_date > *DATE\_ADD*(*NOW*(), INTERVAL -12 MONTH)  and profit > (select *avg*(profit)   from book\_sale bs  join book\_copy copy2 on bs.book\_copy\_id = copy2.book\_copy\_id  join sale s using (sale\_id)  join payment\_type t2 using (payment\_type\_id)); |
| 17 | π delivery.company\_name, count(book\_sale\_delivery.book\_delivery\_id)  ((σ sale.created\_date < NOW and sale.created\_date > NOW - 12 MONTH γ delivery.company\_name) (book\_sale\_delivery ⨝ book\_sale ⨝ delivery ⨝ book\_copy ⨝ editorial\_book ⨝ sale)) | select  company\_name,  *count*(book\_delivery\_id) from book\_sale\_delivery bs  join book\_sale sale on bs.book\_sale\_id = sale.book\_sale\_id  join delivery d on bs.delivery\_id = d.delivery\_id  join delivery\_type t on d.delivery\_type\_id = t.delivery\_type\_id  join book\_copy copy2 on sale.book\_copy\_id = copy2.book\_copy\_id  join editorial\_book book2 using (editorial\_book\_id)  join sale s on sale.sale\_id = s.sale\_id where s.created\_date < *NOW*() and s.created\_date > *DATE\_ADD*(*NOW*(), INTERVAL -12 MONTH) group by company\_name; |
| 18 | 1. ρmultiple\_edition\_deliveries(π count(distinct book.editorial\_book\_id), book\_id, book\_sale\_delivery.delivery\_id (σ (delivery ⨝ book\_sale\_delivery ⨝ book\_sale ⨝ book\_copy ⨝ editorial\_book) γ book.book\_id, book\_sale\_delivery.delivery\_id)) 2. π book.book\_name, delivery.tracking\_number, delivery\_status.delivery\_status\_name, delivery\_type.delivey\_name, delivery\_type.company\_name (delivery ⨝ multiple\_edition\_deliveries ⨝ delivery\_status ⨝ delivery\_type ⨝ book) | select  book\_name,  tracking\_number,  delivery\_status\_name,  delivery\_name,  company\_name from delivery  join (  select  *count*(distinct book.editorial\_book\_id),  book\_id,  delivery2.delivery\_id  from delivery  join book\_sale\_delivery delivery2 on delivery.delivery\_id = delivery2.delivery\_id  join book\_sale sale on delivery2.book\_sale\_id = sale.book\_sale\_id  join book\_copy copy2 on sale.book\_copy\_id = copy2.book\_copy\_id  join editorial\_book book on copy2.editorial\_book\_id = book.editorial\_book\_id  group by book\_id, delivery2.delivery\_id  having *count*(distinct book.editorial\_book\_id) > 1  ) multiple\_edition\_deliveries using (delivery\_id)  join delivery\_status s using (delivery\_status\_id)  join delivery\_type t using (delivery\_type\_id)  join book using (book\_id); |
| 19 | π client.first\_name, client.last\_name, client.mobile\_number, client.created\_date (σ client\_id - (π client\_id (σ created\_date < NOW ∧ created\_date > NOW - 24 MONTHS (sale)))) | select *CONCAT*(*CONCAT*(first\_name, ' '), last\_name),  phone\_number,  mobile\_number,  created\_date from client where client\_id not in (  select client\_id  from sale s  where s.created\_date < *NOW*() and s.created\_date > *DATE\_ADD*(*NOW*(), INTERVAL -24 MONTH) ); |
| 20 | π client.first\_name, client.last\_name, client.mobile\_number, created\_date (σ client.client\_id ∩ (π oorder.client\_id (σ communication.created\_date < NOW - 14 DAYS ∧ bought\_book.book\_id = editorial\_book.book\_id ∧ sale.client\_id = oorder.client\_id ∧ sale.created\_date >= communication.created\_date (communication ⨝ oorder ⨝ editorial\_book ⨝ book\_copy ⨝ book\_sale ⨝ ρbought\_book(editorial\_book) ⨝ sale)))) | select *CONCAT*(*CONCAT*(first\_name, ' '), last\_name), phone\_number, mobile\_number, created\_date from client where client\_id in (  select o.client\_id  from communication c  join oorder o using (order\_id)  join editorial\_book using (book\_id)  join book\_copy copy2 using (editorial\_book\_id)  join book\_sale sale using (book\_copy\_id)  join editorial\_book bought\_book on copy2.editorial\_book\_id = bought\_book.editorial\_book\_id  join sale s using (sale\_id)  where c.created\_date < *DATE\_ADD*(*NOW*(), INTERVAL -14 DAY)  and bought\_book.book\_id = editorial\_book.book\_id  and s.client\_id = o.client\_id  and s.created\_date >= c.created\_date ); |
| 21 | 1. ρbook\_per\_month(π calendar.dd, book\_storage.book\_copy\_id, book\_storage.start\_date, book\_storage.end\_date, ρis\_between(calendar.dd between book\_storage.start\_date and book\_storage.end\_date) (σ book\_storage.storage\_name = 'Warehouse' (calendar ⨯ book\_storage ⨝ storage))) 2. π MONTH(dd), YEAR(dd), sum(is\_between) (σ book\_per\_month γ MONTH(dd), YEAR(dd) τ YEAR(DD), MONTH(DD)) | select  *MONTH*(dd), *YEAR*(dd),  *sum*(is\_between) from (  SELECT  c.dd,  bs.book\_copy\_id,  bs.start\_date,  *IFNULL*(bs.end\_date, *DATE*(*NOW*())) as end\_date,  (CASE  WHEN c.dd between start\_date and *IFNULL*(bs.end\_date, *DATE*(*NOW*()))  THEN 1  ELSE 0  END) as is\_between  from calendar c, book\_storage bs  join storage s using (storage\_id)  where storage\_name = 'Warehouse' ) books\_per\_month group by 1, 2 order by 2, 1; |
| 22 | π count(book\_copy\_id), sum(original\_price) (σ created\_date between '?' and '?' (purchase ⨝ book\_copy)) | select  *count*(book\_copy\_id),  *sum*(original\_price) from purchase  join book\_copy copy2 using (book\_copy\_id) where created\_date between ‘?' and '?’; |
| 23 | ρmonth\_profit (π (π sum(original\_price + profit) (σ MONTH(created\_date) = ? (sale ⨝ book\_sale ⨝ book\_copy))) - (π sum(original\_price) (σ MONTH(created\_date) = ? (purchase ⨝ book\_copy)))) | select (select *sum*(original\_price + profit)  from sale  join book\_sale bs on sale.sale\_id = bs.sale\_id  join book\_copy copy2 on bs.book\_copy\_id = copy2.book\_copy\_id  where *MONTH*(created\_date) = ?) - (select *sum*(original\_price)  from purchase  join book\_copy copy2 using (book\_copy\_id)  where *MONTH*(created\_date) = ?) as month\_profit; |
| 24 | π YEAR(dd), count(sale.sale\_id) / 12 (σ calendar ⟕ sale) γ YEAR(dd) τ YEAR(dd) | select *YEAR*(dd), *count*(s.sale\_id)/12 from calendar left join sale s on *YEAR*(s.created\_date) = *YEAR*(dd) group by *YEAR*(dd) order by *YEAR*(dd) asc; |
| 25 | π ρnet\_salary(sum(hours\_count \* hourly\_salary)) (σ month\_id = ? ∧ year\_id = ? ∧ employee\_id = ? (employee\_history ⨝ employee\_schedule ⨝ employee)) | select *IFNULL*(*sum*(hours\_count \* hourly\_salary), 0) as net\_salary from employee\_history join employee\_schedule es using (employee\_id) join employee e using(employee\_id) where month\_id = ?  and year\_id = ? and employee\_id = ?; |
| 26 | π employee.first\_name, employee.last\_name (σ month(created\_date) = ? ∧ year(created\_date) = ? (sale ⨝ employee) γ employee\_id τ count(sale\_id)) | select *CONCAT*(*CONCAT*(e.first\_name, ' '), e.last\_name) from sale join employee e using(employee\_id)  where *month*(created\_date) = ?  and *year*(created\_date) = ? group by employee\_id order by *count*(sale\_id) desc limit 1 |