SQL Activity – Monday October 14

Listed on the next two pages are 29 forms of SQL queries.

You may make the following assumptions about the queries:

- `Rlist1` and `Rlist2` are disjoint lists of relations.
- All attribute names are unique across the entire database.
- `cond2` may include references to attributes from relations in `Rlist1`, i.e., correlated references to relations outside of the subquery.

You may make the following assumptions about the data:

- No relations are empty.
- No relations contain NULL values.

Problem 1

For each query type except type (1), if you can write an equivalent query using one of the other types, show the equivalent query.

As an example, query type (7) can always be rewritten equivalently using query type (4). Query (7) is equivalent to:

```
select distinct Alist from Rlist1
where cond1 and exists (select * from Rlist2 where cond2 and A1 <> A2)
```

As another example, query type (19) is equivalent to query type (8) as specified, and vice-versa.

Problem 2

*Find a **minimal** set of query types that is sufficient to express queries equivalent to all 29 query forms.*

A set of query types is minimal if taking any type out of the set would produce a strict loss in expressive power, i.e., not all 29 query forms would be expressible. Include query type (1) in your minimal set.

Problem 3

Repeat Problem 2, except remove `distinct` *from all 29 query form.*

(1) plain: `select distinct Alist from Rlist where cond`
(**cond** contains no subqueries)

(2) in:
```
select distinct Alist from Rlist1
  where cond and A1 in (select A2 from Rlist2 where cond2)
```

(3) not in:
```
select distinct Alist from Rlist1
  where cond1 and A1 not in (select A2 from Rlist2 where cond2)
```

(4) exists:
```
select distinct Alist from Rlist1
  where cond1 and exists (select * from Rlist2 where cond2)
```

(5) not exists:
```
select distinct Alist from Rlist1
  where cond1 and not exists (select * from Rlist2 where cond2)
```

(6) = all:
```
select distinct Alist from Rlist1
  where cond1 and A1 = all (select A2 from Rlist2 where cond2)
```

(7) not = all:
```
select distinct Alist from Rlist1
  where cond1 and not A1 = all (select A2 from Rlist2 where cond2)
```

(8) <> all:
```
select distinct Alist from Rlist1
  where cond1 and A1 <> all (select A2 from Rlist2 where cond2)
```

(9) not <> all:
```
select distinct Alist from Rlist1
  where cond1 and not A1 <> all (select A2 from Rlist2 where cond2)
```

(10) < all:
```
select distinct Alist from Rlist1
  where cond1 and A1 < all (select A2 from Rlist2 where cond2)
```

(11) not < all:
```
select distinct Alist from Rlist1
  where cond1 and not A1 < all (select A2 from Rlist2 where cond2)
```

(12) <= all:
```
select distinct Alist from Rlist1
  where cond1 and A1 <= all (select A2 from Rlist2 where cond2)
```

(13) not <= all:
```
select distinct Alist from Rlist1
  where cond1 and not A1 <= all (select A2 from Rlist2 where cond2)
```

(14) > all:
```
select distinct Alist from Rlist1
  where cond1 and A1 > all (select A2 from Rlist2 where cond2)
```

(15) not > all:
```
select distinct Alist from Rlist1
  where cond1 and not A1 > all (select A2 from Rlist2 where cond2)
```

(16) >= all:
```
select distinct Alist from Rlist1
 where cond1 and A1 >= all (select A2 from Rlist2 where cond2)
```

(17) not >= all:
```
select distinct Alist from Rlist1
 where cond1 and not A1 >= all (select A2 from Rlist2 where cond2)
```

(18) = any:
```
select distinct Alist from Rlist1
 where cond1 and A1 = any (select A2 from Rlist2 where cond2)
```

(19) not = any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 = any (select A2 from Rlist2 where cond2)
```

(20) <> any:
```
select distinct Alist from Rlist1
 where cond1 and A1 <> any (select A2 from Rlist2 where cond2)
```

(21) not <> any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 <> any (select A2 from Rlist2 where cond2)
```

(22) < any:
```
select distinct Alist from Rlist1
 where cond1 and A1 < any (select A2 from Rlist2 where cond2)
```

(23) not < any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 < any (select A2 from Rlist2 where cond2)
```

(24) <= any:
```
select distinct Alist from Rlist1
 where cond1 and A1 <= any (select A2 from Rlist2 where cond2)
```

(25) not <= any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 <= any (select A2 from Rlist2 where cond2)
```

(26) > any:
```
select distinct Alist from Rlist1
 where cond1 and A1 > any (select A2 from Rlist2 where cond2)
```

(27) not > any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 > any (select A2 from Rlist2 where cond2)
```

(28) >= any:
```
select distinct Alist from Rlist1
 where cond1 and A1 >= any (select A2 from Rlist2 where cond2)
```

(29) not >= any:
```
select distinct Alist from Rlist1
 where cond1 and not A1 >= any (select A2 from Rlist2 where cond2)
```