Union, Difference, Intersection, and Division in MySQL
Instructor: Artem Chebotko

```
CREATE TABLE a (x INT, y VARCHAR(5));
CREATE TABLE b (x INT, y VARCHAR(5));

INSERT INTO a(x,y) VALUES(1,'A');
INSERT INTO a(x,y) VALUES(2,'B');
INSERT INTO a(x,y) VALUES(3,'C');
INSERT INTO a(x,y) VALUES(4,'D');
INSERT INTO b(x,y) VALUES(1,'A');
INSERT INTO b(x,y) VALUES(3,'C');
```

```
SELECT * FROM a;        SELECT * FROM b;
+------+------+          +------+------+
| x    | y    |          | x    | y    |
+------+------+          +------+------+
|    1 | A    |          |    1 | A    |
|    2 | B    |          |    3 | C    |
|    3 | C    |          +------+------+
|    4 | D    |
+------+------+
```

Union:

```
SELECT * FROM a UNION SELECT * FROM b;
+------+------+
| x    | y    |
+------+------+
|    1 | A    |
|    2 | B    |
|    3 | C    |
|    4 | D    |
+------+------+
```

```
SELECT * FROM a UNION ALL SELECT * FROM b;
+------+------+
| x    | y    |
+------+------+
|    1 | A    |
|    2 | B    |
|    3 | C    |
|    4 | D    |
|    1 | A    |
|    3 | C    |
+------+------+
```

Difference (MySQL supports no MINUS or EXCEPT):

```
SELECT * FROM a WHERE (x,y) NOT IN (SELECT * FROM b);
+------+------+
| x    | y    |
+------+------+
|    2 | B    |
|    4 | D    |
+------+------+
```

```
SELECT * FROM a
WHERE NOT EXISTS (SELECT * FROM b WHERE b.x = a.x AND b.y = a.y);
+------+------+
| x    | y    |
+------+------+
|    2 | B    |
|    4 | D    |
+------+------+
```

```
-- most efficient way;
SELECT DISTINCT a.x AS x, a.y AS y
FROM a LEFT OUTER JOIN b USING (x, y) WHERE b.x IS NULL;
+------+------+
| x    | y    |
+------+------+
|    2 | B    |
|    4 | D    |
+------+------+
```

Intersection (MySQL supports no INTERSECT):

```
SELECT * FROM a WHERE (x,y) IN (SELECT * FROM b)
+------+------+
| x    | y    |
+------+------+
|    1 | A    |
|    3 | C    |
+------+------+
```

```
SELECT * FROM a
WHERE EXISTS (SELECT * FROM b WHERE b.x=a.x AND b.y = a.y);
+------+------+
| x    | y    |
+------+------+
|    1 | A    |
|    3 | C    |
+------+------+
```

```
-- most efficient way;
SELECT DISTINCT a.x AS x, a.y AS y
FROM a INNER JOIN b USING (x,y);
+------+------+
| x    | y    |
+------+------+
|    1 | A    |
|    3 | C    |
+------+------+
```

```
CREATE TABLE c (x INT, y VARCHAR(5));
CREATE TABLE d (x INT);

INSERT INTO c(x,y) VALUES(1,'A');
INSERT INTO c(x,y) VALUES(2,'A');
INSERT INTO c(x,y) VALUES(3,'A');
INSERT INTO c(x,y) VALUES(1,'B');
INSERT INTO c(x,y) VALUES(2,'B');
INSERT INTO c(x,y) VALUES(3,'C');
INSERT INTO c(x,y) VALUES(3,'D');
INSERT INTO d(x) VALUES(1);
INSERT INTO d(x) VALUES(2);
INSERT INTO d(x) VALUES(3);

SELECT * FROM c;     SELECT * FROM d;
+------+------+      +------+
| x    | y    |      | x    |
+------+------+      +------+
|    1 | A    |      |    1 |
|    2 | A    |      |    2 |
|    3 | A    |      |    3 |
|    1 | B    |      +------+
|    2 | B    |
|    3 | C    |
|    3 | D    |
+------+------+
```

Division (MySQL supports no DIVIDE):

```
SELECT DISTINCT c1.y AS y
FROM c c1
WHERE NOT EXISTS
 (SELECT d.x FROM d
  WHERE d.x NOT IN (SELECT c2.x FROM c c2 WHERE c2.y = c1.y));
+------+
| y    |
+------+
| A    |
+------+

SELECT DISTINCT c1.y AS y
FROM c c1
WHERE NOT EXISTS
 (SELECT * FROM d
  WHERE NOT EXISTS (SELECT * FROM c c2 WHERE c2.y = c1.y AND c2.x = d.x));
+------+
| y    |
+------+
| A    |
+------+
```

```
-- does not work;
SELECT DISTINCT c1.y AS y
FROM c c1
WHERE NOT EXISTS
 (SELECT d.x FROM d LEFT OUTER JOIN c c2 USING (x)
  WHERE c2.y = c1.y AND c2.x IS NULL );
+------+
| y    |
+------+
| A    |
| B    |
| C    |
| D    |
+------+

-- does not work;
SELECT DISTINCT c1.y AS y
FROM c c1
WHERE NOT EXISTS
 (SELECT * FROM d LEFT OUTER JOIN c c2
  ON (d.x = c2.x) WHERE c2.y = c1.y AND c2.x IS NULL );
+------+
| y    |
+------+
| A    |
| B    |
| C    |
| D    |
+------+

-- does not work;
SELECT DISTINCT c1.y AS y
FROM c c1
WHERE NOT EXISTS
 (SELECT * FROM d LEFT OUTER JOIN c c2
  ON (d.x = c2.x AND c2.y = c1.y AND c2.x IS NULL) );

ERROR 1054 (42S22): Unknown column 'c1.y' in 'on clause'
```