

```
-- except-all
```

```
-- Once again, to set up the context for these examples, we use SQL commands
-- that have not been covered yet in the course, such as CREATE TABLE
-- and INSERT INTO. They are a preview of material to come in about a week,
-- but you don't need to understand these commands in any detail yet.
-- The point of these examples is something else: how and when duplicates can
-- exist in a table, and can be returned by a query.
```

```
-- Punchline for this example:
```

```
-- The ALL in "EXCEPT ALL" determines not only how many times a tuple occurs
-- but whether or not it occurs at all!
```

```
-- Setup:
```

```
csc343h-dianehe=> create table P (a int, b int);
csc343h-dianehe=> create table Q (a int, c int);
csc343h-dianehe=> insert into P values
csc343h-dianehe-> (1, 151), (2, 123), (3, 432), (1, 333), (1, 345),
csc343h-dianehe-> (4, 912), (5, 123);
csc343h-dianehe=> insert into Q values
csc343h-dianehe-> (1, 44), (3, 88), (3, 12), (9, 12);
```

```
csc343h-dianehe=> select * from P;
```

```
  a | b
----+-----
  1 | 151
  2 | 123
  3 | 432
  1 | 333
  1 | 345
  4 | 912
  5 | 123
(7 rows)
```

```
csc343h-dianehe=> select * from Q;
```

```
  a | c
----+-----
  1 | 44
  3 | 88
  3 | 12
  9 | 12
(4 rows)
```

```
-- With EXCEPT, a single occurrence of a value for a in Q wipes out
-- all occurrences of it from P. In this case, every 1 value in P
-- is removed as a result of a single 1 value in Q.
```

```
csc343h-dianehe=> (select a from P) except (select a from Q);
```

```
  a
---
  2
  4
  5
(3 rows)

<-- There are no 1s anywhere in this result
```

```
-- But with EXCEPT ALL, we match them up one for one.
-- (And the same diagram and matching can be used to predict the
-- results in whichever direction we are subtracting)
-- Now some of the 1 values are left behind after the set difference.
```

```
csc343h-dianehe=> (select a from P) except all (select a from Q);
```

```
  a
---
```

```
1          <-- There are two 1s in this result
1
2
4
5
(5 rows)

-- Checking the two kinds of set difference in the other direction now.

csc343h-dianeH=> (select a from Q) except (select a from P);
 a
---
 9
(1 row)

csc343h-dianeH=> (select a from Q) except all (select a from P);
 a
---
 3
 9
(2 rows)
```