61A Lecture 34

Wednesday, April 22

Announcements

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- Project 4 due Thursday 4/23 @ 11:59pm

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  - Early point #2: All questions (including Extra Credit) by Wednesday 4/22 @ 11:59pm

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    - Email your code & a screenshot of your art to cs61a-tae@imail.eecs.berkeley.edu (Albert)

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- Homework 9 merged with Homework 10; both are due Wednesday 4/29 @ 11:59pm
- Quiz 4 (SQL) released on Tuesday 4/28 is due Thursday 4/30 @ 11:59pm

Aggregation

Aggregate Functions

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An aggregate function in the [columns] clause computes a value from a group of rows

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create table animals as
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create table animals as
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  select "cat"        , 4        , 10           union
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  select "ferret"     , 4        , 10           union
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```

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  select "t-rex"      , 2        , 12000;
```

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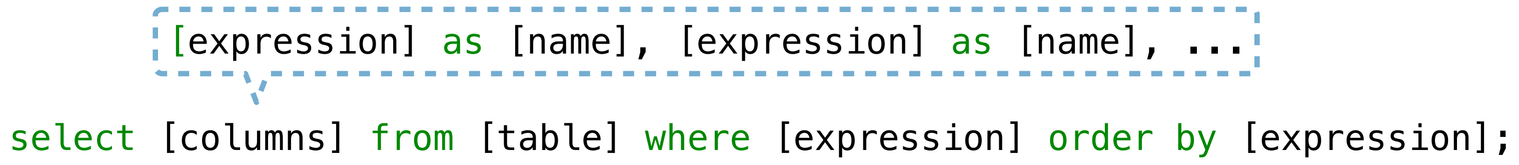

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```

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

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  select "penguin"    , 2        , 10           union
  select "t-rex"      , 2        , 12000;
```

```
select max(legs) from animals;
```

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

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```

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
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penguin	2	10
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```
select max(legs) from animals;
```

max(legs)
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```

animals:

kind	legs	weight
dog	4	20
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ferret	4	10
parrot	2	6
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```
select max(legs) from animals;
```

max(legs)
4

(Demo)

Mixing Aggregate Functions and Single Values

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create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
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  select "penguin"    , 2        , 10           union
  select "t-rex"      , 2        , 12000;
```

animals:

kind	legs	weight
dog	4	20
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Mixing Aggregate Functions and Single Values

An aggregate function also selects a row in the table, which may be meaningful

```
create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
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```

animals:

kind	legs	weight
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Mixing Aggregate Functions and Single Values

An aggregate function also selects a row in the table, which may be meaningful

```
select max(weight), kind from animals;
```

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create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
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animals:

kind	legs	weight
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Mixing Aggregate Functions and Single Values

An aggregate function also selects a row in the table, which may be meaningful

```
select max(weight), kind from animals;

select min(kind), kind from animals;
```

```
create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
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animals:

kind	legs	weight
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select max(weight), kind from animals;       select max(legs), kind from animals;

select min(kind), kind from animals;
```

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```
select max(weight), kind from animals;      select max(legs), kind from animals;

select min(kind), kind from animals;        select avg(weight), kind from animals;
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(Demo)

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Groups

Grouping Rows

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The number of groups is the number of unique values of an expression

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select [columns] from [table] group by [expression] having [expression];
```

The number of groups is the number of unique values of an expression

```
select legs, max(weight) from animals group by legs;
```

animals:

kind	legs	weight
dog	4	20
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```
select legs, max(weight) from animals group by legs;
```

animals:

legs=4

kind	legs	weight
dog	4	20
cat	4	10
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animals:

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animals:

	kind	legs	weight
legs=4	dog	4	20
	cat	4	10
	ferret	4	10
legs=2	parrot	2	6
	penguin	2	10
	t-rex	2	12000

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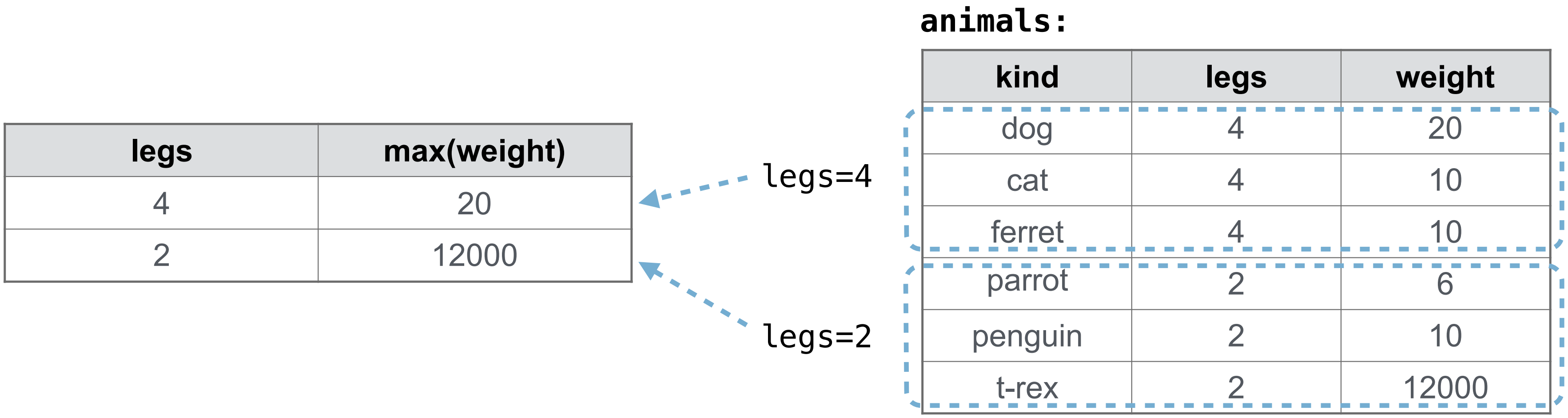

animals:

kind	legs	weight
dog	4	20
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ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

legs	max(weight)
4	20
2	12000

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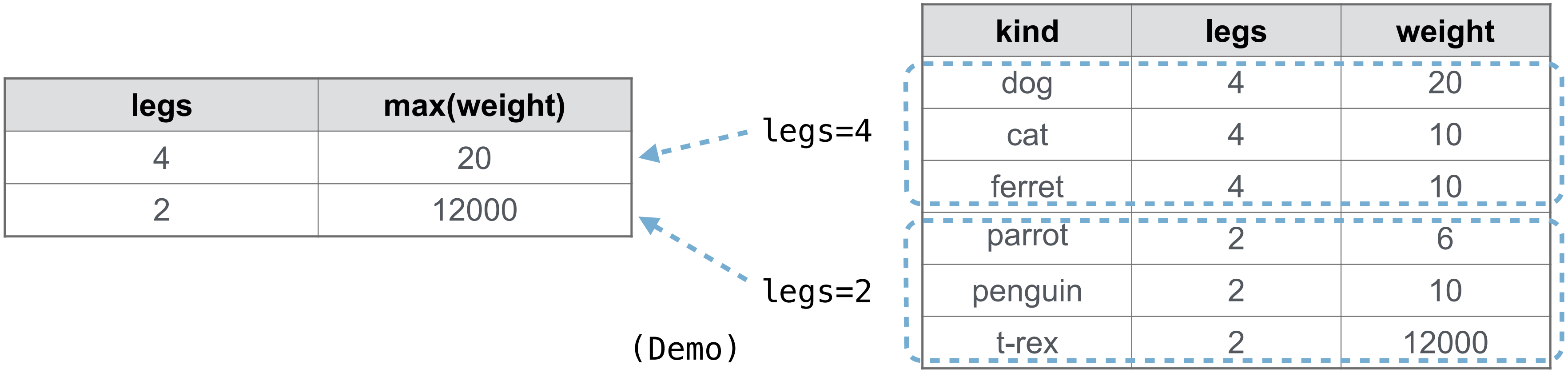

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parrot	2	6
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legs	max(weight)
4	20
2	12000

(Demo)

Selecting Groups

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```

```
select [columns] from [table] group by [expression] having [expression];
```

A having clause filters the set of groups that are aggregated

animals:

kind	legs	weight
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```
select weight/legs, count(*) from animals group by weight/legs having count(*)>1;
```

animals:

kind	legs	weight
dog	4	20
cat	4	10
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parrot	2	6
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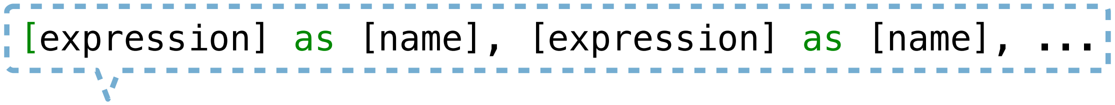

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```
select weight/legs, count(*) from animals group by weight/legs having count(*)>1;
```

weight/legs=5

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

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```
select weight/legs, count(*) from animals group by weight/legs having count(*)>1;
```

weight/legs=5

weight/legs=2

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

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select weight/legs, count(*) from animals group by weight/legs having count(*)>1;
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weight/legs=5

weight/legs=2

weight/legs=2

animals:

kind	legs	weight
dog	4	20
cat	4	10
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parrot	2	6
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animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

weight/legs=5

weight/legs=2

weight/legs=2

weight/legs=3

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weight/legs=5

weight/legs=2

weight/legs=2

weight/legs=3

weight/legs=5

animals:

kind	legs	weight
dog	4	20
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```
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```

animals:

	kind	legs	weight
weight/legs=5	dog	4	20
weight/legs=2	cat	4	10
weight/legs=2	ferret	4	10
weight/legs=3	parrot	2	6
weight/legs=5	penguin	2	10
weight/legs=6000	t-rex	2	12000

Selecting Groups

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[expression] as [name], [expression] as [name], ...
```

```
select [columns] from [table] group by [expression] having [expression];
```

A having clause filters the set of groups that are aggregated

```
select weight/legs, count(*) from animals group by weight/legs having count(*)>1;
```

weight/legs	count(*)
5	2
2	2

weight/legs=5
weight/legs=2
weight/legs=2
weight/legs=3
weight/legs=5
weight/legs=6000

animals:

kind	legs	weight
dog	4	20
cat	4	10
ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

Selecting Groups

Rows in a table can be grouped, and aggregation is performed on each group

```
[expression] as [name], [expression] as [name], ...
```

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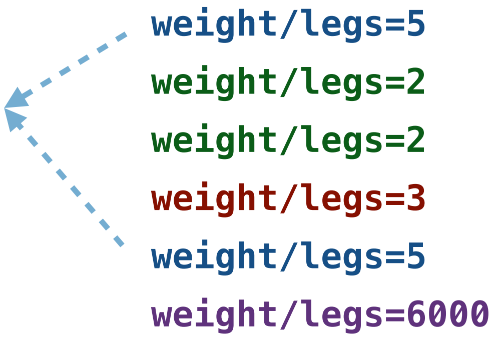

weight/legs=5
weight/legs=2
weight/legs=2
weight/legs=3
weight/legs=5
weight/legs=6000

animals:

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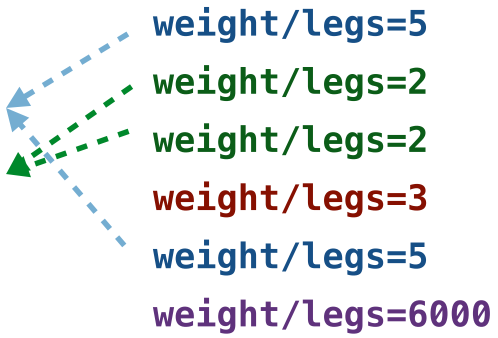

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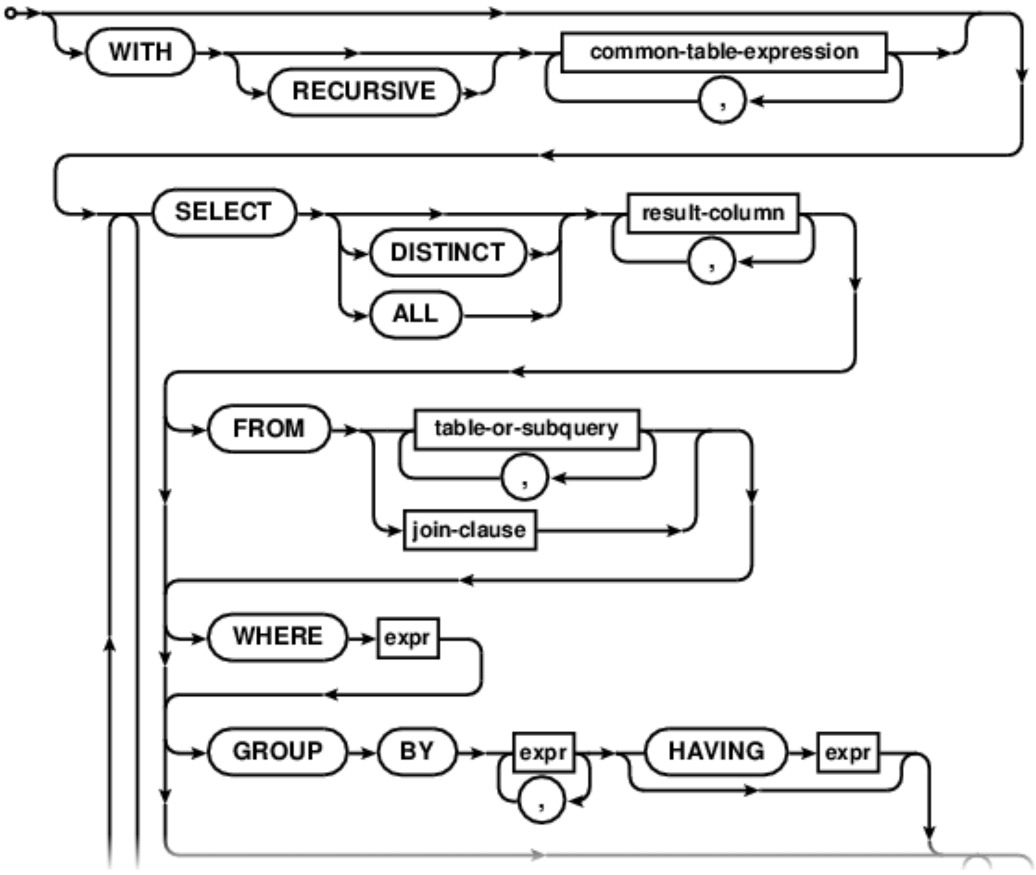
Select Grammar

SQL Select Statements

SQL Select Statements



WITH

RECURSIVE

common-table-expression

,

SELECT

DISTINCT

ALL

result-column

,

FROM

table-or-subquery

,

join-clause

WHERE

expr

GROUP

BY

expr

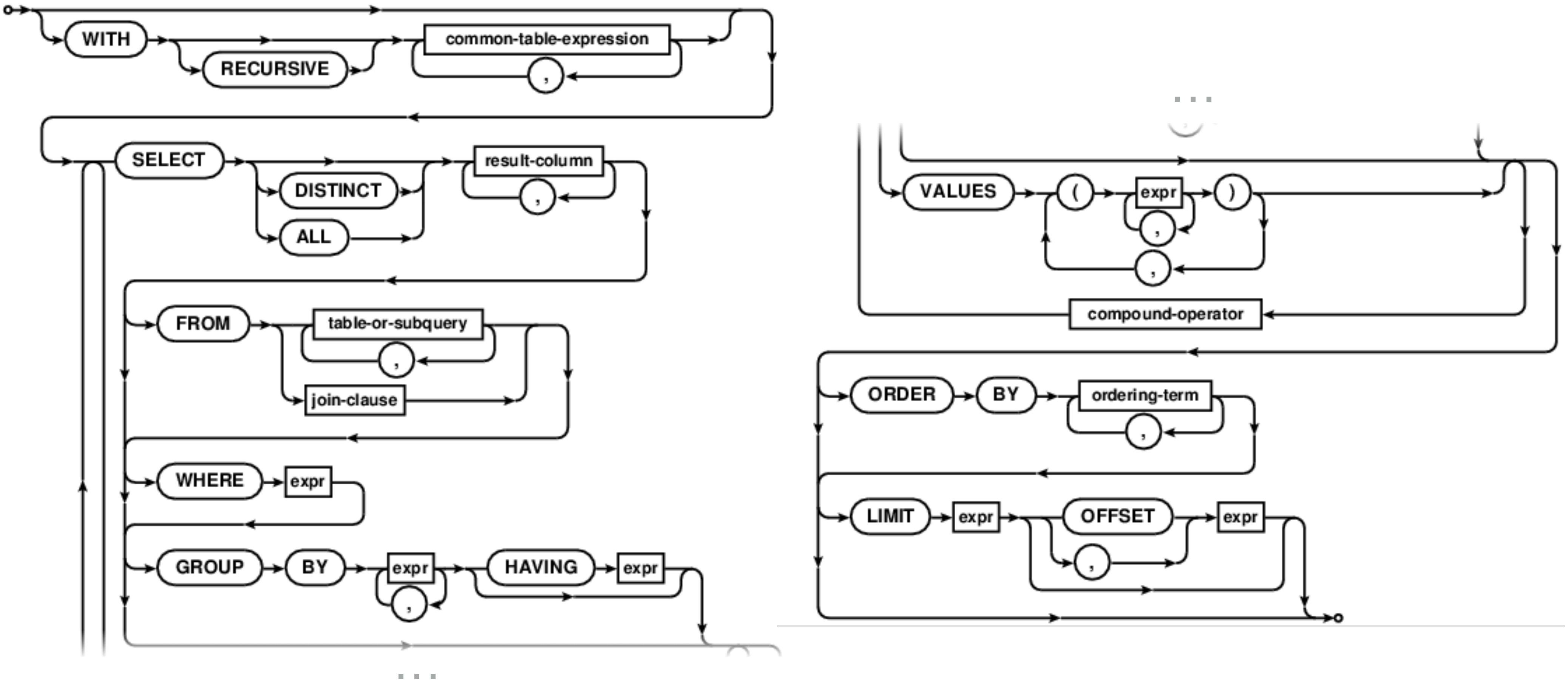
,

HAVING

expr

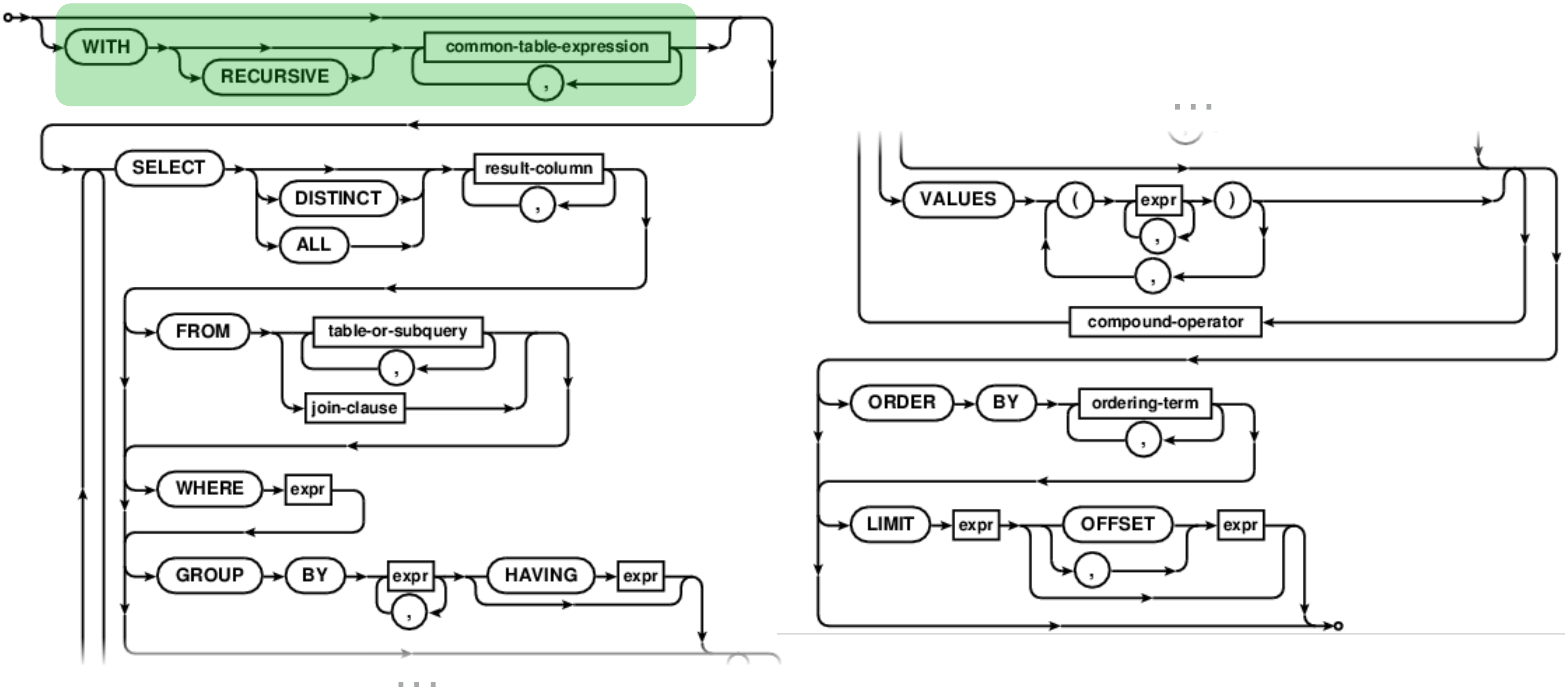
. . .

SQL Select Statements



http://www.sqlite.org/lang_select.html

SQL Select Statements



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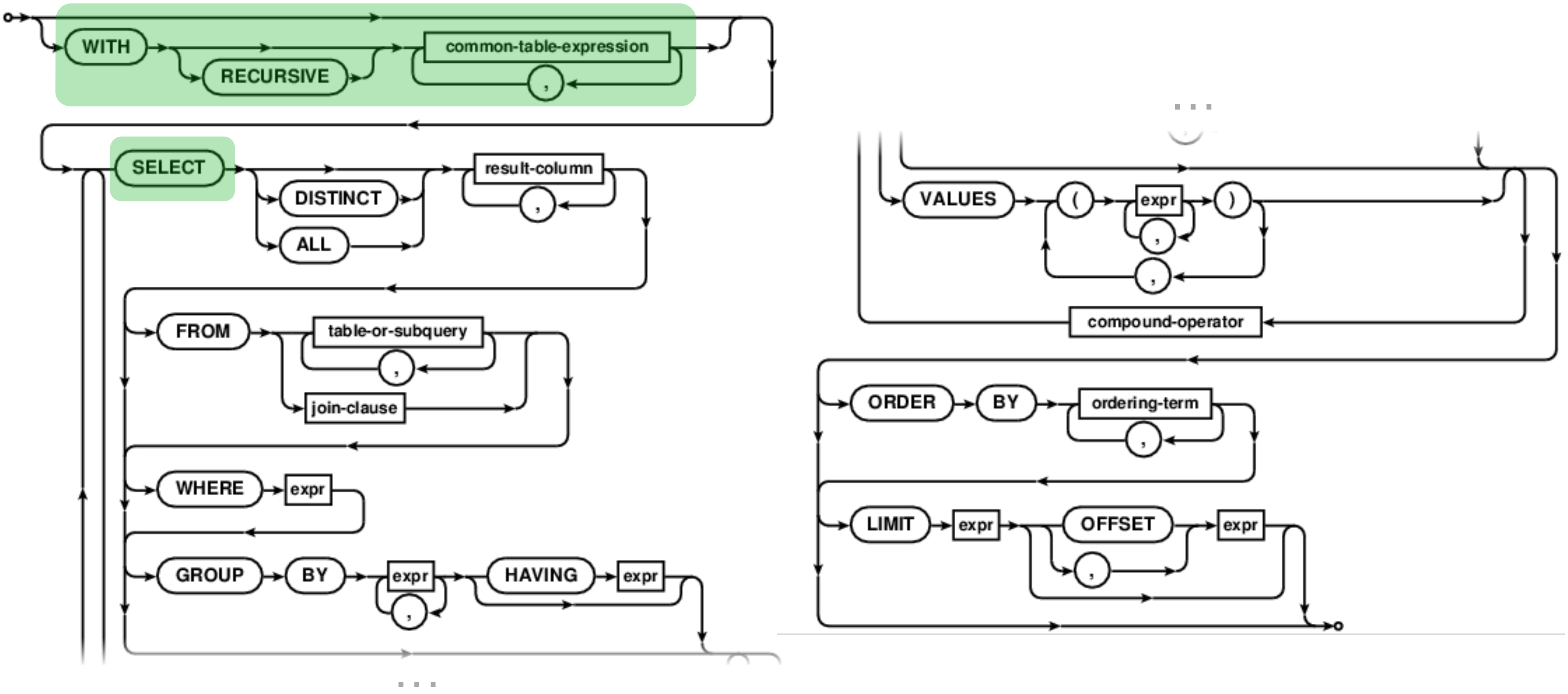
SQL Select Statements



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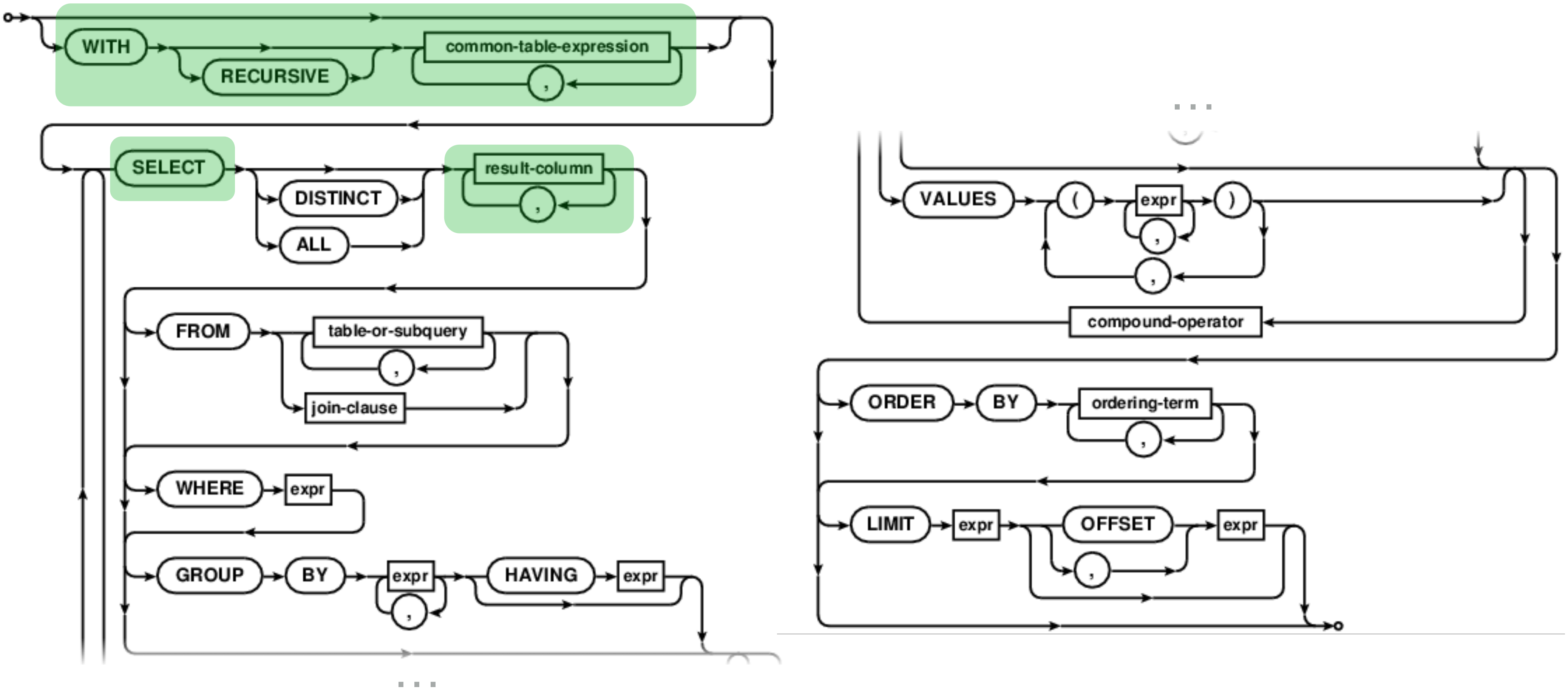
SQL Select Statements



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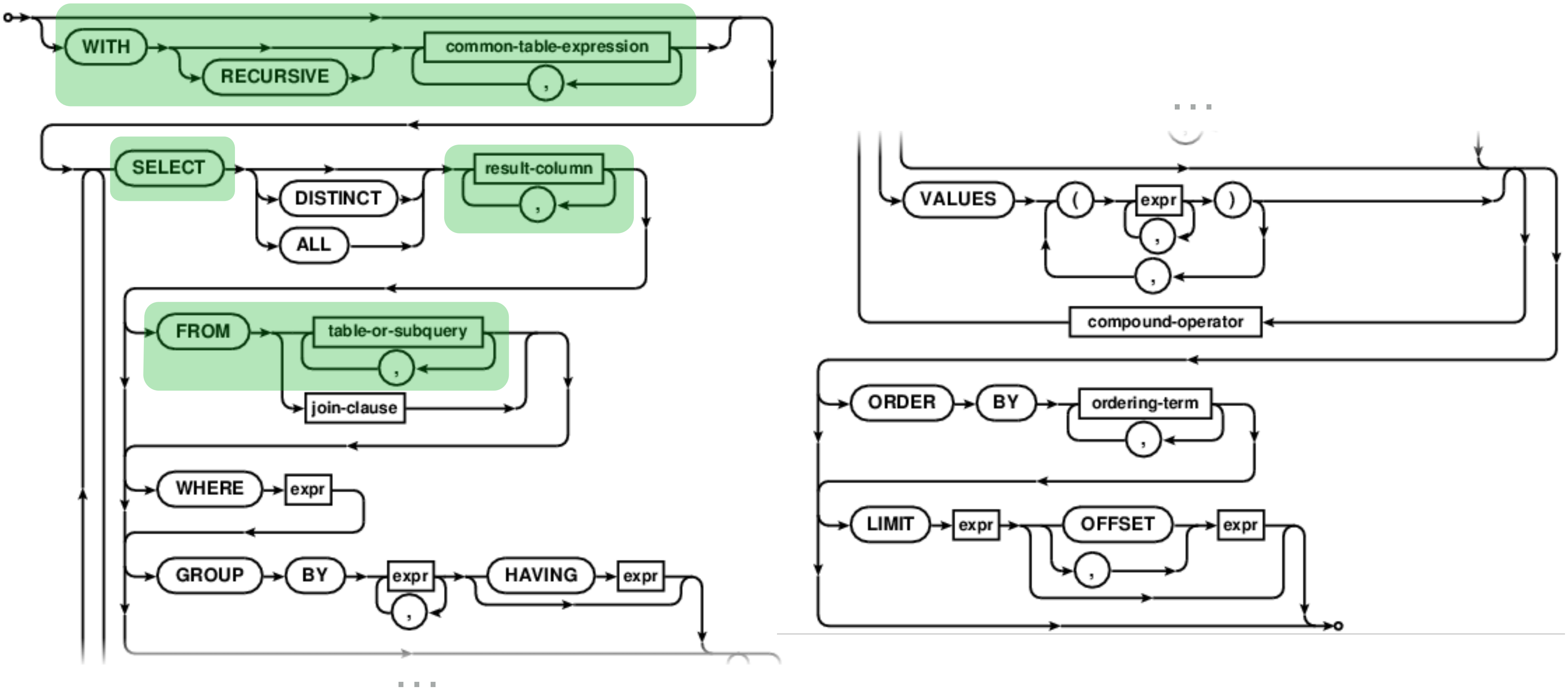
SQL Select Statements



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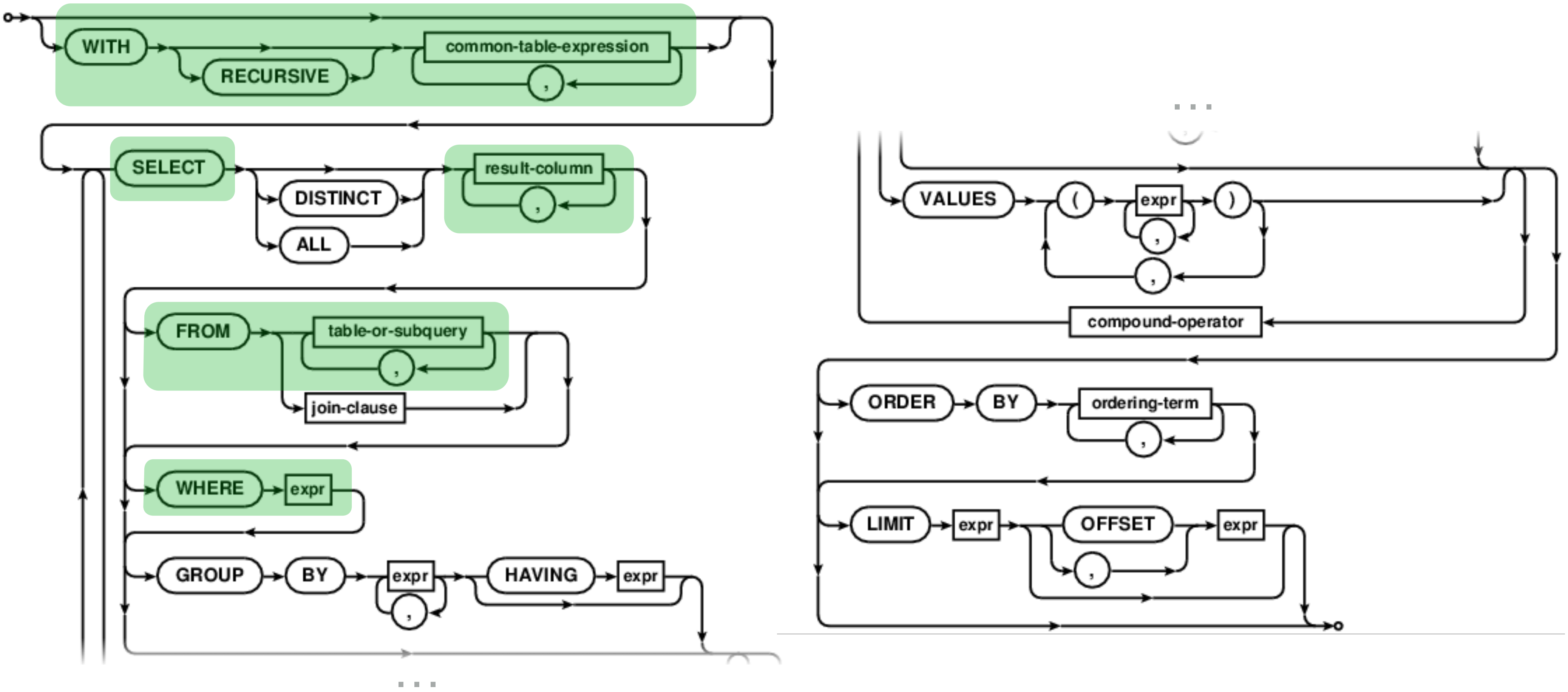
SQL Select Statements



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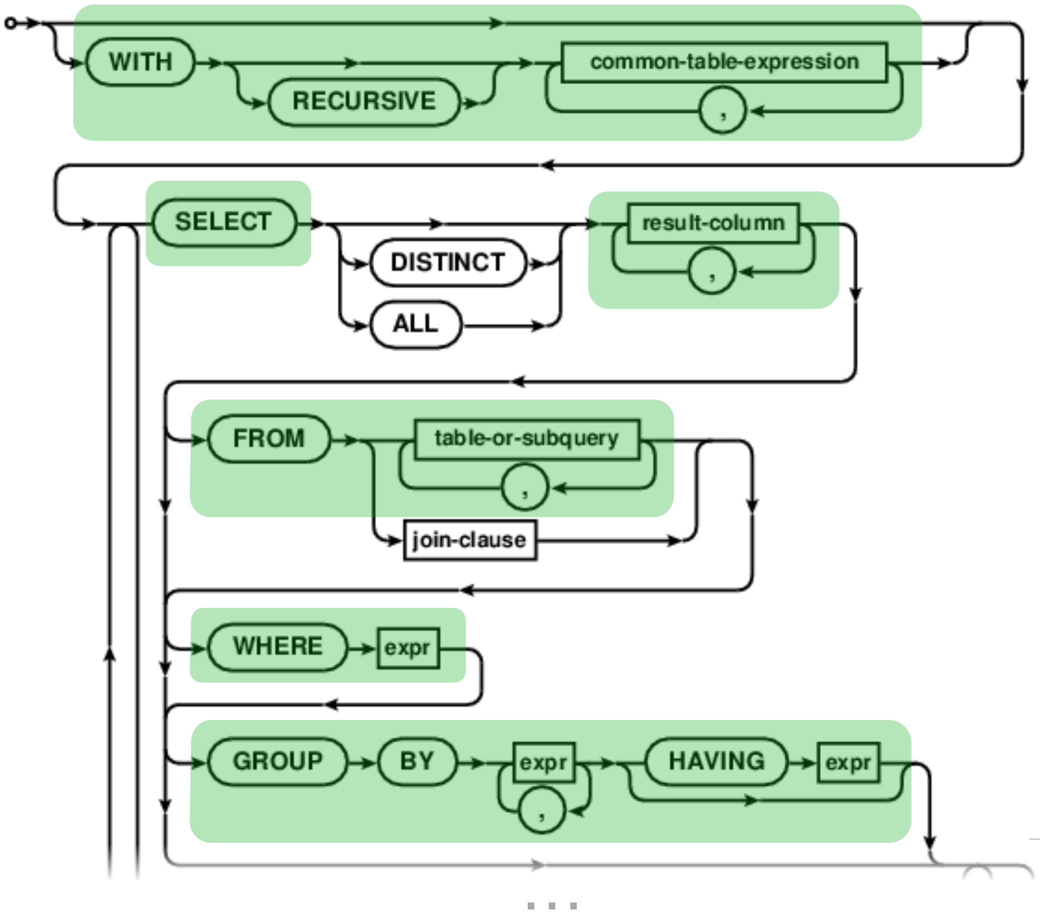
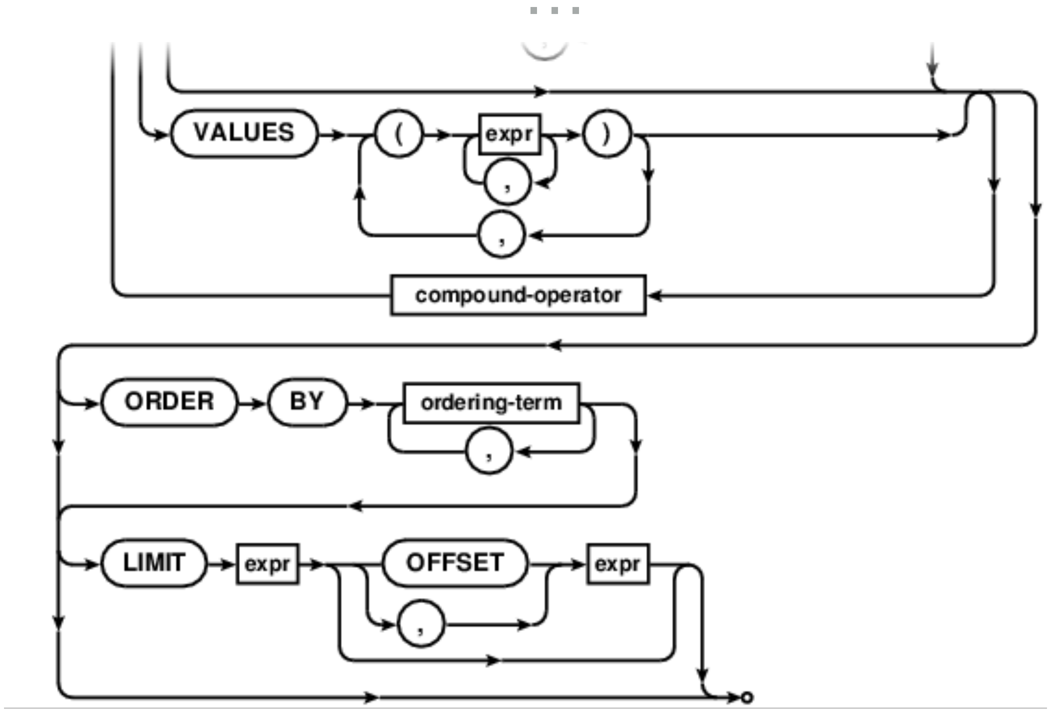
SQL Select Statements





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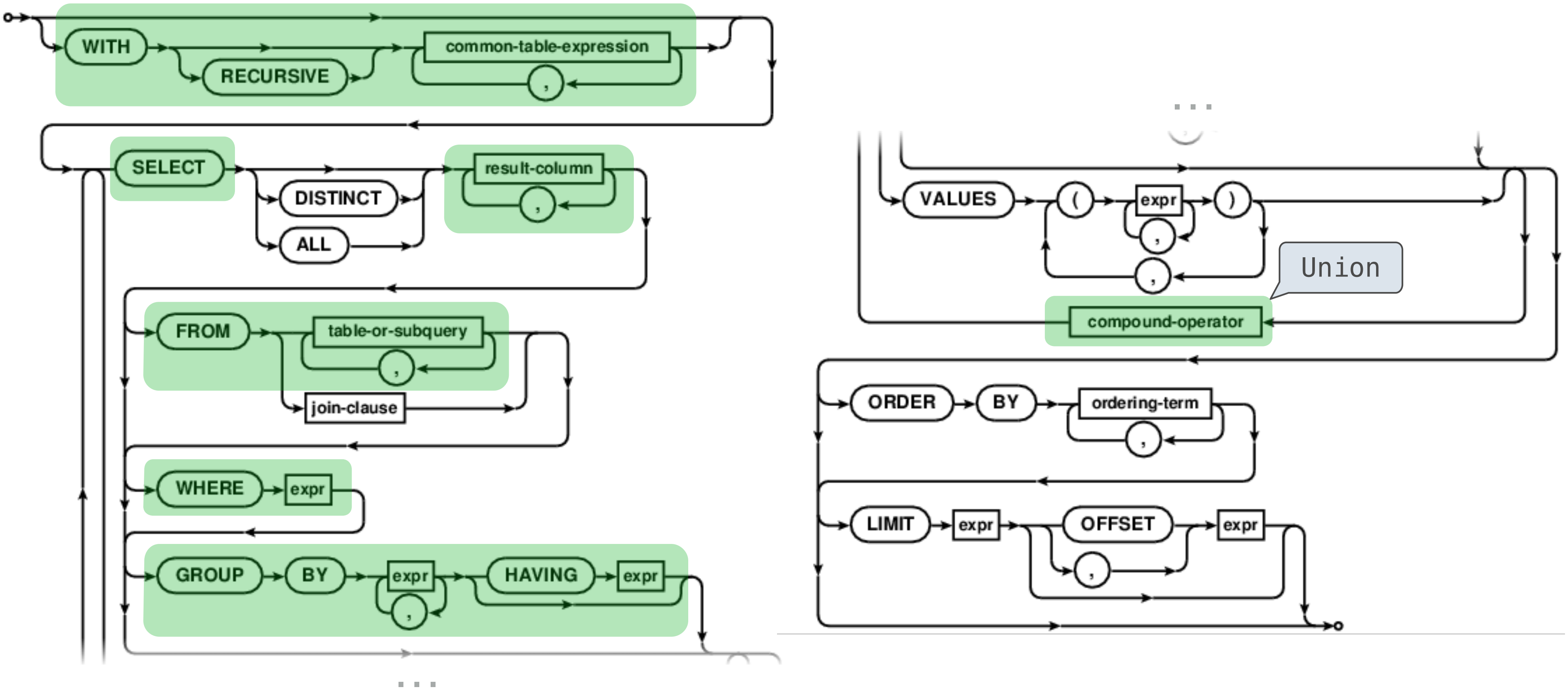

Union

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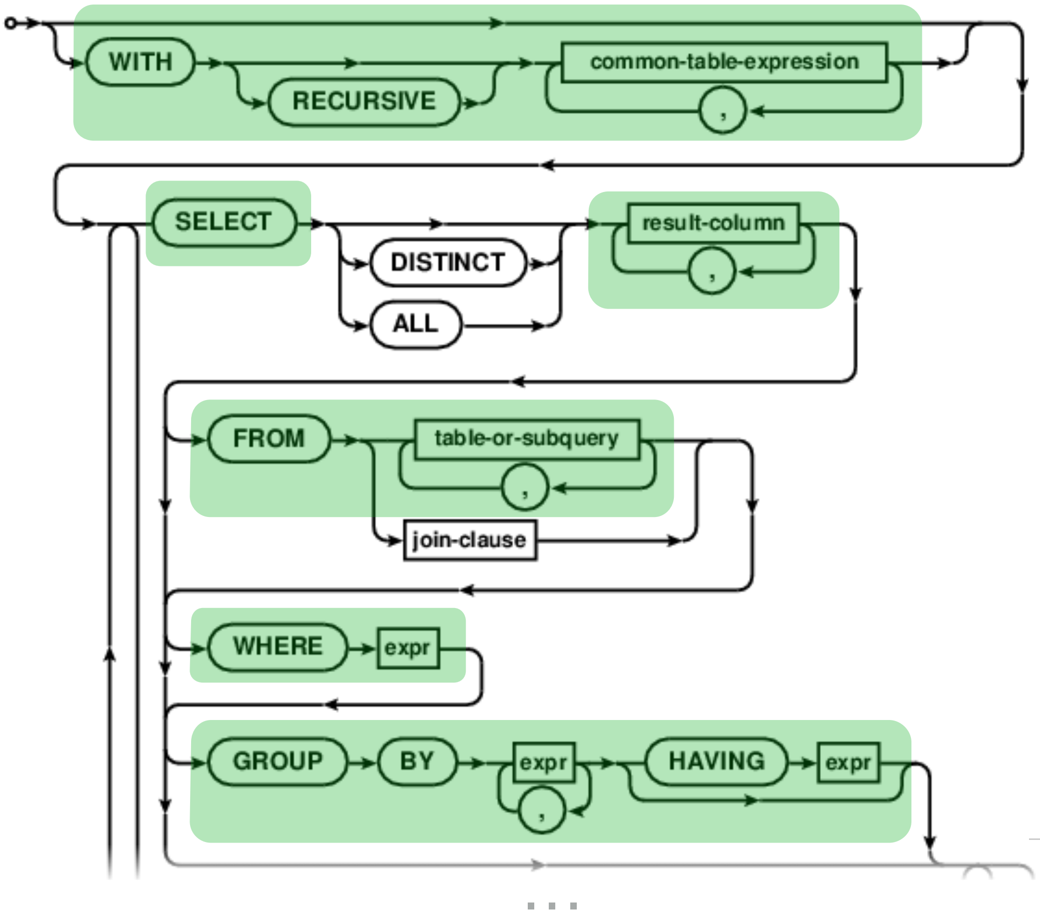
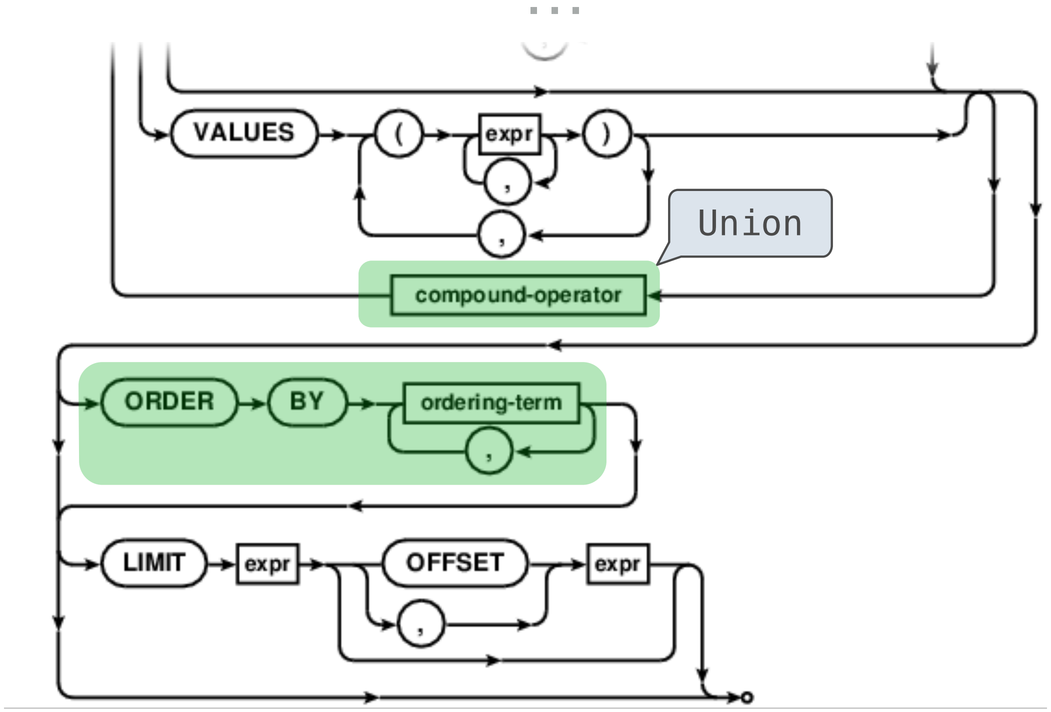
SQL Select Statements





Union

http://www.sqlite.org/lang_select.html