Aggregation

Announcements

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

animals:

kind	legs	weight
dog	4	20
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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
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parrot	2	6
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  select "t-rex"      , 2        , 12000;
```

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

max(legs)
4

animals:

kind	legs	weight
dog	4	20
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```

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

max(legs)
4

(Demo)

animals:

kind	legs	weight
dog	4	20
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parrot	2	6
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Mixing Aggregate Functions and Single Values

```
create table animals as
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animals:

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

An aggregate function also selects some row in the table to supply the values of columns that are not aggregated. In the case of max or min, this row is that of the max or min value. Otherwise, it is arbitrary.

```
create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
  select "cat"        , 4        , 10           union
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animals:

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select max(weight), kind from animals;
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create table animals as
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```
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
  select "cat"        , 4        , 10           union
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animals:

kind	legs	weight
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select max(weight), kind from animals;
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```
select max(legs), kind from animals;
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```
select min(kind), kind from animals;
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create table animals as
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select max(weight), kind from animals;
```

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

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

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

```
create table animals as
  select "dog" as kind, 4 as legs, 20 as weight union
  select "cat"        , 4        , 10           union
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animals:

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(Demo)

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create table animals as
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Groups

Grouping Rows

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

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

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

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

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

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

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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animals:

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legs=4

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animals:

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

animals:

	kind	legs	weight
legs=4	dog	4	20
	cat	4	10
	ferret	4	10
legs=2	parrot	2	6
	penguin	2	10
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legs=4

legs=2

legs	max(weight)
4	20
2	12000

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animals:

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ferret	4	10
parrot	2	6
penguin	2	10
t-rex	2	12000

legs=4

legs=2

legs	max(weight)
4	20
2	12000

(Demo)

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```
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A `having` clause filters the set of groups that are aggregated

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

animals:

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

weight/legs=5

animals:

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weight/legs=5

weight/legs=2

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weight/legs=2

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animals:

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```

weight/legs=5

weight/legs=2

weight/legs=2

weight/legs=3

animals:

kind	legs	weight
dog	4	20
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```

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

animals:

kind	legs	weight
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```

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
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```

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
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```

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

weight/legs	count(*)
5	2
2	2

animals:

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

Discussion Question

What's the maximum difference between leg count for two animals with the same weight?

Optional (but fun) content from here onward

Modifying a Database

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Add a row to the end of an existing table:

```
INSERT INTO [table] VALUES ([column_0_value], [column_1_value], ...);
```

Modifying a Database

Add a row to the end of an existing table:

```
INSERT INTO [table] VALUES ([column_0_value], [column_1_value], ...);
```

Change the values in some rows of an existing table:

```
UPDATE [table] SET [column_label]=[value] WHERE ...;
```

Modifying a Database

Add a row to the end of an existing table:

```
INSERT INTO [table] VALUES ([column_0_value], [column_1_value], ...);
```

Change the values in some rows of an existing table:

```
UPDATE [table] SET [column_label]=[value] WHERE ...;
```

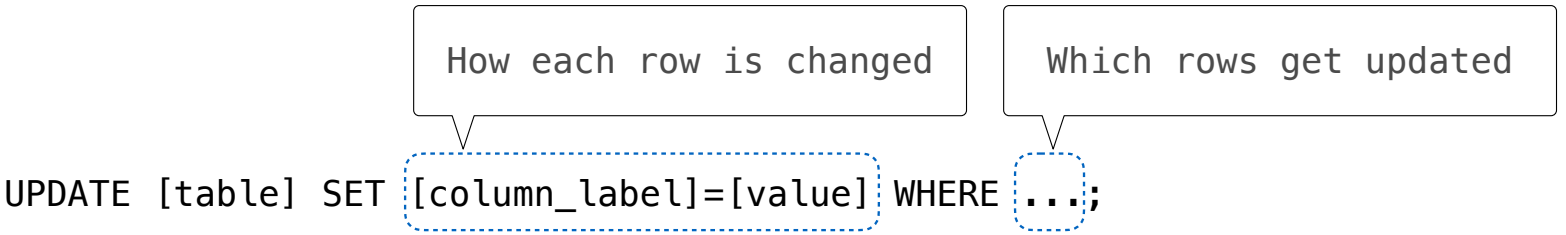
Which rows get updated

Modifying a Database

Add a row to the end of an existing table:

```
INSERT INTO [table] VALUES ([column_0_value], [column_1_value], ...);
```

Change the values in some rows of an existing table:

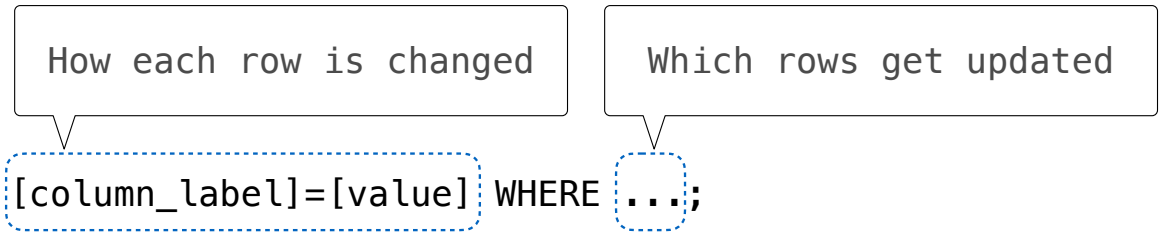


Modifying a Database

Add a row to the end of an existing table:

```
INSERT INTO [table] VALUES ([column_0_value], [column_1_value], ...);
```

Change the values in some rows of an existing table:



Delete a table if it exists (typically used to rebuild a table from scratch):

```
DROP TABLE IF EXISTS [table];
```

Python and SQL

(Demo)

Database Connections

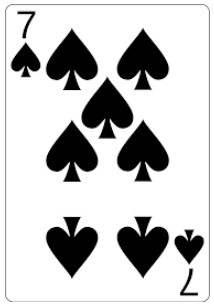
Casino Blackjack

Player:

Dealer:

Casino Blackjack

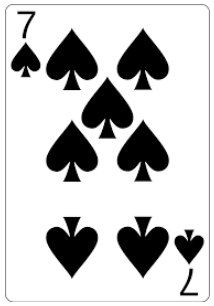
Player:



Dealer:

Casino Blackjack

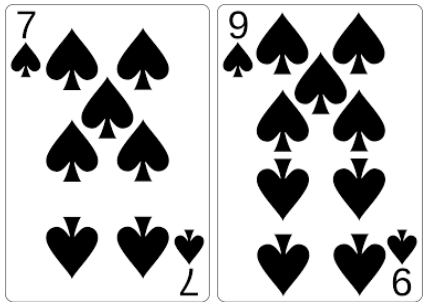
Player:



Dealer:

Casino Blackjack

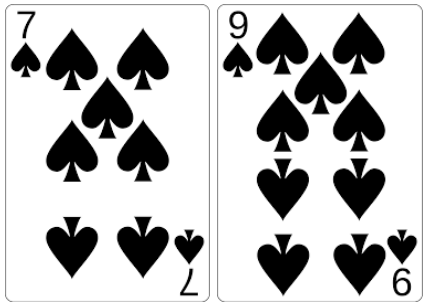
Player:



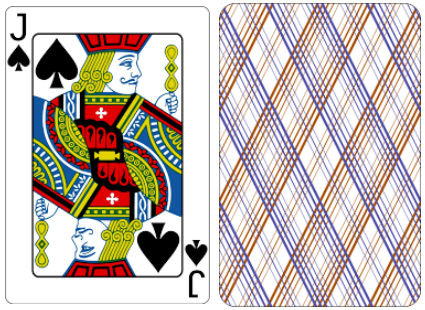
Dealer:

Casino Blackjack

Player:

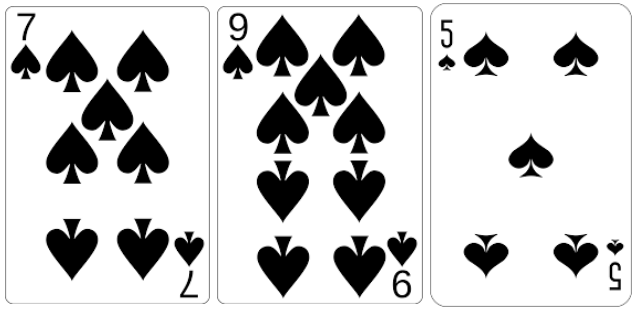


Dealer:

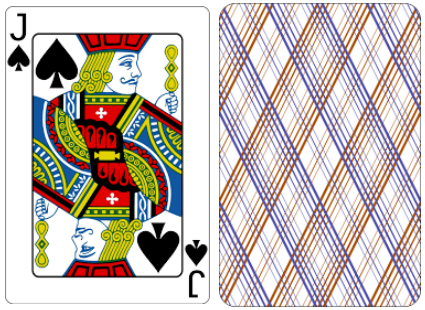


Casino Blackjack

Player:

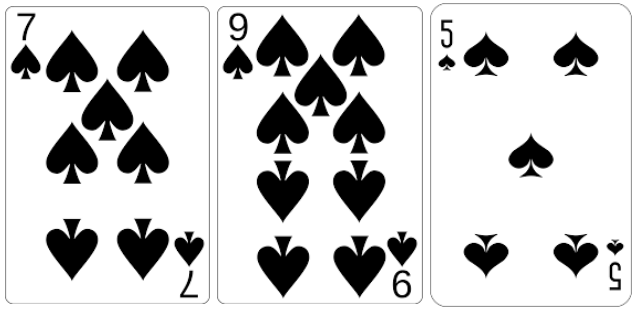


Dealer:

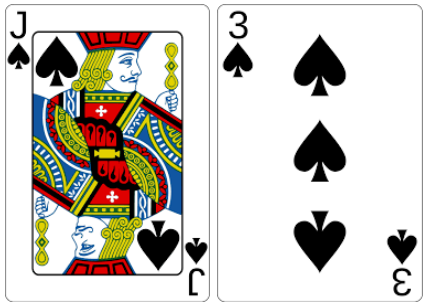


Casino Blackjack

Player:

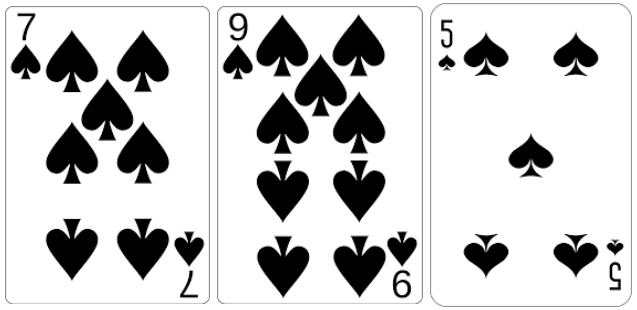


Dealer:

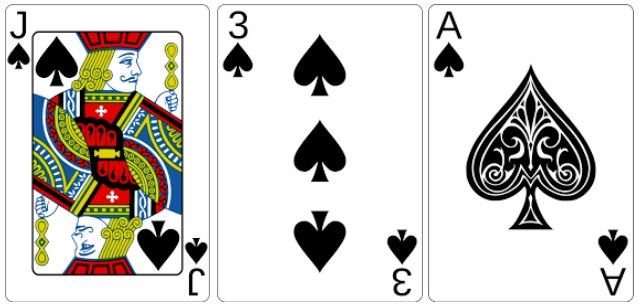


Casino Blackjack

Player:

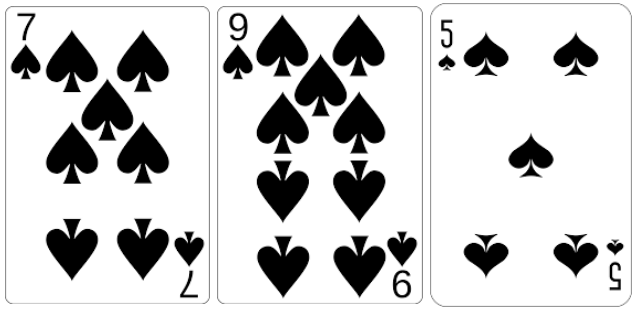


Dealer:

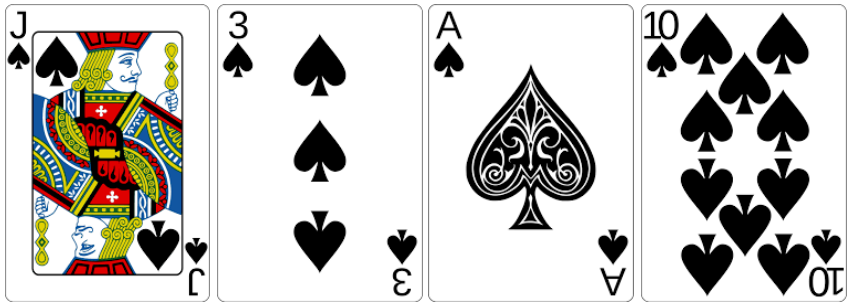


Casino Blackjack

Player:

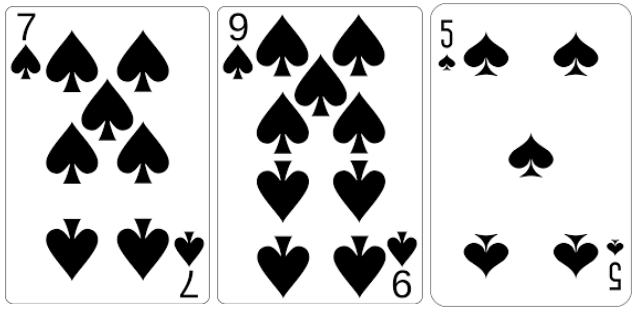


Dealer:

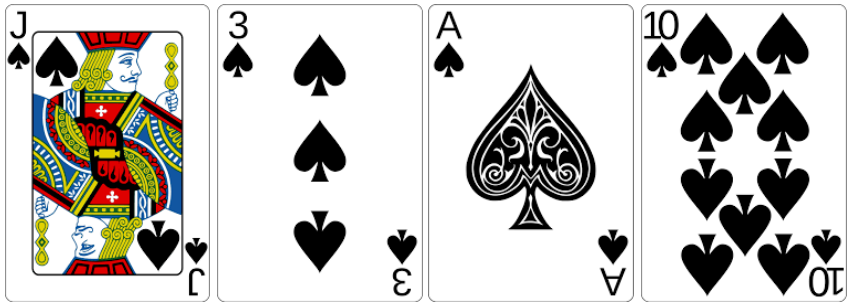


Casino Blackjack

Player:



Dealer:



(Demo)