# SQL Aggregation

# Class outline:

- Aggregate functions
- Groups

# Aggregate functions

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So far, all SQL expressions have referred to the values in a single row at a time.

```
SELECT [columns] FROM [table] WHERE [expression];
```

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

Starting from this table of solar system objects, find the biggest:

```
SELECT MAX(mean_radius) FROM solar_system_objects;
```

See all SQLite aggregate functions.

# Mixing aggregate functions & 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.

```
SELECT body, MAX(mean_radius) FROM solar_system_objects;
```

```
SELECT body, MAX(surface_gravity) FROM solar_system_objects;
```

```
SELECT body, MIN(mean_radius) FROM solar_system_objects;
```

Otherwise, an individual value will just pick from an arbitrary row:

```
SELECT SUM(mass) FROM solar_system_objects;
```

# Groups

# Grouping rows

Rows in a table can be grouped using `GROUP BY`, and aggregation is performed on each group.

```
SELECT [columns] FROM [table] GROUP BY [expression];
```

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

Based on this animals table, find the max weight per each number of legs:

```
SELECT legs, max(weight) FROM animals GROUP BY legs;
```

# Filtering groups

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

```
SELECT [columns] FROM [table] GROUP BY [expression]
HAVING [expression];
```

Find the weight/leg ratios that are shared by more than one kind of animal:

```
SELECT weight/legs, count(*) FROM animals
    GROUP BY weight/legs HAVING COUNT(*) > 1;
```

# Exercise: Max speed

Based on Marvel superheroes table, display the maximum intelligence, speed, and strength of each alignment (good/bad/neutral) and order by maximum intelligence.

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```
SELECT alignment, MAX(intelligence) as max_int, MAX(speed), MAX(st
    FROM marvels GROUP BY alignment ORDER BY max_int DESC;
```

# Exercise: Leg count difference

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

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```
SELECT max(legs)-min(legs) AS diff FROM animals
    GROUP BY weight ORDER BY -diff LIMIT 1;
```