Aggregation Functions

- Returns a single result based on multiple rows
  - COUNT
  - SUM
  - AVG
  - MIN, MAX
  - FIRST, LAST

Aggregation Function Examples

- Number of movies released by SONY
- Total weekend gross of the movies released by SONY
- Average weekend gross of the movies released by SONY
- The movie released by SONY with the highest (lowest) weekend gross

Aggregation Queries

<table>
<thead>
<tr>
<th>location</th>
<th>quarter</th>
<th>month</th>
<th>console</th>
<th>sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>1</td>
<td>1</td>
<td>PS2</td>
<td>23</td>
</tr>
<tr>
<td>MP</td>
<td>1</td>
<td>2</td>
<td>Xbox</td>
<td>10</td>
</tr>
<tr>
<td>AH</td>
<td>1</td>
<td>2</td>
<td>PS2</td>
<td>50</td>
</tr>
<tr>
<td>AH</td>
<td>2</td>
<td>6</td>
<td>Xbox</td>
<td>37</td>
</tr>
</tbody>
</table>

- How many consoles are sold in the first quarter at each store location?
- How many consoles are sold in the Alhambra store each quarter?
- What's the annual sales of each console?

GROUP BY

- The number of movies released by each distributor

SELECT dist, count(title) FROM Box_office GROUP BY dist;

GROUP BY Multiple Columns

<table>
<thead>
<tr>
<th>location</th>
<th>quarter</th>
<th>month</th>
<th>console</th>
<th>sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>MP</td>
<td>1</td>
<td>1</td>
<td>PS2</td>
<td>23</td>
</tr>
<tr>
<td>MP</td>
<td>1</td>
<td>2</td>
<td>Xbox</td>
<td>10</td>
</tr>
<tr>
<td>AH</td>
<td>1</td>
<td>2</td>
<td>PS2</td>
<td>50</td>
</tr>
<tr>
<td>AH</td>
<td>2</td>
<td>6</td>
<td>Xbox</td>
<td>37</td>
</tr>
</tbody>
</table>

SELECT location, sum(sales) FROM Sales_report GROUP BY location;

SELECT location, quarter, sum(sales) FROM Sales_report GROUP BY location, quarter;
Observations About GROUP BY

- Aggregate on distinct value(s) of the group-by attribute(s)
- Group-by attribute(s) must be the same as the non-aggregate attributes in the SELECT clause

HAVING

- The number of movies released by each distributor. Only list those who released at least 2 movies.

```
SELECT dist, count(title) FROM Box_office
GROUP BY dist
HAVING count(title) >= 2;
```

Conditional vs. Final Filter

- HAVING – final filter
- WHERE – conditional filter

```
SELECT class, COUNT(*) FROM Student
GROUP BY class
HAVING class=3;
```

```
SELECT class, COUNT(*) FROM Student
WHERE class=3
GROUP BY class;
```