



CSC 355 Database Systems

Lecture 5

Eric J. Schwabe
School of Computing, DePaul University
Spring 2020



Topic:

- ◆ More SQL Queries
 - Solving query problems
 - Aggregate functions
 - GROUP BY, HAVING

SQL Queries

- ◆ General form of a query:

SELECT *list of expressions*

FROM *set of rows*

[WHERE *condition on rows*]

[GROUP BY *grouping attributes*]

[HAVING *condition on groups*]

[ORDER BY *ordering attributes*] ;

- ◆ Result is an ordered set of ordered tuples

SELECT, FROM

SELECT *list of expressions ...*

- ◆ Indicates what information will be displayed
 - values of attributes, expressions, functions

... FROM set of rows ...

- ◆ Indicates the set of rows from which information will be retrieved
 - a single table (for now...)

WHERE, ORDER BY

... WHERE *condition* ...

- ◆ Only displays rows where condition is true
 - comparisons, wildcards, logical operators

... ORDER BY *ordering attributes*

- ◆ Tuples are sorted by first attribute in the list, ties broken by second, third, et cetera...
 - ascending order by default, DESC for descending

Solving a Query Problem

1. Before you write the query:

- Read the problem carefully to be sure you understand it, and clarify where necessary
- Look at the data and work it out by hand, then think about how you did it

2. Write the query:

First FROM (with SELECT *), then WHERE,
then ORDER BY, then SELECT

Solving a Query Problem

3. Test the query:

- If there are syntax errors, go back to 2. to correct them
- Look at the result against what you did by hand
- If the result is not correct, go back to 2. and re-examine the query against your result and your interpretation of the problem – describe as clearly as you can precisely how it is incorrect

Query Problems

- ◆ Give the names of all undergraduate degree programs
- ◆ Give an alphabetical list of all students who started more than eight years ago
- ◆ List all information for students in Computer Science, Computer Gaming, and Information Systems, ordered by program name
- ◆ Give a sorted list of the IDs of all graduate students not in the PhD program

Query Problems

- ◆ List the IDs of all students who enrolled in a course in 2013
- ◆ Give an alphabetical list of last names of all students who do not have a Social Security number listed
- ◆ List all information for students who are from Springfield and who started between 2011 and 2013
- ◆ List the number of students in each degree program (no query, just work out this answer by hand...)

Aggregate Functions

- ◆ Given an attribute, an aggregate function takes the values of that attribute in the set of returned rows and computes a single value from them
 - COUNT(...): Number of non-NULL values
 - SUM(...): Sum of the values
 - AVG(...): Average of the values
 - MIN(...): Smallest of the values
 - MAX(...): Largest of the values

GROUP BY

... GROUP BY *grouping attributes* ...

- ◆ Combines the rows into sets based on the value(s) of some attribute(s)
 - Can only display the value(s) of this attribute(s) and/or aggregate information for each group
 - If we group rows into sets, we cannot look at the values in the individual rows anymore...

HAVING

... HAVING *condition on groups* ...

- ◆ Includes only those groups that satisfy the condition
 - the condition may only involve the grouping attribute(s) and/or aggregate functions
 - can use all the same comparisons and logical operators as WHERE



Next:

- ◆ More SQL Queries
 - Review GROUP BY and HAVING
 - More query problems
 - Joins