**44-560 Advanced Topics in Database Systems**

**Counting Exercise KEY**

Suppose we have a database containing the following tables:

Student(studentID, studentLastName, studentFirstName, gpa, facultyID)

FK facultyID 🡪 Faculty (note: facultyID is a link to the student’s advisor)

Faculty(facultyID, facultyLastName, facultyFirstName, rank, salary)

Assume

* 5,000 records in the Student table
* 100 records in the Faculty table
* 10 faculty members have the rank of full professor
* 200 students have advisors who are full professors
* Each student has exactly one faculty advisor

Suppose we want to execute the following query:

**Select studentFirstName, facultyLastName**

**from Student, Faculty**

**where Student.facultyID = faculty.facultyID**

**and rank = ‘full professor’;**

The “from” clause results in the creation of a table consisting of the Cartesian product of Student and Faculty.

How many records will be in the Cartesian product? 5,000 \* 100 = 500,000

When we apply the first component of the “where” clause (“where Student.facultyID = faculty.facultyID”), how many records result? There are 5,000 students, and each one has exactly one faculty advisor; for each student, there is exactly one correct match in the Cartesian product, so there will be 5,000 records when the first component of the “where” clause is applied.

When we apply the second component of the “where” clause (“and rank = ‘full professor’”), how many records result? Of the 5,000 students, 200 have advisors who are full professors, so there will be 200 records when the second component of the “where” clause is applied.