ASSIGNMENT 2 - 601.315/415/615 - Databases

Due date: Wednesday, October 24, 2017, 11:00 AM

What To Do:

- Students in 601.415/615 should implement all queries 1-41 in SQL, and also queries 44,46,48,49,50,51,53,55,57,61,63,64,66,67 in SQL.
- Students in 601.315 should implement all queries 1-41 in SQL, **except** queries 6,9,11,18,19,23,26,35,36,37,3 Students in 601.315 should also implement queries 42,43,45,47,49,50,51,52,54,56,58,59,60,62,64-67 in SQL.

Students in all sections (315/415/615) should also implement queries 4,8,10,12,14,21,41,51,62,64,65,67 in **QBE**.

What To Hand In:

You should write all your SQL queries in a text editor, formatted clearly (preferably using SELECT/FROM/WHERE/GROUP_BY commands in all caps, with attribute names in all lower case and relation names with the first letter capitalized).

Submit this program using gradescope, as specified.

In addition, you should submit a *spool* log of your sql code running on the actual database tables in `http://www.cs.jhu.edu/~yarowsky/jhu.sql` - linked to on the class website, or /home/cs415/jhu.sql (on the undergraduate network). Options for doing this (such as cutting and pasting the sql code into the MySQL interpreter are covered in class). You should also submit this spool file via gradescope, as specified.

Finally, you should upload an electronic copy of your QBE queries to gradescope. These can either be created using a text editor (ideally using the plain-text QBE table templates provided for the relations in the databse), but scans of hand-written answers (again, ideally using the plain-text QBE table templates) are also acceptable.

Queries:

The relational table specifications for all queries used in this assignment are given in the file `/home/cs415/jhu.sql` on the undergraduate network and at the `jhu.sql` URL above (and linked to from the class website). They are specified in SQL CREATE TABLE syntax.

All answers should consist of a single SQL (or QBE) query. You should not create and save intermediate output relations to simplify computation. But you may use nesting of expressions or derived relations in the FROM clause as appropriate.

For the purposes of this exercise, the enrolled_in relation only contains one semester's worth of courses (student's classes for the most recent semester) and the students' grades for those courses. There are no semester/year attributes in the enrolled_in relation. Questions concerning class enrollment should use the entire relation.

When a question asks "List the name" of a person, give their first name followed by their last (family) name.

Note that these queries are not necessarily listed in order of increasing difficulty. Also note that queries frequently build on other queries and subsequent queries may require only a few changes from their predecessors.

1. List the name of dorms only housing female students.
2. List the student name and major name of all students who are enrolled in a course taught by Russell Taylor.
3. List the name, age and sex of all students with no roommates.
4. List the student names and major names of all students who are not enrolled in any courses from his/her major.
5. List the names of activities with the most faculty participation.
6. List the names of activities where at least 3 students participate. Include the activity name along with the number of participants. Output should be sorted first by the number of participants (descending), and then by the activity name (dictionary order).
7. List the student name and major name of the students who participate in at least two activities including either Mountain Climbing or Spelunking.
8. List the student name and major name of all students who participate in at least 2 activities, and also have never received a grade below B- in any of the courses s/he is enrolled in.
9. Find the student(s) who is (are) loved by the highest number of people. Report the students' name, major name, and the total number of activities s/he participates in.
10. Find the name of all faculty members whose building is different from his/her department's building. Report the faculty name, department name, faculty office building, and department building.
11. List and Sort the departments according to the total number of courses offered by their primary faculty. Report the department name and the total number of distinct courses offered by their primary faculty.
12. List the dormname and student capacity for female dorms where there are no amenities.
13. List the dormid and student capacity for the dorm with the most amenities. If there is a tie, list all tying dorms.
14. List the student names, major name and advisor name of all students who have received an A+ in "Computer Vision".
15. List the coursename, coursenumber, student name, major name and advisor name of the students who have achieved the highest grade in each course in the database. If there is a tie, list all tying students.

16. List average age of the students who do not participate in any activity.

17. List the student name, major name and advisor name of the student in the database who lives the farthest from Baltimore, MD. You should not include the city code for Baltimore in the query, just the name "Baltimore" and state "MD".

18. List the student name, major name and advisor name of the student enrolled in "Computer Vision" who lives the farthest from Baltimore, MD. You should not include the city code for Baltimore in the query, just the name "Baltimore" and state "MD".

19. List dorm id and dorm name whose resident home is farthest from Baltimore, MD. You should also include the name and sex of that student, and you should not include the city code BAL in your query.

20. List all students who smoke and have working fireplaces in their dorm.

21. Print the names of all students from New York, who live in Wolman, who major in Computer Science, who are allergic to peanut butter and who are majors in the Computer Science department.

22. List the names of all activities that at least one boy likes and no girl loves.

23. List the names and course numbers of all courses for which there are fewer than 3 students are enrolled.

24. List the names of students who suffer from every allergy type.

25. List the most common allergy name (and its allergy type) suffered by students older than 25.

26. Find all roomates who are not compatible on some dimension (at least one difference in smoking, sleep-time or music preferences). Note that for smoking the following pairs *are* compatible: Yes/no-accept and no/no-accept.

27. List the name, age, and major of all students enrolled in a class taught by their advisor (also include the name of the advisor).

28. List the student name, course name, instructor name, and letter grade for all classes enrolled in by students who are early risers and have no allergies and do not smoke.

29. List the name and age of both the oldest and the youngest student in the database (include in a single table with 6 columns FN1,LN1,Age1,FN2,LN2,Age2).

30. List all pairs of students enrolled in the same course and sharing the same first name (give FN1,LN1,FN2,LN2 where FN1=FN2). Make sure that students are not paired with themselves. Also, because of symmetry, each pair will appear twice in the result in reversed order (e.g. (John Smith, John Winters) and (John Winters, John Smith)). Eliminate this duplication (this can be done as a simple change when eliminating self pairings).

31. Find the total number of CS majors who are smokers and who do not like anyone in the database. (for the QBE question, find the *names*, not number.)

32. List all the students who have minored in Math, but also have an 'A+' or 'A' from a computer science course.

33. List all the courses Bruce Wilson is enrolled in, giving the course name, the number of credits offered by the class (e.g. 3), Bruce's letter grade in the class, and his numeric gradepoint for the class. For example:

CID	Course Name	Credits	LetGrade	Gradepoint
340.108	Intermediate Basketweaving	3	A	4.0
220.209	Physics for Poets	3	B	3.0
600.117	Exploring the Internet	3	B+	3.3
340.500	Beginning Pet Grooming	2	A-	3.1

To help you with the letter-grade to gradepoint conversion, a relation called grade-conversion has been defined for you.

Lettergrade	Gradepoint
A	4.0
A-	3.7
B+	3.3
...	...

34. Compute Bruce Wilson's grade point average (for all courses listed for him in the enrolled_in relation), restricted to courses in his major. The GPA is defined as the sum of (gradepoint $\times$ course.credits) for all his major courses divided by the sum of his course.credits for all his major courses. For the example above, assuming his major is 340, his major GPA would be $(12 + 6.2)/5$. You need only to list his student ID number, total number of credits he has enrolled in and his major GPA.

35. List the first and last names of all students in the database and their GPA's (restricted to courses in the student's major and calculated as in the problem above). Format the GPA so that it shows only one value to the right of the decimal point.

36. How many students who are both smokers and late nighters have a GPA greater than 3.0?

37. List all dorms and the average GPA of their residents, sorted by GPA in descending order.

38. For each department with greater than 3 student majors, list the most popular music preference of its students. If there is a tie, give any or all of the tying preferences.

39. Create a table (filled with appropriate values) that maps between a letter grade and the next lower letter grade. Assume that the grade lower than F is F. For example:

LetterGrade	NextLower
A+	A
A	A-
A-	B+
B+	B
B	B-

Also, write an SQL command that uses this table to lower the grades of all students enrolled in courses taught by their parents to the next lowest grade (e.g. B to B-). **Do NOT** actually run this last SQL command, just write it.

40. List names of all students in the Computer Science department who are in a unilateral love (i.e. they love someone who does not love them back).

41. List sleep habits of all students who have two majors and have Mark Giuliano as advisor.

42. List the names of clubs which have members who have not taken a course that is taught by a faculty that works in the same building as Yair Amir.

43. List the names, course titles and minimum grade given for courses where the minimum grade is greater than or equal to a B- (a grade point conversion of at least 2.7).

44. List the names and ssn's of professors who teach at least one course where the minimum grade is greater than or equal to a B- (a great point conversion of at least 2.7)

45. List the names, course titles and average grade (converted to grade points) for all courses where the average grade in the class is at least 2.7 (grade point conversion).

46. List the names and ssn's of professors who teach at least one course where average grade (using grade point conversion) is at least 2.7.

47. List the name and total enrollment of the course with the largest number of enrolled students.

48. List the name, total enrollment and average grade (using grade point conversion) of the course with the highest average grade.

49. List the first and last names of all pairs of dorm mates (and their StuID's) who have taken at least one course together. You should only list a given pair of roommates once (do not repeat duplicates), and your a nswer should have 6 columns (FN1,LN1,StuID1,FN2,LN2,StuID2);

50. List the first and last names of all pairs of roommates (and their StuID's) who have the identical set of preferences and also share the same major. You should only list a given pair of roommates once (do not repeat duplicates), and your answer should have 6 columns (FN1,LN1,StuID1,FN2,LN2,StuID2);

51. List the names, primary department, office roomnumber and office building of professors who have their offices in the same building as the office of their primary department, and teach at least one course in their primary department.

52. What is the average GPA of female students who come from Maryland.

53. What is the state with the highest average GPA in the database?

54. List the name and StuID of the student in the database who lives farthest from Baltimore?

55. List the Dorm Name where the average student distance from Baltimore is greatest.

56. What is the minimum GPA of a student who lives in Maryland, along with that student's name, major, city and GPA.

57. What is the average, minimum and maximum GPA of all students who live in Maryland and do not major in Computer Science.

58. List the name and student ID of the student (or students) with the highest GPA who play Lacrosse more than 16 hours per week.

59. List the names of students who either live with someone who plays video games OR are not members of any club.

60. List the names of every department and the total number of hours their majors play video games (you can omit departments where no major plays video games).

61. List the names of every department and the average number of hours their majors play video games (including departments where no major plays video games, where the average would then be listed as 0).

62. List the names of courses that are taught by faculty who participate in the same activity as at least one of the students in that course.

63. List the names of courses that are taught by faculty who participate in the same activity as at least one of the students in that course, AND are only taken by students who do not participate in the same activity with one another.

64. List the average money spent at restaurants by students who only visit "Sandwich" type restaurants.

65. List names and StuID's of all students who have at least one allergy and have at least one roommate.

66. List the name of the dorm with the highest percentage of students who own pets (and also what that percentage is).

67. Invent a complex, interesting question of your choice and write a SQL query to compute the answer. Grading of this question will be based as much on your creativity as the correctness of your solution.