

**Database Design, CSCI 340, Spring 2015**  
**2<sup>nd</sup> Exam, March 27**

**Multiple-Choice**

1. An SQL keyword is often used with aggregate functions such as COUNT, SUM, AVG. Which of the following best fits this description? (4 pts.)
  - a. JOIN
  - b. LEFT JOIN
  - c. WHERE
  - d. ORDER BY
  - e. **GROUP BY**
  
2. A relationship going from the offering of a course (for instance Spring 2013 offering of CSCI340) to the course itself (CSCI340, Database Design) is what type of relationship? (4 pts.)
  - a. 1 to 1
  - b. 1 to many
  - c. **many to 1**
  - d. many to many
  - e. none of the above
  
3. SQL CREATE statements effect the \_\_\_\_ of a database, while INSERT statements effect the \_\_\_\_ of a database. (4 pts.)
  - a. intension, intension
  - b. **intension, extension**
  - c. extension, intension
  - d. extension, extension
  - e. None of the above
  
4. Views: (4 pts.)
  - a. Increase execution efficiency of queries
  - b. Help enforce referential integrity
  - c. **Provide a consistent picture of the database even when the database changes**
  - d. None of the above
  - e. All of the above
  
5. In relational algebra the function of the select symbol ( $\sigma$ ) most closely corresponds to which SQL keyword? (4 pts.)
  - a. SELECT
  - b. FROM
  - c. **WHERE**
  - d. ORDER BY
  - e. GROUP BY

### Short Answer

6. What is meant by normalization? (5 pts.)

Technique for providing a set of relations with desirable properties such as avoiding anomalies

Process of dividing data in a relation into multiple relations to avoid redundancy, yet not lose any information (lossless breakdown)

7. Give the definition of Boyce-Codd Normal Form (BCNF) (5 pts.)

A relation is in BCNF, if and only if, every determinant is a candidate key

8. Consider the following relation.

staffNo	dentistName	patNo	patName	appointDate	AppointTime	surgeyNo
S1011	Tony Smith	P100	Gillian White	12-Sep-08	10.00	S15
S1011	Tony Smith	P105	Jill Bell	12-Sep-08	12.00	S15
S1024	Helen Pearson	P108	Ian MacKay	12-Sep-08	10.00	S10
S1024	Helen Pearson	P108	Ian MacKay	14-Sep-08	14.00	S10
S1032	Robin Plevin	P105	Jill Bell	14-Sep-08	16.30	S15
S1032	Robin Plevin	P110	John Walker	15-Sep-08	18.00	S13
S1032	Robin Plevin	P105	Jill Bell	15-Sep-08	18.00	S10

Does it appear that the dentist/patient appointment data support the functional dependency:

staffNo, patNo → surgeryNo? (1 pts.)

No

Why, be specific? (3 pts.)

Staff person S1032 (Robin Plevin) met with patient P105 (Jill Bell) in two different surgeries (S15 and S10).

## Problem Solving

9. List all of the apparent FDs in the following relation. When something is ambiguous, you can ask me, or state your assumptions on the exam. (10 pts.)

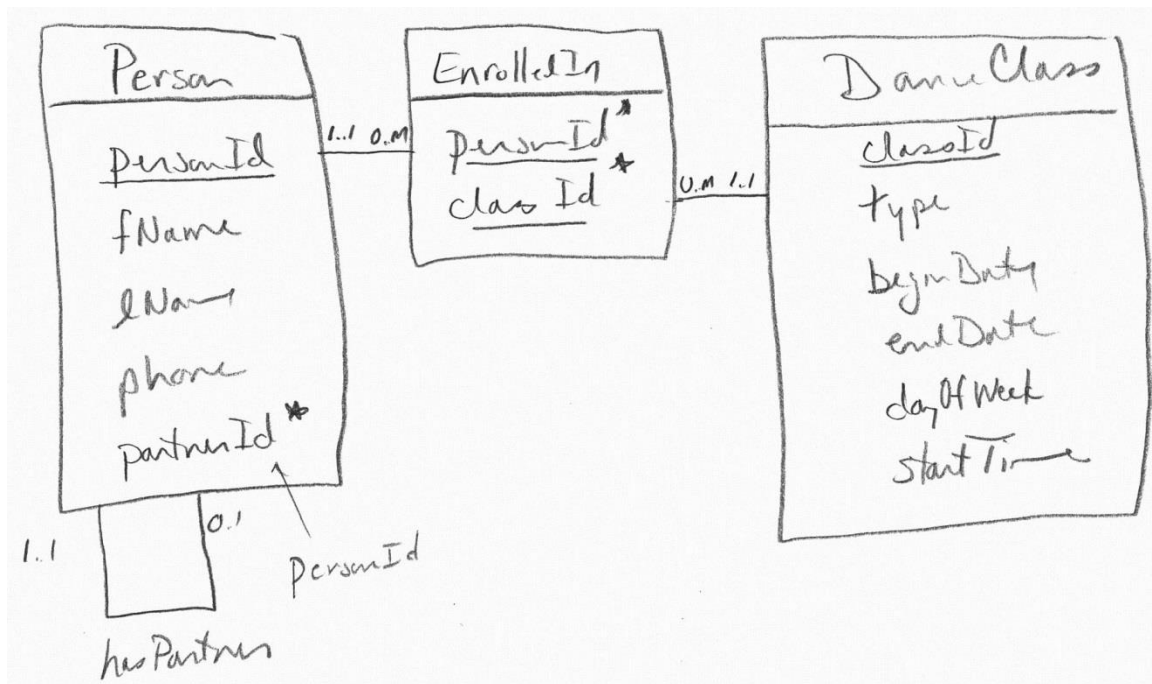
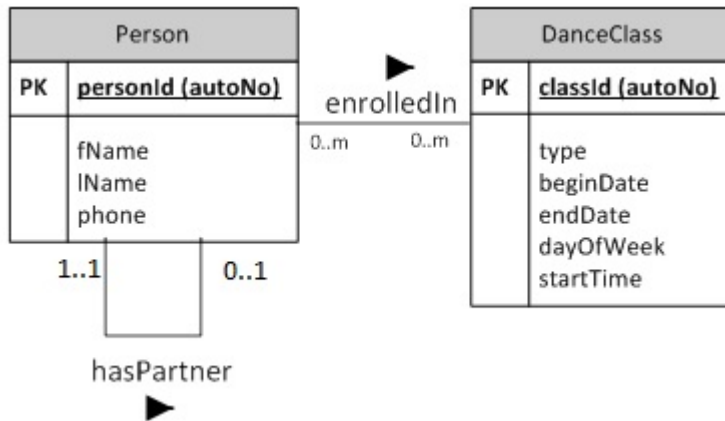
guideID	contact	countr	countryName	tripID	beginDate	endDate	client	dob	gender
8	790-442-3411-	ZAM	Zambia	1	6/3/2013	7/1/2013	Jean Duggins	3/2/1992	f
3	790-442-3411-	ZAM	Zambia	1	6/3/2013	7/1/2013	Darwin Smith	4/3/1972	m
3	790-442-3411-	ZAM	Zambia	1	6/3/2013	7/1/2013	Elaine Smith	8/13/1974	f
3	790-442-3411-	ZAM	Zambia	1	6/3/2013	7/1/2013	Jack Smith	4/12/2005	m
3	790-442-3411-	ZAM	Zambia	1	6/3/2013	7/1/2013	Emily Smith	6/7/2011	f
1	980-733-1288	FR	France	2	5/21/2013	5/28/2013	Mark Ashbaugl	5/1/1952	m
1	980-733-1288	FR	France	2	5/21/2013	5/28/2013	Jennifer Ashba	12/25/1950	f
1	980-733-1288	FR	France	2	5/21/2013	5/28/2013	Jean Duggins	3/2/1992	f
2	720-594-5543	GER	Germany	3	5/15/2013	5/22/2013	Emily Smith	6/7/2011	f
2	720-594-5543	GER	Germany	3	5/15/2013	5/22/2013	Jean Duggins	3/2/1992	f
2	720-594-5543	GER	Germany	3	5/15/2013	5/22/2013	Darwin Smith	4/3/1972	m
1	980-733-1288	ZAM	Zambia	4	12/25/2015	1/14/2016	Jean Duggins	3/2/1992	f
1	980-733-1288	ZAM	Zambia	4	12/25/2015	1/14/2016	Elaine Smith	8/13/1974	f
1	980-733-1288	ZAM	Zambia	4	12/25/2015	1/14/2016	Jennifer Ashba	12/25/1950	f
2	720-594-5543	FR	France	5	11/12/2015	12/12/2015	Mark Ashbaugl	5/1/1952	m
2	720-594-5543	FR	France	5	11/12/2015	12/12/2015	Emily Smith	6/7/2011	f

The following answers were for a previous table!

- guideID → contact, coutry, countryName, tripID, beginDate, endDate
- contact → guideID, coutry, countryName, tripID, beginDate, endDate
- country → guideID, contact, countryName, tripID, beginDate, endDate
- countryName → guideID, contact, coutry, tripID, beginDate, endDate
- tripID → guideID, contact, coutry, countryName, beginDate, endDate  
(could also use beginDate and endDate according to the data but that is just too silly)
- client → dob, gender  
(once again could use dob here, according to the data, but that is just too silly)
- guideID, client → all
- contact, client → all
- country, client → all
- countryName, client → all
- tripID, client → all

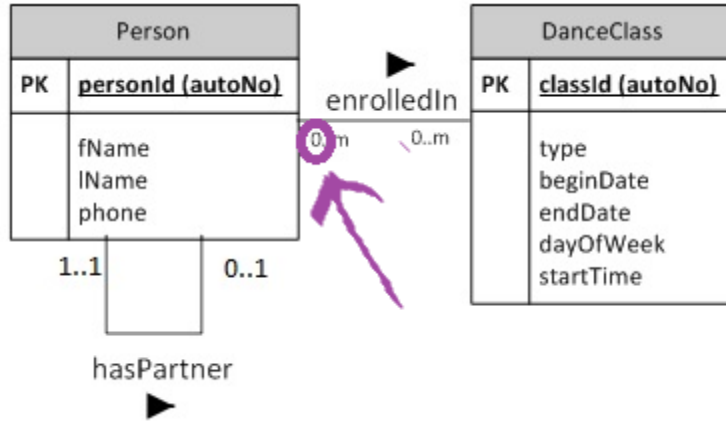
10. The conceptual model below shows that people are enrolled in dance classes and that people may or may not have partners (who may or may not be enrolled in dance classes). Convert this conceptual schema to a logical schema, containing all necessary foreign keys and join relations. Give the minimum and maximum cardinalities of all relationships in the logical model. Name the relationships. Underline the attributes of the primary keys and place a star beside any attributes of foreign keys.

(10 pts.)



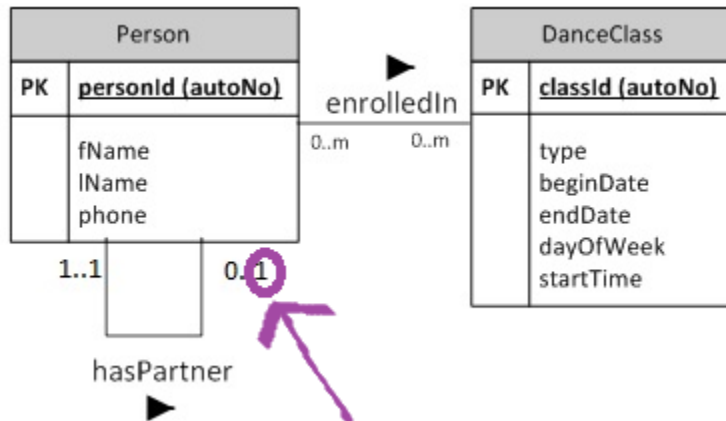


11. In the enrolledIn relationship in the conceptual model of the previous question, describe what is meant by the following.



a. This minimum cardinality of 0 means: (3 pts.)

That a dance class might not have anyone enrolled.



b. This maximum cardinality of 1 means: (3 pts.)

That someone can only have one partner in the database.

12. All FDs of the following relation have been given below. Normalize the relation to BCNF. (10 pts.)

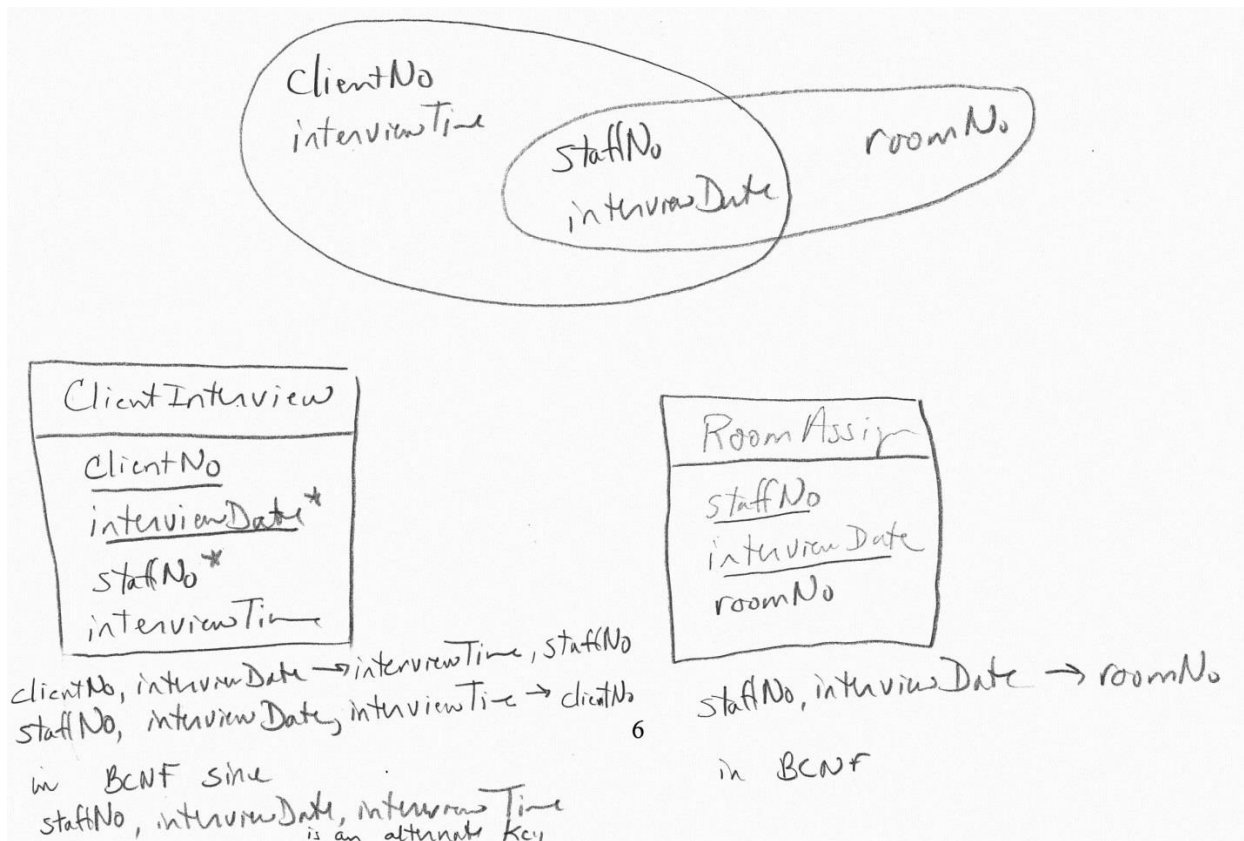
ClientInterview

clientNo	interviewDate	interviewTime	staffNo	roomNo
CR76	13-May-09	10.30	SG5	G101
CR56	13-May-09	12.00	SG5	G101
CR74	13-May-09	12.00	SG37	G102
CR56	1-Jul-09	10.30	SG5	G102

Figure 15.1 ClientInterview relation.

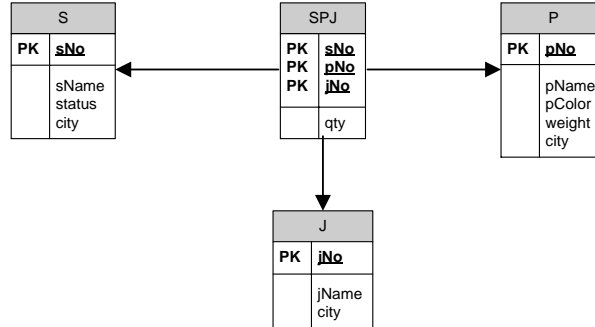
With FDs:

- clientNo, interviewDate  $\rightarrow$  interviewTime, staffNo, roomNo
- staffNo, interviewDate, interviewTime  $\rightarrow$  clientNo, roomNo
- roomNo, interviewDate, interviewTime  $\rightarrow$  clientNo, staffNo
- staffNo, interviewDate  $\rightarrow$  roomNo



## Queries (written without a computer)

Suppliers-Parts-Project  
Database



13. Write a relational algebra query which displays the name, color and weight of all parts supplied by S005 and S006. (5 pts.)

$$\pi_{pName, pColor, weight} \left( \sigma_{sNo = 'S005' \vee sNo = 'S006'} (SPJ \bowtie P) \right)$$

14. Write a relational algebra query which lists the part name (as pName), color (as pColor), project name, and number of this type of part which is supplied to the given project, regardless of the supplier. Note that black cogs should be included in the output, even though no black cogs were supplied to any project. (5 pts.)

$$\pi_{pName, pColor, jName, \text{sum}(qty)} \left( J \bowtie ((P \bowtie SPJ) \bowtie J) \right)$$



15. Write an SQL (*not relational algebra*) statement to create a view for part manufacturers to see the part name (as pName), color (as pColor), project name, and number of this type of part which is supplied to the project, regardless of the supplier. Note that black cogs should be included in the output, even though no black cogs were supplied to any project. (5 pts.)

```
CREATE VIEW PartView AS
  (SELECT pName, pColor, jName, SUM(qty) AS 'qty'
   FROM P LEFT OUTER JOIN SPJ ON P.pNo=SPJ.pNo
   LEFT OUTER JOIN J ON SPJ.jNo=J.jNo
   GROUP BY P.pNo, SPJ.jNo);
```

In MySQL the parentheses around the select statement are optional.

**Database Design, CSCI 340, Spring 2015**  
**2<sup>nd</sup> Exam, Computer Portion, March 27**

Please turn in the first portion of the exam before beginning this portion. To complete this portion of the exam you may use your notes, any previous assignments, the text and/or the Internet. You may not communicate with anyone other than myself during this exam.

Login to your katie account and then to the mysql class account:

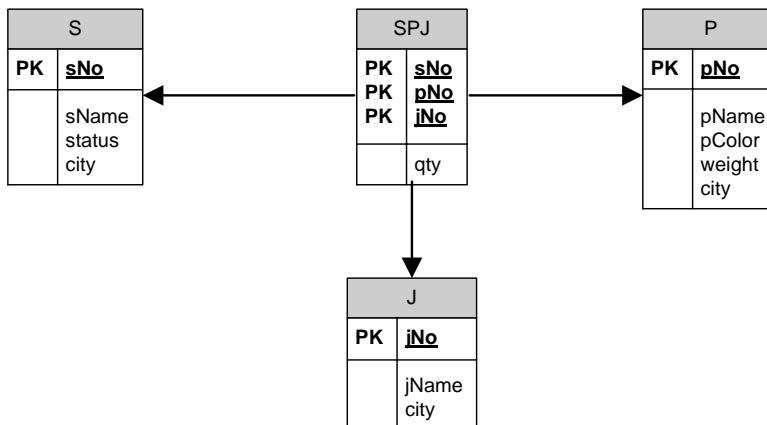
- `mysql -u csci340User -p`
- Enter password: `csci340Pass`

Switch into the SuppliersPartsProjets database via:

- `USE SuppliersPartsProjets;`

Write queries for the following. Remember that your query must work for any extension of the database, not just the current extension.

Suppliers-Parts-Project  
Database



16. Write an SQL query which displays the name, color and weight of all parts supplied by S005 and S006. (5 pts.)

```
SELECT pName, pColor, weight
FROM P JOIN SPJ ON P.pNo=SPJ.pNo
WHERE sNo='S005' OR sNo='S006';
```

17. Write an SQL statement to create a view for part manufacturers to see the part name (as pName), color (as pColor), project name, and number of this type of part which is supplied to the project, regardless of the supplier. Note that black cogs should be included in the output, even though no black cogs were supplied to any project. (5 pts.)

```
CREATE VIEW PartView AS
  (SELECT pName, pColor, jName, SUM(qty) AS 'qty'
   FROM P LEFT OUTER JOIN SPJ ON P.pNo=SPJ.pNo
        LEFT OUTER JOIN J ON SPJ.jNo=J.jNo
   GROUP BY P.pNo, SPJ.jNo);
```

18. Write an SQL statement which, for P05 (blue cams) displays the part name (“Cam”), color (“Blue”), project name, and number of this type of part which is supplied to the given project, regardless of the supplier. Note that the above view might be helpful for this. (5 pts.)

```
SELECT pName, pColor, jName, qty
FROM PartView
WHERE pName='Cam' AND pColor='Blue';
```

### Extra Credit

19. Write an SQL statement which provides the names of all cities in the database, without duplicates. (5 pts.)

```
SELECT city
FROM S
UNION
SELECT city
FROM P
UNION
SELECT city
FROM J;
```