

F16_95-703 DATABASE MANAGEMENT Project

Team #1

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Question A:

Script #1:

```
DROP TABLE employee      CASCADE CONSTRAINTS;
DROP TABLE department    CASCADE CONSTRAINTS;
DROP TABLE training      CASCADE CONSTRAINTS;
DROP TABLE course        CASCADE CONSTRAINTS;
DROP TABLE class         CASCADE CONSTRAINTS;
DROP TABLE instructor    CASCADE CONSTRAINTS;
DROP TABLE grade_score   CASCADE CONSTRAINTS;

CREATE TABLE department
(dept_ID      NUMBER(5),
 dept_Name    VARCHAR2(30) NOT NULL,
 dept_Mngr    NUMBER(5),
 CONSTRAINT department_ID_PK PRIMARY KEY (dept_ID)
);

CREATE TABLE employee
(emp_ID       NUMBER(5),
 emp_Lname    VARCHAR2(30),
 emp_Fname    VARCHAR2(30),
 email        VARCHAR2(30),
 DOB          DATE NOT NULL,
 hire_Date    DATE DEFAULT SYSDATE,
 street       VARCHAR2(30),
 city         VARCHAR2(30),
 state        VARCHAR2(2),
 zip_code     NUMBER(5),
 dept_ID     NUMBER(5),
 sup_ID      NUMBER(5),
 CONSTRAINT employee_ID_PK PRIMARY KEY (emp_ID),
 CONSTRAINT employee_deptID_FK FOREIGN KEY (dept_ID) REFERENCES department (dept_ID),
 CONSTRAINT employee_supID_FK FOREIGN KEY (sup_ID) REFERENCES employee (emp_ID),
 CONSTRAINT employee_dates_CK CHECK (DOB <= hire_Date),
 CONSTRAINT employee_email_CK CHECK (email LIKE '%@%.%'),
 CONSTRAINT employee_supID_CK CHECK (sup_ID <> emp_ID)
);

CREATE TABLE course
(crs_ID        NUMBER(5),
 crs_Title    VARCHAR2(50),
 crs_Type     VARCHAR2(30),
 college_Name VARCHAR2(30),
 tuition      NUMBER(5),
 CONSTRAINT course_ID_PK PRIMARY KEY (crs_ID)
);
```

```

CREATE TABLE instructor
(instr_ID      NUMBER(5),
instr_Lname   VARCHAR2(30) NOT NULL,
instr_Fname   VARCHAR2(30) NOT NULL,
instr_Phone   NUMBER(10),
specialty    VARCHAR2(30),
CONSTRAINT instructor_ID_PK PRIMARY KEY (instr_ID)
);

CREATE TABLE grade_score
(grade    VARCHAR2(2) NOT NULL,
score    NUMBER(3,2) NOT NULL,
CONSTRAINT gradeScore_grade_PK PRIMARY KEY (grade),
CONSTRAINT gradeScore_grade_CK CHECK (grade IN ('A+', 'A', 'A-', 'B+', 'B', 'B-', 'C+', 'C', 'C-', 'R')),
CONSTRAINT gradeScore_score_CK CHECK ((score <= 4.33) AND (score >= 0.00))
);

CREATE TABLE class
(crs_ID      NUMBER(5),
section     VARCHAR2(2),
sem_Cmpleted VARCHAR2(30),
instr_ID    NUMBER(5),
CONSTRAINT class_ID_PK PRIMARY KEY (crs_ID,section,sem_Cmpleted),
CONSTRAINT class_crsID_FK FOREIGN KEY (crs_ID) REFERENCES course (crs_ID),
CONSTRAINT class_instrID_FK FOREIGN KEY (instr_ID) REFERENCES instructor (instr_ID)
);

CREATE TABLE training
(TID        NUMBER(5),
emp_ID     NUMBER(5),
appr_Date  DATE,
crs_ID     NUMBER(5),
section    VARCHAR2(2),
sem_Cmpleted VARCHAR2(30) NOT NULL,
grade      VARCHAR2(2) NOT NULL,
CONSTRAINT training_TID_PK PRIMARY KEY (TID),
CONSTRAINT training_empID_FK FOREIGN KEY (emp_ID) REFERENCES employee (emp_ID),
CONSTRAINT training_crsID_FK FOREIGN KEY (crs_ID,section,sem_Cmpleted) REFERENCES class (crs_ID,section,sem_Cmpleted),
CONSTRAINT training_grade_FK FOREIGN KEY (grade) REFERENCES grade_score (grade)
);

ALTER TABLE department
ADD CONSTRAINT department_deptMngr_FK FOREIGN KEY (dept_Mngr) REFERENCES employee (emp_ID);

COMMIT;

```

Question A:

Script #2:

```
-- department
INSERT INTO department VALUES (1001,'Marketing',null);
INSERT INTO department VALUES (1002,'Human Resources',null);
INSERT INTO department VALUES (1003,'Sales',null);
INSERT INTO department VALUES (1004,'Customer Service',null);
INSERT INTO department VALUES (1005,'Finance',null);
INSERT INTO department VALUES (1006,'Production',null);
INSERT INTO department VALUES (1007,'Research and Development',null);
INSERT INTO department VALUES (1008,'Manufacturing',null);
INSERT INTO department VALUES (1009,'Accounting',null);
INSERT INTO department VALUES (1010,'Consulting',null);
INSERT INTO department VALUES (1011,'Analytics',null);

-- employee
INSERT INTO employee VALUES (10001,'Liu','Jingxiao','jingxial@andrew.cmu.edu','19-FEB-1994','01-AUG-2011',
    '230 N Craig','Pittsburgh','PA',15213,1001,null);
INSERT INTO employee VALUES (10002,'Agarwal','Ajay','aragarwa@andrew.cmu.edu','10-JAN-1994','02-AUG-2011',
    '5710 Bartlett Street','Pittsburgh','PA',15217,1001,10001);
INSERT INTO employee VALUES (10003,'Ahn','Jungho','junghoa@andrew.cmu.edu','24-JUN-1994','01-AUG-2011',
    '4750 Centre Avenue','Pittsburgh','PA',15213,1001,10001);
INSERT INTO employee VALUES (10004,'Aravind','Pritham','pvaravin@andrew.cmu.edu','09-APR-1994','02-AUG-2011',
    '5738 Darlington','Pittsburgh','PA',15217 ,1002,null);
INSERT INTO employee VALUES (10005,'Bakert','Andrew','abakert@andrew.cmu.edu','21-DEC-1994','01-AUG-2012',
    '240 Melwood Ave','Pittsburgh','PA',15213,1002,10004);
INSERT INTO employee VALUES (10006,'Arora','Rajat','rarora1@cmu.edu','06-APR-1993','02-AUG-2012',
    '5738 Darlington','Pittsburgh','PA',15217 ,1003,null);
INSERT INTO employee VALUES (10007,'Chao','Shucheng','shuchenc@andrew.cmu.edu','21-NOV-1994','01-AUG-2012',
    '230 N Craig','Pittsburgh','PA',15213,1003,10006);
INSERT INTO employee VALUES (10008,'Chen','Dihong','dihonc@andrew.cmu.edu','09-APR-1994','02-AUG-2012',
    '5738 Darlington','Pittsburgh','PA',15217 ,1004,null);
INSERT INTO employee VALUES (10009,'Chen','Yiming','yimingc1@andrew.cmu.edu','21-SEP-1993','02-AUG-2012',
    '5710 Bartlett Street','Pittsburgh','PA',15217,1004,10008);
INSERT INTO employee VALUES (10010,'Dennin','Luke','ldennin@andrew.cmu.edu','03-APR-1995','02-AUG-2012',
    '5738 Darlington','Pittsburgh','PA',15217 ,1005,null);
INSERT INTO employee VALUES (10011,'Feng','Christopher','cf1@andrew.cmu.edu','27-FEB-1994','01-AUG-2012',
    '4750 Centre Avenue','Pittsburgh','PA',15213,1005,10010);
INSERT INTO employee VALUES (10012,'Zhu','Di','zhudi@andrew.cmu.edu','19-MAR-1994','01-AUG-2012',
    '230 N Craig','Pittsburgh','PA',15213,1006,null);
INSERT INTO employee VALUES (10013,'Zhou','Jiali','jializ@andrew.cmu.edu','10-JAN-1994','02-AUG-2012',
    '5710 Bartlett Street','Pittsburgh','PA',15217,1006,10012);
INSERT INTO employee VALUES (10014,'Zhao','Yusheng','zhaoyu@andrew.cmu.edu','24-JUN-1994','01-AUG-2012',
    '4750 Centre Avenue','Pittsburgh','PA',15213,1007,null);
INSERT INTO employee VALUES (10015,'Zhao','Yiren','Yiren@andrew.cmu.edu','09-APR-1994','02-AUG-2012',
    '5738 Darlington','Pittsburgh','PA',15217 ,1007,10014);
INSERT INTO employee VALUES (10016,'Zhao','Xin','xinzh@andrew.cmu.edu','21-DEC-1994','01-AUG-2012',
    '240 Melwood Ave','Pittsburgh','PA',15213,1008,null);
INSERT INTO employee VALUES (10017,'Alla','Sharan','sharan@cmu.edu','06-APR-1993','02-AUG-2012',
    '5738 Darlington','Pittsburgh','PA',15217,1008,10016);
INSERT INTO employee VALUES (10018,'Bamforth','Gabriel','gabriel@andrew.cmu.edu','21-NOV-1994','01-AUG-2012',
    '230 N Craig','Pittsburgh','PA',15213,1009,null);
```

```
INSERT INTO employee VALUES (10019,'Cheng','Perry','perryc@andrew.cmu.edu','09-APR-1994','02-AUG-2012',
                            '5738 Darlington','Pittsburgh','PA',15217,1009,10018);
INSERT INTO employee VALUES (10020,'Chirinos','Renato','renato@andrew.cmu.edu','21-SEP-1993','02-AUG-2011',
                            '5710 Bartlett Street','Pittsburgh','PA',15217,1010,null);
INSERT INTO employee VALUES (10021,'Chukwuma','Obianozo','obiano@andrew.cmu.edu','03-APR-1995','02-AUG-2015',
                            '5738 Darlington','Pittsburgh','PA',15217,1010,10020);
INSERT INTO employee VALUES (10022,'Clarke','Dylan','dylan@andrew.cmu.edu','27-FEB-1994','01-AUG-2015',
                            '4750 Centre Avenue','Pittsburgh','PA',15213,1011,null);
INSERT INTO employee VALUES (10023,'Cruz','Julissa','julis@andrew.cmu.edu','27-FEB-1994','01-AUG-2015',
                            '4750 Centre Avenue','Pittsburgh','PA',15213,1011,10022);
```

-- instructor

```
INSERT INTO instructor VALUES (9501,'Szczyplula','Janusz',4122686096,'Database');
INSERT INTO instructor VALUES (9502,'Esmall','Zadeh',1881109911,'Management');
INSERT INTO instructor VALUES (9503,'Dwivedi','Neelam',4122687246,'Java');
INSERT INTO instructor VALUES (9504,'Pastor','Lynne',4122686725,'Finance');
INSERT INTO instructor VALUES (9505,'Alessandro','Acquisti',4122686101,'Economics');
INSERT INTO instructor VALUES (9506,'Crane','John',4122686065,'Management');
INSERT INTO instructor VALUES (9507,'Pastor','Lynn',1881109943,'Finance');
INSERT INTO instructor VALUES (9508,'Labash','Chris',4122687256,'Management');
INSERT INTO instructor VALUES (9509,'Rosenberg','Haley',4122686723,'Management');
INSERT INTO instructor VALUES (9510,'Baron','Raymond',4122686176,'Management');
INSERT INTO instructor VALUES (9511,'Szczyplula','Janusz',4122686096,'Database');
```

-- grade_score

```
INSERT INTO grade_score VALUES ('A+',4.33);
INSERT INTO grade_score VALUES ('A',4.00);
INSERT INTO grade_score VALUES ('A-',3.67);
INSERT INTO grade_score VALUES ('B+',3.33);
INSERT INTO grade_score VALUES ('B',3.00);
INSERT INTO grade_score VALUES ('B-',2.67);
INSERT INTO grade_score VALUES ('C+',2.33);
INSERT INTO grade_score VALUES ('C',2.00);
INSERT INTO grade_score VALUES ('C-',1.67);
INSERT INTO grade_score VALUES ('R',0.00);
```

--course

```
INSERT INTO course VALUES (95703,'Database Mngt','DBM','Heinz',1800);
INSERT INTO course VALUES (95705,'Telecommunications Management','EXTC','Heinz',0);
INSERT INTO course VALUES (95706,'Object Oriented Analysis and Design','CS','Heinz',0);
INSERT INTO course VALUES (95716,'Principles of Finance','Finance','Heinz',900);
INSERT INTO course VALUES (95710,'Economic Analysis','Finance','Heinz',null);
INSERT INTO course VALUES (95701,'Marketing Digital Media','Finance','Heinz',1800);
INSERT INTO course VALUES (95702,'Financial Accounting','Finance','Heinz',2700);
INSERT INTO course VALUES (95704,'Professional Speaking','English','Heinz',1800);
INSERT INTO course VALUES (95707,'Professional Writing','English','Heinz',2700);
INSERT INTO course VALUES (95708,'Managing Disruptive Technologies','CS','Heinz',null);
INSERT INTO course VALUES (95722,'Data Structures','CS','School of Computer Science',2700);
INSERT INTO course VALUES (95723,'Machine Learning','CS','School of Computer Science',900);
```

```
-- class
INSERT INTO class VALUES (95706,'A1','Spring 2013',9503);
INSERT INTO class VALUES (95716,'A2','Spring 2013',9504);
INSERT INTO class VALUES (95710,'A2','Spring 2013',9505);
INSERT INTO class VALUES (95701,'A1','Fall 2013',9506);
INSERT INTO class VALUES (95702,'A1','Fall 2013',9507);
INSERT INTO class VALUES (95708,'A2','Fall 2013',9510);
INSERT INTO class VALUES (95722,'A2','Fall 2013',9501);
INSERT INTO class VALUES (95723,'A2','Fall 2013',9502);
INSERT INTO class VALUES (95703,'A1','Spring 2014',9501);
INSERT INTO class VALUES (95716,'A2','Spring 2014',9504);
INSERT INTO class VALUES (95710,'A2','Spring 2014',9505);
INSERT INTO class VALUES (95701,'A1','Fall 2014',9506);
INSERT INTO class VALUES (95702,'A1','Fall 2014',9507);
INSERT INTO class VALUES (95704,'A1','Fall 2014',9508);
INSERT INTO class VALUES (95722,'A2','Fall 2014',9501);
INSERT INTO class VALUES (95723,'A2','Fall 2014',9502);
INSERT INTO class VALUES (95705,'A1','Spring 2014',9502);
INSERT INTO class VALUES (95703,'A1','Spring 2015',9501);
INSERT INTO class VALUES (95705,'A1','Spring 2015',9502);
INSERT INTO class VALUES (95710,'A2','Spring 2015',9505);
INSERT INTO class VALUES (95701,'A1','Fall 2015',9506);
INSERT INTO class VALUES (95702,'A1','Fall 2015',9507);
INSERT INTO class VALUES (95704,'A1','Fall 2015',9508);
INSERT INTO class VALUES (95707,'A2','Fall 2015',9509);
INSERT INTO class VALUES (95723,'A2','Fall 2015',9502);
INSERT INTO class VALUES (95716,'A2','Spring 2015',9504);
INSERT INTO class VALUES (95703,'A1','Spring 2016',9501);
INSERT INTO class VALUES (95705,'A1','Spring 2016',9502);
INSERT INTO class VALUES (95706,'A1','Spring 2016',9503);
INSERT INTO class VALUES (95701,'A1','Fall 2016',9506);
INSERT INTO class VALUES (95702,'A1','Fall 2016',9507);
INSERT INTO class VALUES (95704,'A1','Fall 2016',9508);
INSERT INTO class VALUES (95707,'A2','Fall 2016',9509);
INSERT INTO class VALUES (95708,'A2','Fall 2016',9510);
```

--training

```
INSERT INTO training VALUES (001,10018,'29-NOV-2012',95710,'A2','Spring 2013','A');
INSERT INTO training VALUES (002,10019,'29-NOV-2012',95710,'A2','Spring 2013','B');
INSERT INTO training VALUES (003,10014,'29-MAR-2013',95701,'A1','Fall 2013','B-');
INSERT INTO training VALUES (004,10014,'29-MAR-2013',95702,'A1','Fall 2013','B');
INSERT INTO training VALUES (005,10001,'29-MAR-2013',95701,'A1','Fall 2013','A');
INSERT INTO training VALUES (006,10001,'29-MAR-2013',95702,'A1','Fall 2013','B');
INSERT INTO training VALUES (007,10012,'29-MAR-2013',95723,'A2','Fall 2013','R');
INSERT INTO training VALUES (008,10013,'29-MAR-2013',95723,'A2','Fall 2013','B');
INSERT INTO training VALUES (009,10012,'29-MAR-2014',95723,'A2','Fall 2014','A');
INSERT INTO training VALUES (010,10001,'29-NOV-2013',95703,'A1','Spring 2014','C-');
INSERT INTO training VALUES (011,10003,'29-NOV-2013',95716,'A2','Spring 2014','B+');
INSERT INTO training VALUES (012,10004,'29-NOV-2013',95710,'A2','Spring 2014','A');
INSERT INTO training VALUES (013,10005,'29-NOV-2013',95710,'A2','Spring 2014','B');
INSERT INTO training VALUES (014,10006,'29-NOV-2013',95716,'A2','Spring 2014','R');
INSERT INTO training VALUES (015,10001,'29-MAR-2014',95701,'A1','Fall 2014','A');
INSERT INTO training VALUES (016,10002,'29-MAR-2014',95702,'A1','Fall 2014','B');
```

```
INSERT INTO training VALUES (017,10003,'29-MAR-2014',95704,'A1','Fall 2014','R');
INSERT INTO training VALUES (018,10004,'29-MAR-2014',95701,'A1','Fall 2014','A');
INSERT INTO training VALUES (019,10005,'29-MAR-2014',95702,'A1','Fall 2014','B');
INSERT INTO training VALUES (020,10009,'29-MAR-2014',95723,'A2','Fall 2014','C');
INSERT INTO training VALUES (021,10010,'29-MAR-2014',95723,'A2','Fall 2014','B');
INSERT INTO training VALUES (022,10006,'29-NOV-2014',95716,'A2','Spring 2015','C');
INSERT INTO training VALUES (023,10003,'29-MAR-2015',95704,'A1','Fall 2015','B+');
INSERT INTO training VALUES (024,10011,'29-NOV-2014',95703,'A1','Spring 2015','R');
INSERT INTO training VALUES (025,10012,'29-NOV-2014',95705,'A1','Spring 2015','A-');
INSERT INTO training VALUES (026,10015,'29-NOV-2014',95710,'A2','Spring 2015','B');
INSERT INTO training VALUES (027,10019,'29-NOV-2014',95710,'A2','Spring 2015','C-');
INSERT INTO training VALUES (028,10011,'29-MAR-2015',95701,'A1','Fall 2015','C-');
INSERT INTO training VALUES (029,10012,'29-MAR-2015',95702,'A1','Fall 2015','B');
INSERT INTO training VALUES (030,10014,'29-MAR-2015',95701,'A1','Fall 2015','A');
INSERT INTO training VALUES (031,10015,'29-MAR-2015',95702,'A1','Fall 2015','R');
INSERT INTO training VALUES (032,10017,'29-MAR-2015',95707,'A2','Fall 2015','R');
INSERT INTO training VALUES (033,10015,'29-MAR-2016',95702,'A1','Fall 2016','B');
INSERT INTO training VALUES (034,10017,'29-MAR-2016',95707,'A2','Fall 2016','B');
INSERT INTO training VALUES (035,10011,'29-NOV-2015',95703,'A1','Spring 2016','B');
INSERT INTO training VALUES (036,10001,'29-NOV-2015',95703,'A1','Spring 2016','A');
INSERT INTO training VALUES (037,10006,'29-NOV-2015',95703,'A1','Spring 2016','A');
INSERT INTO training VALUES (038,10002,'29-NOV-2015',95705,'A1','Spring 2016','A-');
INSERT INTO training VALUES (039,10006,'29-MAR-2016',95701,'A1','Fall 2016','R');
INSERT INTO training VALUES (040,10022,'29-MAR-2016',95702,'A1','Fall 2016','B');
INSERT INTO training VALUES (041,10023,'29-MAR-2016',95704,'A1','Fall 2016','B+');
INSERT INTO training VALUES (042,10009,'29-MAR-2016',95701,'A1','Fall 2016','A');
INSERT INTO training VALUES (043,10009,'29-MAR-2016',95702,'A1','Fall 2016','R');
```

```
--ADD DEPT_MNGR
-- department_deptMngr
UPDATE department SET dept_Mngr = 10001 WHERE dept_ID = 1001;
UPDATE department SET dept_Mngr = 10004 WHERE dept_ID = 1002;
UPDATE department SET dept_Mngr = 10006 WHERE dept_ID = 1003;
UPDATE department SET dept_Mngr = 10008 WHERE dept_ID = 1004;
UPDATE department SET dept_Mngr = 10010 WHERE dept_ID = 1005;
UPDATE department SET dept_Mngr = 10012 WHERE dept_ID = 1006;
UPDATE department SET dept_Mngr = 10014 WHERE dept_ID = 1007;
UPDATE department SET dept_Mngr = 10016 WHERE dept_ID = 1008;
UPDATE department SET dept_Mngr = 10018 WHERE dept_ID = 1009;
UPDATE department SET dept_Mngr = 10020 WHERE dept_ID = 1010;
UPDATE department SET dept_Mngr = 10022 WHERE dept_ID = 1011;
```

```
COMMIT;
```

Question A:

Content of the tables:

SQL> SELECT * FROM employee;

| EMP_ID | EMP_LNAME | EMP_FNAME | EMAIL | DOB | HIRE_DATE | STREET | CITY | ST | ZIP_CODE | DEPT_ID | SUP_ID |
|--------|-----------|-------------|-------------------------|-----------|-----------|----------------------|------------|----|----------|---------|--------|
| 10001 | Liu | Jingxiao | jingxial@andrew.cmu.edu | 19-FEB-94 | 01-AUG-11 | 230 N Craig | Pittsburgh | PA | 15213 | 1001 | |
| 10002 | Agarwal | Ajay | agararwa@andrew.cmu.edu | 10-JAN-94 | 02-AUG-11 | 5710 Bartlett Street | Pittsburgh | PA | 15217 | 1001 | 10001 |
| 10003 | Ahn | Jungho | junghoa@andrew.cmu.edu | 24-JUN-94 | 01-AUG-11 | 4750 Centre Avenue | Pittsburgh | PA | 15213 | 1001 | 10001 |
| 10004 | Aravind | Pritham | pvaravin@andrew.cmu.edu | 09-APR-94 | 02-AUG-11 | 5738 Darlington | Pittsburgh | PA | 15217 | 1002 | |
| 10005 | Bakert | Andrew | abakert@andrew.cmu.edu | 21-DEC-94 | 01-AUG-12 | 240 Melwood Ave | Pittsburgh | PA | 15213 | 1002 | 10004 |
| 10006 | Arora | Rajat | rarora1@cmu.edu | 06-APR-93 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1003 | |
| 10007 | Chao | Shucheng | shuchenc@andrew.cmu.edu | 21-NOV-94 | 01-AUG-12 | 230 N Craig | Pittsburgh | PA | 15213 | 1003 | 10006 |
| 10008 | Chen | Dihong | dihonc@andrew.cmu.edu | 09-APR-94 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1004 | |
| 10009 | Chen | Yiming | yimingc1@andrew.cmu.edu | 21-SEP-93 | 02-AUG-12 | 5710 Bartlett Street | Pittsburgh | PA | 15217 | 1004 | 10008 |
| 10010 | Dennin | Luke | ldennin@andrew.cmu.edu | 03-APR-95 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1005 | |
| 10011 | Feng | Christopher | cf1@andrew.cmu.edu | 27-FEB-94 | 01-AUG-12 | 4750 Centre Avenue | Pittsburgh | PA | 15213 | 1005 | 10010 |
| 10012 | Zhu | Di | zhudi@andrew.cmu.edu | 19-MAR-94 | 01-AUG-12 | 230 N Craig | Pittsburgh | PA | 15213 | 1006 | |
| 10013 | Zhou | Jiali | jializ@andrew.cmu.edu | 10-JAN-94 | 02-AUG-12 | 5710 Bartlett Street | Pittsburgh | PA | 15217 | 1006 | 10012 |
| 10014 | Zhao | Yusheng | zhaoyu@andrew.cmu.edu | 24-JUN-94 | 01-AUG-12 | 4750 Centre Avenue | Pittsburgh | PA | 15213 | 1007 | |
| 10015 | Zhao | Yiren | Yiren@andrew.cmu.edu | 09-APR-94 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1007 | 10014 |
| 10016 | Zhao | Xin | xinzh@andrew.cmu.edu | 21-DEC-94 | 01-AUG-12 | 240 Melwood Ave | Pittsburgh | PA | 15213 | 1008 | |
| 10017 | Alla | Sharan | sharan@cmu.edu | 06-APR-93 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1008 | 10016 |
| 10018 | Bamforth | Gabriel | gabriel@andrew.cmu.edu | 21-NOV-94 | 01-AUG-12 | 230 N Craig | Pittsburgh | PA | 15213 | 1009 | |
| 10019 | Cheng | Perry | perryc@andrew.cmu.edu | 09-APR-94 | 02-AUG-12 | 5738 Darlington | Pittsburgh | PA | 15217 | 1009 | 10018 |
| 10020 | Chirinos | Renato | renato@andrew.cmu.edu | 21-SEP-93 | 02-AUG-11 | 5710 Bartlett Street | Pittsburgh | PA | 15217 | 1010 | |
| 10021 | Chukwuma | Obianozo | obiano@andrew.cmu.edu | 03-APR-95 | 02-AUG-15 | 5738 Darlington | Pittsburgh | PA | 15217 | 1010 | 10020 |
| 10022 | Clarke | Dylan | dylan@andrew.cmu.edu | 27-FEB-94 | 01-AUG-15 | 4750 Centre Avenue | Pittsburgh | PA | 15213 | 1011 | |
| 10023 | Cruz | Julissa | julis@andrew.cmu.edu | 27-FEB-94 | 01-AUG-15 | 4750 Centre Avenue | Pittsburgh | PA | 15213 | 1011 | 10022 |

23 rows selected.

SQL> SELECT * FROM department;

| DEPT_ID | DEPT_NAME | DEPT_MNGR |
|---------|--------------------------|-----------|
| 1001 | Marketing | 10001 |
| 1002 | Human Resources | 10004 |
| 1003 | Sales | 10006 |
| 1004 | Customer Service | 10008 |
| 1005 | Finance | 10010 |
| 1006 | Production | 10012 |
| 1007 | Research and Development | 10014 |
| 1008 | Manufacturing | 10016 |
| 1009 | Accounting | 10018 |
| 1010 | Consulting | 10020 |
| 1011 | Analytics | 10022 |

11 rows selected.

```
SQL> SELECT * FROM training;
```

| TID | EMP_ID | APPR_DATE | CRS_ID | SECTION | SEM_CMPLETED | GR |
|-----|--------|-----------|--------|---------|--------------|----|
| 1 | 10018 | 29-NOV-12 | 95710 | A2 | Spring 2013 | A |
| 2 | 10019 | 29-NOV-12 | 95710 | A2 | Spring 2013 | B |
| 3 | 10014 | 29-MAR-13 | 95701 | A1 | Fall 2013 | B- |
| 4 | 10014 | 29-MAR-13 | 95702 | A1 | Fall 2013 | B |
| 5 | 10001 | 29-MAR-13 | 95701 | A1 | Fall 2013 | A |
| 6 | 10001 | 29-MAR-13 | 95702 | A1 | Fall 2013 | B |
| 7 | 10012 | 29-MAR-13 | 95723 | A2 | Fall 2013 | R |
| 8 | 10013 | 29-MAR-13 | 95723 | A2 | Fall 2013 | B |
| 9 | 10012 | 29-MAR-14 | 95723 | A2 | Fall 2014 | A |
| 10 | 10001 | 29-NOV-13 | 95703 | A1 | Spring 2014 | C- |
| 11 | 10003 | 29-NOV-13 | 95716 | A2 | Spring 2014 | B+ |
| 12 | 10004 | 29-NOV-13 | 95710 | A2 | Spring 2014 | A |
| 13 | 10005 | 29-NOV-13 | 95710 | A2 | Spring 2014 | B |
| 14 | 10006 | 29-NOV-13 | 95716 | A2 | Spring 2014 | R |
| 15 | 10001 | 29-MAR-14 | 95701 | A1 | Fall 2014 | A |
| 16 | 10002 | 29-MAR-14 | 95702 | A1 | Fall 2014 | B |
| 17 | 10003 | 29-MAR-14 | 95704 | A1 | Fall 2014 | R |
| 18 | 10004 | 29-MAR-14 | 95701 | A1 | Fall 2014 | A |
| 19 | 10005 | 29-MAR-14 | 95702 | A1 | Fall 2014 | B |
| 20 | 10009 | 29-MAR-14 | 95723 | A2 | Fall 2014 | C |
| 21 | 10010 | 29-MAR-14 | 95723 | A2 | Fall 2014 | B |
| 22 | 10006 | 29-NOV-14 | 95716 | A2 | Spring 2015 | C |
| 23 | 10003 | 29-MAR-15 | 95704 | A1 | Fall 2015 | B+ |
| 24 | 10011 | 29-NOV-14 | 95703 | A1 | Spring 2015 | R |
| 25 | 10012 | 29-NOV-14 | 95705 | A1 | Spring 2015 | A- |
| 26 | 10015 | 29-NOV-14 | 95710 | A2 | Spring 2015 | B |
| 27 | 10019 | 29-NOV-14 | 95710 | A2 | Spring 2015 | C- |
| 28 | 10011 | 29-MAR-15 | 95701 | A1 | Fall 2015 | C- |
| 29 | 10012 | 29-MAR-15 | 95702 | A1 | Fall 2015 | B |
| 30 | 10014 | 29-MAR-15 | 95701 | A1 | Fall 2015 | A |
| 31 | 10015 | 29-MAR-15 | 95702 | A1 | Fall 2015 | R |
| 32 | 10017 | 29-MAR-15 | 95707 | A2 | Fall 2015 | R |
| 33 | 10015 | 29-MAR-16 | 95702 | A1 | Fall 2016 | B |
| 34 | 10017 | 29-MAR-16 | 95707 | A2 | Fall 2016 | B |
| 35 | 10011 | 29-NOV-15 | 95703 | A1 | Spring 2016 | B |
| 36 | 10001 | 29-NOV-15 | 95703 | A1 | Spring 2016 | A |
| 37 | 10006 | 29-NOV-15 | 95703 | A1 | Spring 2016 | A |
| 38 | 10002 | 29-NOV-15 | 95705 | A1 | Spring 2016 | A- |
| 39 | 10006 | 29-MAR-16 | 95701 | A1 | Fall 2016 | R |
| 40 | 10022 | 29-MAR-16 | 95702 | A1 | Fall 2016 | B |
| 41 | 10023 | 29-MAR-16 | 95704 | A1 | Fall 2016 | B+ |
| 42 | 10009 | 29-MAR-16 | 95701 | A1 | Fall 2016 | A |
| 43 | 10009 | 29-MAR-16 | 95702 | A1 | Fall 2016 | R |

43 rows selected.

```
SQL> SELECT * FROM course;
```

| CRS_ID | CRS_TITLE | CRS_TYPE | COLLEGE_NAME | TUITION |
|--------|-------------------------------------|----------|----------------------------|---------|
| 95703 | Database Mngt | DBM | Heinz | 1800 |
| 95705 | Telecommunications Management | EXTC | Heinz | 0 |
| 95706 | Object Oriented Analysis and Design | CS | Heinz | 0 |
| 95716 | Principles of Finance | Finance | Heinz | 900 |
| 95710 | Economic Analysis | Finance | Heinz | |
| 95701 | Marketing Digital Media | Finance | Heinz | 1800 |
| 95702 | Financial Accounting | Finance | Heinz | 2700 |
| 95704 | Professional Speaking | English | Heinz | 1800 |
| 95707 | Professional Writing | English | Heinz | 2700 |
| 95708 | Managing Disruptive Technologies | CS | Heinz | |
| 95722 | Data Structures | CS | School of Computer Science | 2700 |
| 95723 | Machine Learning | CS | School of Computer Science | 900 |

12 rows selected.

```
SQL> SELECT * FROM instructor;
```

| INSTR_ID | INSTR_LNAME | INSTR_FNAME | INSTR_PHONE | SPECIALTY |
|----------|-------------|-------------|-------------|------------|
| 9501 | Szczypula | Janusz | 4122686096 | Database |
| 9502 | Esmall | Zadeh | 1881109911 | Management |
| 9503 | Dwivedi | Neelam | 4122687246 | Java |
| 9504 | Pastor | Lynne | 4122686725 | Finance |
| 9505 | Alessandro | Acquisti | 4122686101 | Economics |
| 9506 | Crane | John | 4122686065 | Management |
| 9507 | Pastor | Lynn | 1881109943 | Finance |
| 9508 | Labash | Chris | 4122687256 | Management |
| 9509 | Rosenberg | Haley | 4122686723 | Management |
| 9510 | Baron | Raymond | 4122686176 | Management |
| 9511 | Szczypula | Janusz | 4122686096 | Database |

11 rows selected.

```
SQL> SELECT * FROM class;
```

| CRS_ID | SECTION | SEM_CMPLETED | INSTR_ID |
|--------|---------|--------------|----------|
| 95706 | A1 | Spring 2013 | 9503 |
| 95716 | A2 | Spring 2013 | 9504 |
| 95710 | A2 | Spring 2013 | 9505 |
| 95701 | A1 | Fall 2013 | 9506 |
| 95702 | A1 | Fall 2013 | 9507 |
| 95708 | A2 | Fall 2013 | 9510 |
| 95722 | A2 | Fall 2013 | 9501 |
| 95723 | A2 | Fall 2013 | 9502 |
| 95703 | A1 | Spring 2014 | 9501 |
| 95716 | A2 | Spring 2014 | 9504 |
| 95710 | A2 | Spring 2014 | 9505 |
| 95701 | A1 | Fall 2014 | 9506 |
| 95702 | A1 | Fall 2014 | 9507 |
| 95704 | A1 | Fall 2014 | 9508 |
| 95722 | A2 | Fall 2014 | 9501 |
| 95723 | A2 | Fall 2014 | 9502 |
| 95705 | A1 | Spring 2014 | 9502 |
| 95703 | A1 | Spring 2015 | 9501 |
| 95705 | A1 | Spring 2015 | 9502 |
| 95710 | A2 | Spring 2015 | 9505 |
| 95701 | A1 | Fall 2015 | 9506 |
| 95702 | A1 | Fall 2015 | 9507 |
| 95704 | A1 | Fall 2015 | 9508 |
| 95707 | A2 | Fall 2015 | 9509 |
| 95723 | A2 | Fall 2015 | 9502 |
| 95716 | A2 | Spring 2015 | 9504 |
| 95703 | A1 | Spring 2016 | 9501 |
| 95705 | A1 | Spring 2016 | 9502 |
| 95706 | A1 | Spring 2016 | 9503 |
| 95701 | A1 | Fall 2016 | 9506 |
| 95702 | A1 | Fall 2016 | 9507 |
| 95704 | A1 | Fall 2016 | 9508 |
| 95707 | A2 | Fall 2016 | 9509 |
| 95708 | A2 | Fall 2016 | 9510 |

```
34 rows selected.
```

```
SQL> SELECT * FROM grade_score;
```

| GR | SCORE |
|----|-------|
| A+ | 4.33 |
| A | 4 |
| A- | 3.67 |
| B+ | 3.33 |
| B | 3 |
| B- | 2.67 |
| C+ | 2.33 |
| C | 2 |
| C- | 1.67 |
| R | 0 |

```
10 rows selected.
```

Question B:

Create SQL queries:

```
SQL> --Q1
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN employee FORMAT A30
SQL> COLUMN GPA FORMAT 0.99
SQL> SELECT DISTINCT emp_ID || '-' || emp_Lname || ', ' || emp_Fname AS employee,
  2      COUNT(emp_ID) AS "# of times", AVG(score) AS GPA, crs_ID
  3  FROM  grade_score JOIN training USING(grade)
  4  JOIN employee USING(emp_ID)
  5 GROUP BY emp_ID,emp_Lname,emp_Fname,crs_ID
  6 HAVING COUNT(emp_ID) > 1;
```

| EMPLOYEE | # of times | GPA | CRS_ID |
|-------------------------|------------|------|--------|
| 10019-Cheng, Perry | 2 | 2.34 | 95710 |
| 10012-Zhu, Di | 2 | 2.00 | 95723 |
| 10003-Ahn, Jungho | 2 | 1.67 | 95704 |
| 10011-Feng, Christopher | 2 | 1.50 | 95703 |
| 10001-Liu, Jingxiao | 2 | 4.00 | 95701 |
| 10017-Alla, Sharan | 2 | 1.50 | 95707 |
| 10014-Zhao, Yusheng | 2 | 3.34 | 95701 |
| 10001-Liu, Jingxiao | 2 | 2.84 | 95703 |
| 10015-Zhao, Yiren | 2 | 1.50 | 95702 |
| 10006-Arora, Rajat | 2 | 1.00 | 95716 |

10 rows selected.

```

SQL> --Q2
SQL> --Assumption: The fiscal year in the USA is from OCT 1st to next year's Sept 30th. In order to make sure that
SQL> --every semester is finished in one fiscal year. We assume that the fall semester is from AUG 1st to SEPT 30th,
SQL> --and the spring semester is from FEB 1st to MAR 31st. Thus, we should use different semesters' records in
SQL> --different month.
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN employee FORMAT A30
SQL> SELECT employee, email, "# of classes"
  2  FROM(SELECT DISTINCT emp_ID || '-' || emp_Lname || ', ' || emp_Fname AS employee, email,
  3          COUNT(emp_ID) AS "# of classes", AVG(score) AS "GPA"
  4      FROM employee JOIN training USING(emp_ID)
  5          JOIN class USING(crs_ID, section, sem_Cmpleted)
  6          JOIN course USING(crs_ID)
  7          JOIN grade_score USING(grade)
  8     WHERE (LOWER(crs_Title) = 'database mngrt' OR LOWER(crs_Type) = 'dbm')
  9     AND (TO_NUMBER(SUBSTR(sem_Cmpleted,INSTR(sem_Cmpleted,' ')+1,INSTR(sem_Cmpleted,' ')+4)) > EXTRACT(YEAR FROM SYSDATE)-3
10      OR sem_Cmpleted = (CASE
11          WHEN EXTRACT(MONTH FROM SYSDATE) BETWEEN 1 AND 9 THEN 'Fall '
12          ELSE NULL END) || TO_CHAR(EXTRACT(YEAR FROM SYSDATE)-3)
13      OR sem_Cmpleted = (CASE
14          WHEN EXTRACT(MONTH FROM SYSDATE) BETWEEN 1 AND 3 THEN 'Spring '
15          ELSE NULL END) || TO_CHAR(EXTRACT(YEAR FROM SYSDATE)-3))
16  GROUP BY emp_ID,emp_Lname,emp_Fname,email)
17 WHERE "GPA" > 0.00;

```

| EMPLOYEE | EMAIL | # of classes |
|-------------------------|-------------------------|--------------|
| 10001-Liu, Jingxiao | jingxial@andrew.cmu.edu | 2 |
| 10006-Arora, Rajat | raroraj@cmu.edu | 1 |
| 10011-Feng, Christopher | cf1@andrew.cmu.edu | 2 |

```

SQL> --Q3
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN department FORMAT A35
SQL> COLUMN "Total budget" FORMAT $99990
SQL> COLUMN Classes FORMAT 99
SQL> SELECT dept_ID || ' - ' || dept_Name AS department, COUNT(TID) AS "# of trainings",
  2      COUNT(DISTINCT crs_ID || sem_Cmpleted || section) AS "# of classes",
  3      SUM(NVL(tuition,0)) AS "Total budget",
  4      RANK() OVER (ORDER BY SUM(NVL(tuition,0)) DESC) AS Rank
  5  FROM  department JOIN employee USING(dept_ID)
  6          LEFT OUTER JOIN training USING(emp_ID)
  7          LEFT OUTER JOIN class USING(crs_ID, section, sem_Cmpleted)
  8          LEFT OUTER JOIN course USING(crs_ID)
  9 GROUP BY dept_ID, dept_Name;

```

| DEPARTMENT | # of trainings | # of classes | Total budget | RANK |
|---------------------------------|----------------|--------------|--------------|------|
| 1001 - Marketing | 10 | 10 | \$17100 | 1 |
| 1007 - Research and Development | 6 | 6 | \$11700 | 2 |
| 1005 - Finance | 4 | 4 | \$6300 | 3 |
| 1003 - Sales | 4 | 4 | \$5400 | 4 |
| 1004 - Customer Service | 3 | 3 | \$5400 | 4 |
| 1008 - Manufacturing | 2 | 2 | \$5400 | 4 |
| 1006 - Production | 5 | 4 | \$5400 | 4 |
| 1002 - Human Resources | 4 | 3 | \$4500 | 8 |
| 1011 - Analytics | 2 | 2 | \$4500 | 8 |
| 1010 - Consulting | 0 | 0 | \$0 | 10 |
| 1009 - Accounting | 3 | 2 | \$0 | 10 |

11 rows selected.

```

SQL> --Q4
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN instructor FORMAT A35
SQL> COLUMN class FORMAT A55
SQL> SELECT DISTINCT instr_ID || '-' || instr_Lname || ', ' || instr_Fname AS Instructor, instr_Phone AS PhoneNum,
2      crs_ID || '-' || crs_Title || ', ' || section || ', ' || sem_Cmpleted AS Class
3  FROM   instructor JOIN class USING(instr_ID)
4        JOIN course USING(crs_ID)
5        JOIN training USING(crs_ID, section, sem_Cmpleted)
6 WHERE  grade <> 'R';

```

| INSTRUCTOR | PHONENUM | CLASS |
|---------------------------|------------|--|
| 9502-Esmall, Zadeh | 1881109911 | 95723-Machine Learning, A2, Fall 2014 |
| 9502-Esmall, Zadeh | 1881109911 | 95723-Machine Learning, A2, Fall 2013 |
| 9506-Crane, John | 4122686065 | 95701-Marketing Digital Media, A1, Fall 2016 |
| 9507-Pastor, Lynn | 1881109943 | 95702-Financial Accounting, A1, Fall 2016 |
| 9509-Rosenberg, Haley | 4122686723 | 95707-Professional Writing, A2, Fall 2016 |
| 9504-Pastor, Lynne | 4122686725 | 95716-Principles of Finance, A2, Spring 2015 |
| 9505-Alessandro, Acquisti | 4122686101 | 95710-Economic Analysis, A2, Spring 2015 |
| 9505-Alessandro, Acquisti | 4122686101 | 95710-Economic Analysis, A2, Spring 2014 |
| 9506-Crane, John | 4122686065 | 95701-Marketing Digital Media, A1, Fall 2014 |
| 9508-Labash, Chris | 4122687256 | 95704-Professional Speaking, A1, Fall 2016 |
| 9501-Szcypula, Janusz | 4122686096 | 95703-Database Mngt, A1, Spring 2014 |
| 9506-Crane, John | 4122686065 | 95701-Marketing Digital Media, A1, Fall 2013 |
| 9501-Szcypula, Janusz | 4122686096 | 95703-Database Mngt, A1, Spring 2016 |
| 9505-Alessandro, Acquisti | 4122686101 | 95710-Economic Analysis, A2, Spring 2013 |
| 9507-Pastor, Lynn | 1881109943 | 95702-Financial Accounting, A1, Fall 2014 |
| 9502-Esmall, Zadeh | 1881109911 | 95705-Telecommunications Management, A1, Spring 2015 |
| 9507-Pastor, Lynn | 1881109943 | 95702-Financial Accounting, A1, Fall 2015 |
| 9507-Pastor, Lynn | 1881109943 | 95702-Financial Accounting, A1, Fall 2013 |
| 9508-Labash, Chris | 4122687256 | 95704-Professional Speaking, A1, Fall 2015 |
| 9502-Esmall, Zadeh | 1881109911 | 95705-Telecommunications Management, A1, Spring 2016 |
| 9504-Pastor, Lynne | 4122686725 | 95716-Principles of Finance, A2, Spring 2014 |
| 9506-Crane, John | 4122686065 | 95701-Marketing Digital Media, A1, Fall 2015 |

22 rows selected.

```

SQL> --Q5
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN "Previous Semester" FORMAT 0.99
SQL> COLUMN "Current Semester" FORMAT 0.99
SQL> COLUMN "Following Semester" FORMAT 0.99
SQL> COLUMN semester FORMAT A15
SQL> SELECT L || R AS semester,
  2     LAG(grade, 1) OVER (ORDER BY R, L DESC) AS "Previous Semester",
  3     grade AS "Current Semester",
  4     LEAD(grade, 1) OVER (ORDER BY R, L DESC) AS "Following Semester"
  5 FROM(
  6     SELECT SUBSTR(semester,1,INSTR(semester,' ')) AS L, SUBSTR(semester,INSTR(semester,' ')+1,INSTR(semester,' ')+4) AS R, grade
  7     FROM(
  8         SELECT DISTINCT sem_Cmpleted AS semester, ROUND(AVG(score),2) AS grade
  9         FROM training JOIN grade_score USING(grade)
 10         GROUP BY sem_Cmpleted))
 11 ORDER BY R, L DESC;

```

| SEMESTER | Previous Semester | Current Semester | Following Semester |
|-------------|-------------------|------------------|--------------------|
| Spring 2013 | | 3.50 | 2.61 |
| Fall 2013 | 3.50 | 2.61 | 2.40 |
| Spring 2014 | 2.61 | 2.40 | 2.88 |
| Fall 2014 | 2.40 | 2.88 | 2.07 |
| Spring 2015 | 2.88 | 2.07 | 2.00 |
| Fall 2015 | 2.07 | 2.00 | 3.67 |
| Spring 2016 | 2.00 | 3.67 | 2.33 |
| Fall 2016 | 3.67 | 2.33 | |

8 rows selected.

```

SQL> --Q6
SQL> CLEAR COLUMNS
columns cleared
SQL> SELECT tuition, COUNT(tuition) AS "# of Classes"
  2  FROM(SELECT (CASE
  3          WHEN tuition > 0 AND tuition <= 1000 THEN 'Inexpensive'
  4          WHEN tuition > 1000 AND tuition <= 2000 THEN 'Moderate'
  5          WHEN tuition > 2000 THEN 'Expensive'
  6          WHEN tuition IS NULL OR tuition = 0 THEN 'Unknown' END) AS tuition
  7  FROM    class JOIN course USING(crs_ID))
  8  RIGHT OUTER JOIN
  9    (SELECT 'Inexpensive' AS tuition FROM class
 10      UNION
 11      SELECT 'Moderate' AS tuition FROM class
 12      UNION
 13      SELECT 'Expensive' AS tuition FROM class
 14      UNION
 15      SELECT 'Unknown' AS tuition FROM class) USING(tuition)
 16 GROUP BY tuition
 17 ORDER BY 2 DESC;

```

| TUITION | # of Classes |
|-------------|--------------|
| Unknown | 10 |
| Moderate | 10 |
| Expensive | 8 |
| Inexpensive | 6 |

```

SQL> --Q7
SQL> --Assumption: Number of classes attended is defined as the classes registered by employees. Thus, we counted
SQL> --classes, not trainings here.
SQL> COLUMN "Total tuition" FORMAT $999990
SQL> SELECT college_Name, COUNT(DISTINCT Offered) AS "# of Classes Offered",
  2      COUNT(DISTINCT CASE
  3          WHEN TID IS NOT NULL
  4          THEN offered
  5          END) AS "# of Classes Attended",
  6      SUM(DECODE(TID,NULL,0,tuition)) AS "Total tuition"
  7  FROM(SELECT college_Name, crs_ID || sem_Cmpleted || section AS Offered, tuition, TID
  8      FROM class LEFT OUTER JOIN training USING(crs_ID, section, sem_Cmpleted)
  9      JOIN course USING(crs_ID))
 10 GROUP BY college_Name;

```

| COLLEGE_NAME | # of Classes Offered | # of Classes Attended | Total tuition |
|----------------------------|----------------------|-----------------------|---------------|
| Heinz | 29 | 23 | \$61200 |
| School of Computer Science | 5 | 2 | \$4500 |

2 rows selected.

```

SQL> --Q8
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN employee FORMAT A30
SQL> SELECT DISTINCT emp_ID || '-' || emp_Lname || ', ' || emp_Fname AS employee,
  2      COUNT(crs_ID) AS "# of Classes",
  3      DENSE_RANK() OVER (ORDER BY COUNT(crs_ID) DESC) AS Rank
  4  FROM  employee LEFT OUTER JOIN training USING(emp_ID)
  5          LEFT OUTER JOIN class USING(crs_ID, section, sem_Cmpleted)
  6 GROUP BY emp_ID,emp_Lname,emp_Fname
  7 ORDER BY rank;

```

| EMPLOYEE | # of Classes | RANK |
|--------------------------|--------------|------|
| 10001-Liu, Jingxiao | 5 | 1 |
| 10006-Arora, Rajat | 4 | 2 |
| 10012-Zhu, Di | 4 | 2 |
| 10003-Ahn, Jungho | 3 | 3 |
| 10009-Chen, Yiming | 3 | 3 |
| 10011-Feng, Christopher | 3 | 3 |
| 10014-Zhao, Yusheng | 3 | 3 |
| 10015-Zhao, Yiren | 3 | 3 |
| 10002-Agarwal, Ajay | 2 | 4 |
| 10004-Aravind, Pritham | 2 | 4 |
| 10005-Bakert, Andrew | 2 | 4 |
| 10017-Alla, Sharan | 2 | 4 |
| 10019-Cheng, Perry | 2 | 4 |
| 10010-Dennin, Luke | 1 | 5 |
| 10013-Zhou, Jiali | 1 | 5 |
| 10018-Bamforth, Gabriel | 1 | 5 |
| 10022-Clarke, Dylan | 1 | 5 |
| 10023-Cruz, Julissa | 1 | 5 |
| 10007-Chao, Shucheng | 0 | 6 |
| 10008-Chen, Dihong | 0 | 6 |
| 10016-Zhao, Xin | 0 | 6 |
| 10020-Chirinos, Renato | 0 | 6 |
| 10021-Chukwuma, Obianozo | 0 | 6 |

23 rows selected.

```

SQL> --Q9
SQL> CLEAR COLUMNS
columns cleared
SQL> COLUMN employee FORMAT A30
SQL> COLUMN crs_Title FORMAT A35
SQL> COLUMN "Semester and Grade (a)" FORMAT A22
SQL> COLUMN "Semester and Grade (b)" FORMAT A22
SQL> SELECT employee, crs_Title, A.Sem_Grade AS "Semester and Grade (a)", B.Sem_Grade AS "Semester and Grade (b)"
  2  FROM(
  3  (SELECT DISTINCT emp_ID || ' - ' || emp_Lname || ', ' || emp_Fname AS employee, crs_Title,
  4    sem_Cmpleted || ',' ' || grade AS Sem_Grade
  5  FROM
  6  ((SELECT emp_Lname, emp_Fname, emp_ID,
  7    crs_Title, crs_ID, COUNT(crs_ID) AS courseNum
  8    FROM employee JOIN training USING(emp_ID)
  9      JOIN course USING(crs_ID)
 10     GROUP BY emp_Lname,emp_Fname, emp_ID,crs_Title, crs_ID
 11    HAVING COUNT(crs_ID)>1)
 12   JOIN
 13   training USING(emp_ID,crs_ID))) A
 14  JOIN
 15  (SELECT DISTINCT emp_ID || ' - ' || emp_Lname || ', ' || emp_Fname AS employee, crs_Title,
 16    sem_Cmpleted || ',' ' || grade AS Sem_Grade
 17  FROM
 18  ((SELECT emp_Lname, emp_Fname, emp_ID,
 19    crs_Title, crs_ID, COUNT(crs_ID) AS courseNum
 20    FROM employee JOIN training USING(emp_ID)
 21      JOIN course USING(crs_ID)
 22     GROUP BY emp_Lname,emp_Fname, emp_ID,crs_Title, crs_ID
 23    HAVING COUNT(crs_ID)>1)
 24   JOIN
 25   training USING(emp_ID,crs_ID))) B
 26 USING(employee, crs_Title))
 27 WHERE A.Sem_Grade < B.Sem_Grade;

```

| EMPLOYEE | CRS_TITLE | Semester and Grade (a) | Semester and Grade (b) |
|---------------------------|-------------------------|------------------------|------------------------|
| 10015 - Zhao, Yiren | Financial Accounting | Fall 2015, R | Fall 2016, B |
| 10019 - Cheng, Perry | Economic Analysis | Spring 2013, B | Spring 2015, C- |
| 10017 - Alla, Sharan | Professional Writting | Fall 2015, R | Fall 2016, B |
| 10001 - Liu, Jingxiao | Database Mngt | Spring 2014, C- | Spring 2016, A |
| 10001 - Liu, Jingxiao | Marketing Digital Media | Fall 2013, A | Fall 2014, A |
| 10003 - Ahn, Jungho | Professional Speaking | Fall 2014, R | Fall 2015, B+ |
| 10014 - Zhao, Yusheng | Marketing Digital Media | Fall 2013, B- | Fall 2015, A |
| 10006 - Arora, Rajat | Principles of Finance | Spring 2014, R | Spring 2015, C |
| 10011 - Feng, Christopher | Database Mngt | Spring 2015, R | Spring 2016, B |
| 10012 - Zhu, Di | Machine Learning | Fall 2013, R | Fall 2014, A |

10 rows selected.

```

SQL> --Q10
SQL> CLEAR COLUMNS
columns cleared
SQL> BREAK ON course
SQL> COLUMN sem_Cmpleted FORMAT A15
SQL> COLUMN section FORMAT A10
SQL> COLUMN employee_ONE FORMAT A30
SQL> COLUMN employee_TWO FORMAT A30
SQL> COLUMN course FORMAT A35
SQL> SELECT DISTINCT crs_ID || ' - ' || crs_Title AS course, sem_Cmpleted, section, A.employee AS employee_ONE, B.employee AS employee_TWO
  2  FROM  ((SELECT crs_ID, crs_Title, sem_Cmpleted, section, emp_ID || '-' || emp_Lname || ', ' || emp_Fname AS employee
  3    FROM  employee JOIN training USING(emp_ID)
  4          JOIN class USING(crs_ID, sem_Cmpleted, section)
  5          JOIN course USING(crs_ID)) A
  6  JOIN
  7  (SELECT crs_ID, crs_Title, sem_Cmpleted, section, emp_ID || '-' || emp_Lname || ', ' || emp_Fname AS employee
  8    FROM  employee JOIN training USING(emp_ID)
  9          JOIN class USING(crs_ID, sem_Cmpleted, section)
 10          JOIN course USING(crs_ID)) B
 11  USING(crs_ID, crs_Title, sem_Cmpleted, section))
 12 WHERE A.employee > B.employee
 13 ORDER BY 1;

```

| COURSE | SEM_CMPLETED | SECTION | EMPLOYEE_ONE | EMPLOYEE_TWO |
|---------------------------------|--------------|---------|-------------------------|-------------------------|
| 95701 - Marketing Digital Media | Fall 2013 | A1 | 10014-Zhao, Yusheng | 10001-Liu, Jingxiao |
| | Fall 2014 | A1 | 10004-Aravind, Pritham | 10001-Liu, Jingxiao |
| | Fall 2015 | A1 | 10014-Zhao, Yusheng | 10011-Feng, Christopher |
| | Fall 2016 | A1 | 10009-Chen, Yiming | 10006-Arora, Rajat |
| 95702 - Financial Accounting | Fall 2013 | A1 | 10014-Zhao, Yusheng | 10001-Liu, Jingxiao |
| | Fall 2014 | A1 | 10005-Bakert, Andrew | 10002-Agarwal, Ajay |
| | Fall 2015 | A1 | 10015-Zhao, Yiren | 10012-Zhu, Di |
| | Fall 2016 | A1 | 10015-Zhao, Yiren | 10009-Chen, Yiming |
| | Fall 2016 | A1 | 10022-Clarke, Dylan | 10009-Chen, Yiming |
| 95703 - Database Mngt | Fall 2016 | A1 | 10022-Clarke, Dylan | 10015-Zhao, Yiren |
| | Spring 2016 | A1 | 10006-Arora, Rajat | 10001-Liu, Jingxiao |
| | Spring 2016 | A1 | 10011-Feng, Christopher | 10001-Liu, Jingxiao |
| 95710 - Economic Analysis | Spring 2016 | A1 | 10011-Feng, Christopher | 10006-Arora, Rajat |
| | Spring 2013 | A2 | 10019-Cheng, Perry | 10018-Bamforth, Gabriel |
| | Spring 2014 | A2 | 10005-Bakert, Andrew | 10004-Aravind, Pritham |
| 95716 - Principles of Finance | Spring 2015 | A2 | 10019-Cheng, Perry | 10015-Zhao, Yiren |
| | Spring 2014 | A2 | 10006-Arora, Rajat | 10003-Ahn, Jungho |
| 95723 - Machine Learning | Fall 2013 | A2 | 10013-Zhou, Jiali | 10012-Zhu, Di |
| | Fall 2014 | A2 | 10010-Dennin, Luke | 10009-Chen, Yiming |
| | Fall 2014 | A2 | 10012-Zhu, Di | 10009-Chen, Yiming |
| | Fall 2014 | A2 | 10012-Zhu, Di | 10010-Dennin, Luke |

21 rows selected.

```

SQL>
SQL> SPOOL OUT

```

Question C:
Report Script:

```
DROP VIEW employeeTrainingSummary;
CREATE VIEW employeeTrainingSummary
AS
SELECT dept_Name AS department,
       employee.emp_ID || ' - ' || employee.emp_Lname || ', ' || employee.emp_Fname AS employee,
       (CASE
        WHEN employee.sup_ID IS NULL
        THEN NULL
        ELSE employee.sup_ID || ' - ' || sup.emp_Lname || ', ' || sup.emp_Fname
        END) AS supervisor,
       (CASE
        WHEN crs_Title IS NULL
        THEN NULL
        ELSE crs_Title || ', ' || sem_Cmpleted || ', ' || grade
        END) AS Training, score
FROM   department JOIN employee ON employee.dept_ID = department.dept_ID
               LEFT OUTER JOIN employee sup ON employee.sup_ID = sup.emp_ID
               LEFT OUTER JOIN training ON employee.emp_ID = training.emp_ID
               LEFT OUTER JOIN class USING(crs_ID,section,sem_Cmpleted)
               LEFT OUTER JOIN course USING(crs_ID)
               LEFT OUTER JOIN grade_Score USING(grade)
ORDER BY 1,2,3,4;
```

```
REM "Employee Training Information Report" created on November 29 2016
REM by user CASTEEL
SET FEEDBACK OFF LINESIZE 150 PAGESIZE 45
REM set up the appropriate parameters to increase readability
CLEAR COLUMNS
COLUMN employee    HEADING 'Employee|Number/Name'          FORMAT A30
COLUMN supervisor   HEADING 'Supervisor|Number/Name'        FORMAT A30 NULL 'Supervisor'
COLUMN department   HEADING 'Department|Number/Name'        FORMAT A25
COLUMN training     HEADING 'Training|Title/Semester/Grade' FORMAT A50 NULL 'No training'
COLUMN Score        HEADING 'GPA'                          FORMAT 0.99
```

```
TTITLE 'Employee Trainings'
BTITLE CENTER 'END of Employee Training Information Report' RIGHT 'Run By: Team#1'
BREAK ON department SKIP 1 ON employee SKIP 1 ON supervisor
COMPUTE COUNT LABEL 'Number of Classes (Emp)' OF training ON employee
COMPUTE AVG    LABEL 'Employee GPA' OF score ON employee
COMPUTE COUNT LABEL 'Number of Classes (Dept)' OF training ON department
COMPUTE AVG    LABEL 'Department GPA' OF score ON department
```

```
SPOOL C:\DBM\Project\Report_OUTPUT.TXT
SELECT department, employee, supervisor, training, score
FROM employeeTrainingSummary;
SPOOL OFF
```

```
CLEAR BREAK COLUMN COMPUTE
TTITLE OFF
BTITLE OFF
SET FEEDBACK ON LINESIZE 100 PAGESIZE 80
```

Question C:
Report Output:

```
SQL> SELECT department, employee, supervisor, training, score
  2  FROM employeeTrainingSummary;
```

Wed Nov 30

page 1

Employee Trainings

| Department Number/Name | Employee Number/Name | Supervisor Number/Name | Training Title/Semester/Grade | GPA |
|---------------------------|----------------------------|---------------------------|--------------------------------------|-------|
| Accounting | 10018 - Bamforth, Gabriel | Supervisor | Economic Analysis, Spring 2013, A | 4.00 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 4.00 |
| | Number of Classes (Emp) | | | 1 |
| | ***** | ***** | ***** | ***** |
| | 10019 - Cheng, Perry | 10018 - Bamforth, Gabriel | Economic Analysis, Spring 2013, B | 3.00 |
| | ***** | ***** | Economic Analysis, Spring 2015, C- | 1.67 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 2.34 |
| | Number of Classes (Emp) | | | 2 |
| | ***** | ***** | ***** | ***** |
| Department GPA | | | | 2.89 |
| Number of Classes (Dept) | | | | 3 |
| Analytics | 10022 - Clarke, Dylan | Supervisor | Financial Accounting, Fall 2016, B | 3.00 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 3.00 |
| | Number of Classes (Emp) | | | 1 |
| | ***** | ***** | ***** | ***** |
| | 10023 - Cruz, Julissa | 10022 - Clarke, Dylan | Professional Speaking, Fall 2016, B+ | 3.33 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 3.33 |
| | Number of Classes (Emp) | | | 1 |
| | ***** | ***** | ***** | ***** |
| Department GPA | | | | 3.17 |
| Number of Classes (Dept) | | | | 2 |
| Consulting | 10020 - Chirinos, Renato | Supervisor | No training | |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | |
| | Number of Classes (Emp) | | | 0 |
| | ***** | ***** | ***** | ***** |
| | 10021 - Chukwuma, Obianozo | 10020 - Chirinos, Renato | No training | |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | |

END of Employee Training Information Report

Run By: Team#1

Employee Trainings

| Department Number/Name | Employee Number/Name | Supervisor Number/Name | Training Title/Semester/Grade | GPA |
|--|----------------------|------------------------|--------------------------------|------|
| | | | | |
| <hr/> | | | | |
| Number of Classes (Emp) | | | | |
| 0 | | | | |
| <hr/> | | | | |
| ***** Department GPA | | | | |
| Number of Classes (Dept) | | | | |
| 0 | | | | |
| <hr/> | | | | |
| Customer Service | 10008 - Chen, Dihong | Supervisor | No training | |
| <hr/> | | | | |
| Employee GPA | | | | |
| Number of Classes (Emp) | | | | |
| 0 | | | | |
| <hr/> | | | | |
| 10009 - Chen, Yiming | | | | |
| 10008 - Chen, Dihong | | | | |
| Financial Accounting, Fall 2016, R | | | | |
| Machine Learning, Fall 2014, C | | | | |
| Marketing Digital Media, Fall 2016, A | | | | |
| <hr/> | | | | |
| Employee GPA | | | | |
| Number of Classes (Emp) | | | | |
| 2.00 | | | | |
| <hr/> | | | | |
| ***** Department GPA | | | | |
| Number of Classes (Dept) | | | | |
| 3 | | | | |
| <hr/> | | | | |
| Finance | 10010 - Dennin, Luke | Supervisor | Machine Learning, Fall 2014, B | 3.00 |
| <hr/> | | | | |
| Employee GPA | | | | |
| Number of Classes (Emp) | | | | |
| 1 | | | | |
| <hr/> | | | | |
| 10011 - Feng, Christopher | | | | |
| 10010 - Dennin, Luke | | | | |
| Database Mngt, Spring 2015, R | | | | |
| Database Mngt, Spring 2016, B | | | | |
| Marketing Digital Media, Fall 2015, C- | | | | |
| <hr/> | | | | |
| Employee GPA | | | | |
| Number of Classes (Emp) | | | | |
| 3 | | | | |
| <hr/> | | | | |
| ***** Department GPA | | | | |
| Number of Classes (Dept) | | | | |
| 4 | | | | |

END of Employee Training Information Report

Run By: Team#1

Employee Trainings

| Department Number/Name | Employee Number/Name | Supervisor Number/Name | Training Title/Semester/Grade | GPA |
|--------------------------|---|--------------------------|---|--------------------------------------|
| Human Resources | 10004 - Aravind, Pritham | Supervisor | Economic Analysis, Spring 2014, A Marketing Digital Media, Fall 2014, A | 4.00 4.00 |
| | ***** | ***** | ***** | 4.00 |
| | Employee GPA | | | |
| | Number of Classes (Emp) | | | 2 |
| | 10005 - Bakert, Andrew | 10004 - Aravind, Pritham | Economic Analysis, Spring 2014, B Financial Accounting, Fall 2014, B | 3.00 3.00 |
| | ***** | ***** | ***** | 3.00 |
| | Employee GPA | | | |
| | Number of Classes (Emp) | | | 2 |
| ***** | ***** | ***** | ***** | 3.50 |
| Department GPA | | | | |
| Number of Classes (Dept) | | | | 4 |
| Manufacturing | 10016 - Zhao, Xin | Supervisor | No training | |
| | ***** | ***** | ***** | |
| | Employee GPA | | | |
| | Number of Classes (Emp) | | | 0 |
| | 10017 - Alla, Sharan | 10016 - Zhao, Xin | Professional Writing, Fall 2015, R Professional Writing, Fall 2016, B | 0.00 3.00 |
| | ***** | ***** | ***** | |
| | Employee GPA | | | |
| | Number of Classes (Emp) | | | 1.50 |
| ***** | ***** | ***** | ***** | 2 |
| Department GPA | | | | |
| Number of Classes (Dept) | | | | 1.50 |
| Marketing | 10001 - Liu, Jingxiao | Supervisor | Database Mngt, Spring 2014, C- Database Mngt, Spring 2016, A Financial Accounting, Fall 2013, B Marketing Digital Media, Fall 2013, A Marketing Digital Media, Fall 2014, A | 1.67 4.00 3.00 4.00 4.00 |
| | END of Employee Training Information Report | | | Run By: Team#1 |

Employee Trainings

| Department Number/Name | Employee Number/Name | Supervisor Number/Name | Training Title/Semester/Grade | GPA |
|--------------------------|-----------------------|------------------------|--|------------------------------|
| ***** | ***** | ***** | ***** | ***** |
| Employee GPA | | | | 3.33 |
| Number of Classes (Emp) | | | | 5 |
| Marketing | 10002 - Agarwal, Ajay | 10001 - Liu, Jingxiao | Financial Accounting, Fall 2014, B Telecommunications Management, Spring 2016, A- | 3.00 3.67 |
| ***** | ***** | ***** | ***** | ***** |
| Employee GPA | | | | 3.34 |
| Number of Classes (Emp) | | | | 2 |
| | 10003 - Ahn, Jungho | 10001 - Liu, Jingxiao | Principles of Finance, Spring 2014, B+ Professional Speaking, Fall 2014, R Professional Speaking, Fall 2015, B+ | 3.33 0.00 3.33 |
| ***** | ***** | ***** | ***** | ***** |
| Employee GPA | | | | 2.22 |
| Number of Classes (Emp) | | | | 3 |
| ***** | ***** | ***** | ***** | ***** |
| Department GPA | | | | 3.00 |
| Number of Classes (Dept) | | | | 10 |
| Production | 10012 - Zhu, Di | Supervisor | Financial Accounting, Fall 2015, B Machine Learning, Fall 2013, R Machine Learning, Fall 2014, A Telecommunications Management, Spring 2015, A- | 3.00 0.00 4.00 3.67 |
| ***** | ***** | ***** | ***** | ***** |
| Employee GPA | | | | 2.67 |
| Number of Classes (Emp) | | | | 4 |
| | 10013 - Zhou, Jiali | 10012 - Zhu, Di | Machine Learning, Fall 2013, B | 3.00 |
| ***** | ***** | ***** | ***** | ***** |
| Employee GPA | | | | 3.00 |
| Number of Classes (Emp) | | | | 1 |
| ***** | ***** | ***** | ***** | ***** |
| Department GPA | | | | 2.73 |
| Number of Classes (Dept) | | | | 5 |

END of Employee Training Information Report

Employee Trainings

| Department Number/Name | Employee Number/Name | Supervisor Number/Name | Training Title/Semester/Grade | GPA |
|--------------------------|-------------------------|------------------------|--|------------------------------|
| Research and Development | 10014 - Zhao, Yusheng | Supervisor | Financial Accounting, Fall 2013, B Marketing Digital Media, Fall 2013, B- Marketing Digital Media, Fall 2015, A | 3.00 2.67 4.00 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 3.22 |
| | Number of Classes (Emp) | | | 3 |
| | 10015 - Zhao, Yiren | 10014 - Zhao, Yusheng | Economic Analysis, Spring 2015, B Financial Accounting, Fall 2015, R Financial Accounting, Fall 2016, B | 3.00 0.00 3.00 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 2.00 |
| | Number of Classes (Emp) | | | 3 |
| ***** | ***** | ***** | ***** | ***** |
| Department GPA | | | | 2.61 |
| Number of Classes (Dept) | | | | 6 |
| Sales | 10006 - Arora, Rajat | Supervisor | Database Mngt, Spring 2016, A Marketing Digital Media, Fall 2016, R Principles of Finance, Spring 2014, R Principles of Finance, Spring 2015, C | 4.00 0.00 0.00 2.00 |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 1.50 |
| | Number of Classes (Emp) | | | 4 |
| | 10007 - Chao, Shucheng | 10006 - Arora, Rajat | No training | |
| | ***** | ***** | ***** | ***** |
| | Employee GPA | | | 0 |
| | Number of Classes (Emp) | | | 0 |
| ***** | ***** | ***** | ***** | ***** |
| Department GPA | | | | 1.50 |
| Number of Classes (Dept) | | | | 4 |

END of Employee Training Information Report

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SQL> SPOOL OFF