COP 4710 – Exam #1 – Fall 2013

NAME: KEY

September 24, 2013 (**100 points)**

1. **(20 points – 2 points each)**

Provide answers to questions (a)-(j) based on the scenario shown in the ERD diagram below.

(a) Is every employee either a staff member, administrator, or professor?

NO

(b) Does every course generate a class?

NO

(c) Can any employee chair a department?

NO, only professors

(d) Can a professor be employed by more than one department?

NO

(e) Do professors have a hire date?

YES, inherited from EMPLOYEE

(f) Is every class generated by a course?

YES

(g) Is every room used for a class?

NO

(h) Does every department offer a course?

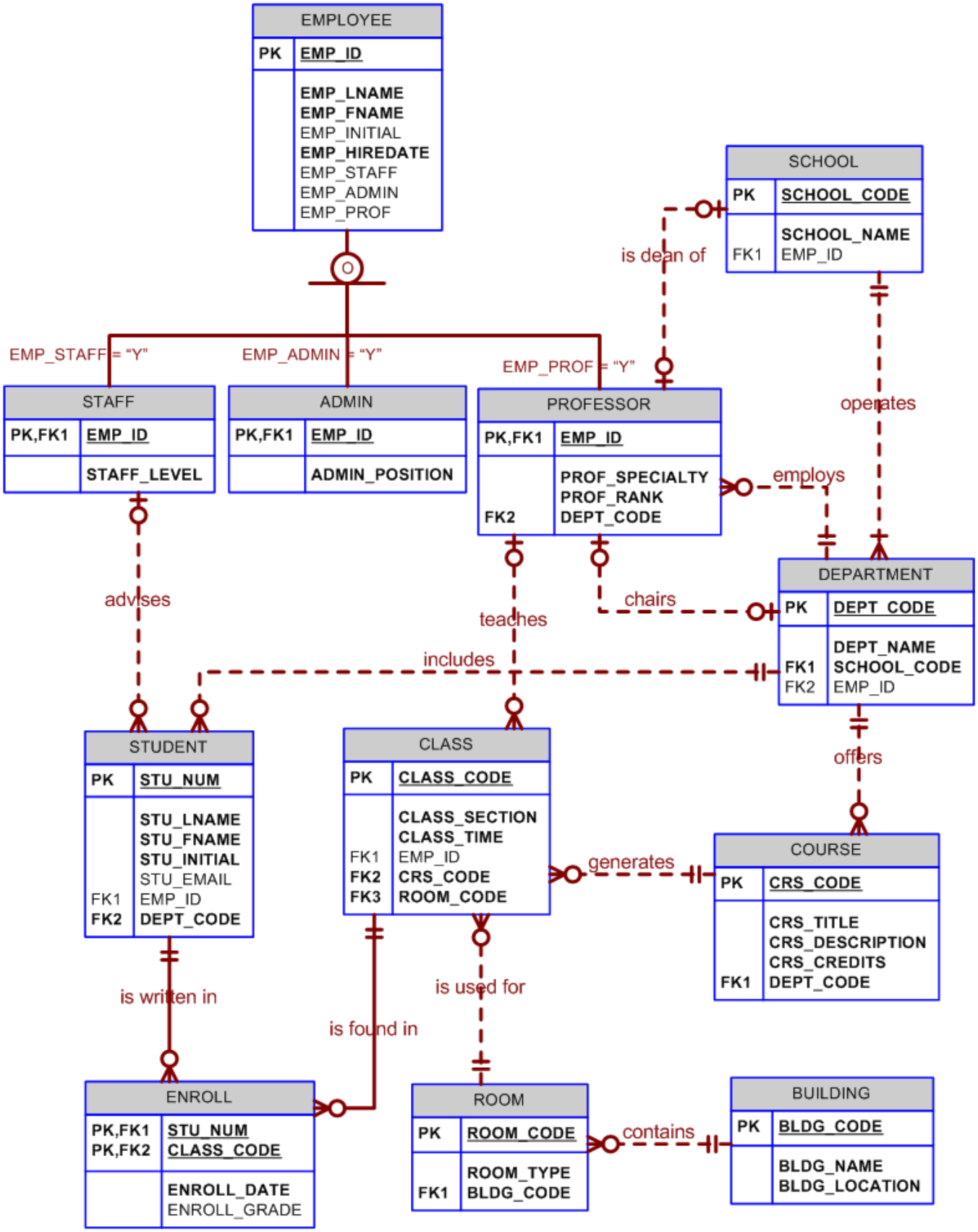
NO

(i) Can an employee be both a staff member as well as an administrator?

YES

(j) Does every school have a dean?

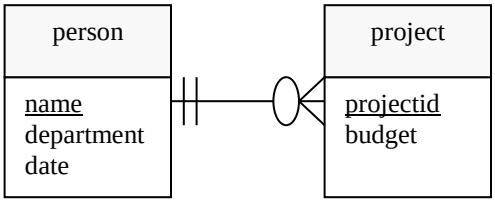
NO


EMPLOYEE
PK EMP_ID
EMP_LNAME
EMP_FNAME
EMP_INITIAL
EMP_HIREDATE
EMP_STAFF
EMP_ADMIN
EMP_PROF
SCHOOL
PK SCHOOL_CODE
SCHOOL_NAME
FK1 EMP_ID
is dean of
EMP_STAFF = "Y"
EMP_ADMIN = "Y"
EMP_PROF = "Y"
STAFF
PK,FK1 EMP_ID
STAFF_LEVEL
ADMIN
PK,FK1 EMP_ID
ADMIN_POSITION
PROFESSOR
PK,FK1 EMP_ID
PROF_SPECIALTY
PROF_RANK
FK2 DEPT_CODE
operates
employs
advises
teaches
chairs
DEPARTMENT
PK DEPT_CODE
DEPT_NAME
FK1 SCHOOL_CODE
FK2 EMP_ID
includes
offers
STUDENT
PK STU_NUM
STU_LNAME
STU_FNAME
STU_INITIAL
STU_EMAIL
FK1 EMP_ID
FK2 DEPT_CODE
CLASS
PK CLASS_CODE
CLASS_SECTION
CLASS_TIME
FK1 EMP_ID
FK2 CRS_CODE
FK3 ROOM_CODE
generates
COURSE
PK CRS_CODE
CRS_TITLE
CRS_DESCRIPTION
CRS_CREDITS
FK1 DEPT_CODE
is written in
is found in
is used for
ENROLL
PK,FK1 STU_NUM
PK,FK2 CLASS_CODE
ENROLL_DATE
ENROLL_GRADE
ROOM
PK ROOM_CODE
ROOM_TYPE
FK1 BLDG_CODE
contains
BUILDING
PK BLDG_CODE
BLDG_NAME
BLDG_LOCATION

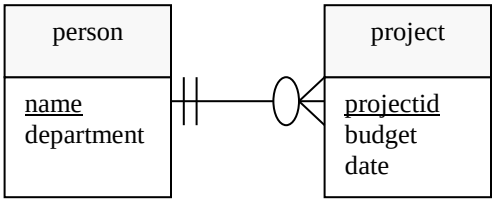
2. (15 points – 5 points each)

We discussed how cardinality constraints in an ER diagram can affect the placement of an attribute. For the two scenarios shown below answer each question.

(a) A person works on possibly many different projects, but a project has only one person who works on that project. For each person working on a project we want to record the date that they worked on the project. Which of the following ERDs is correct for this scenario? Justify your answer.



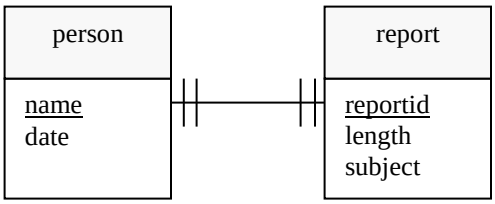
(a)



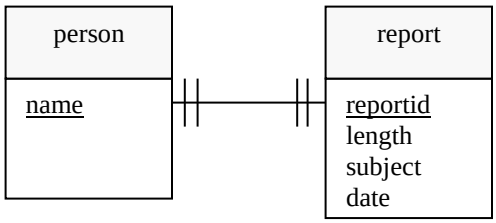
(b)

The correct ERD is (b). Since a person can work on more than one project, placing the date attribute in the person entity will allow us to model only a single date.

(b) A person files a report and each report is filed by only one person. Each person must file a report and every report is filed by a person. For each report filed we want to record the date that the report was filed. Which of the following ERDs is correct for this scenario? Justify your answer.



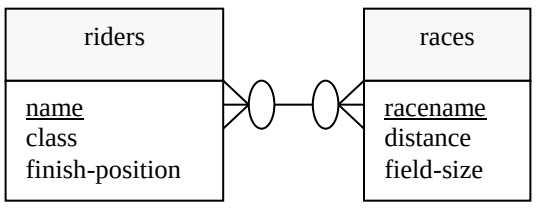
(a)

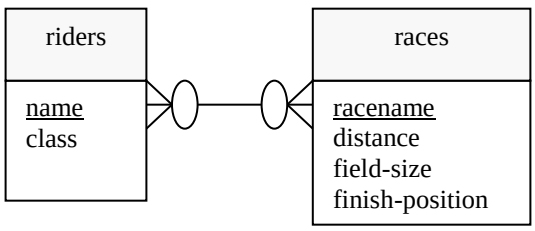


(b)

Either ERD is correct. Since the cardinality constraint is 1:1 the date could belong to either the person or the report. Logically it probably makes more sense to associate the date with the report, but from a functional point of view, either one is ok.

(c) A bicycle racer competes in possibly many different races. Races (events) have many different riders competing in the event. For each rider competing in an event we want to record their finishing position in the race. Which of the following ERDs is correct for this scenario? Justify your answer.



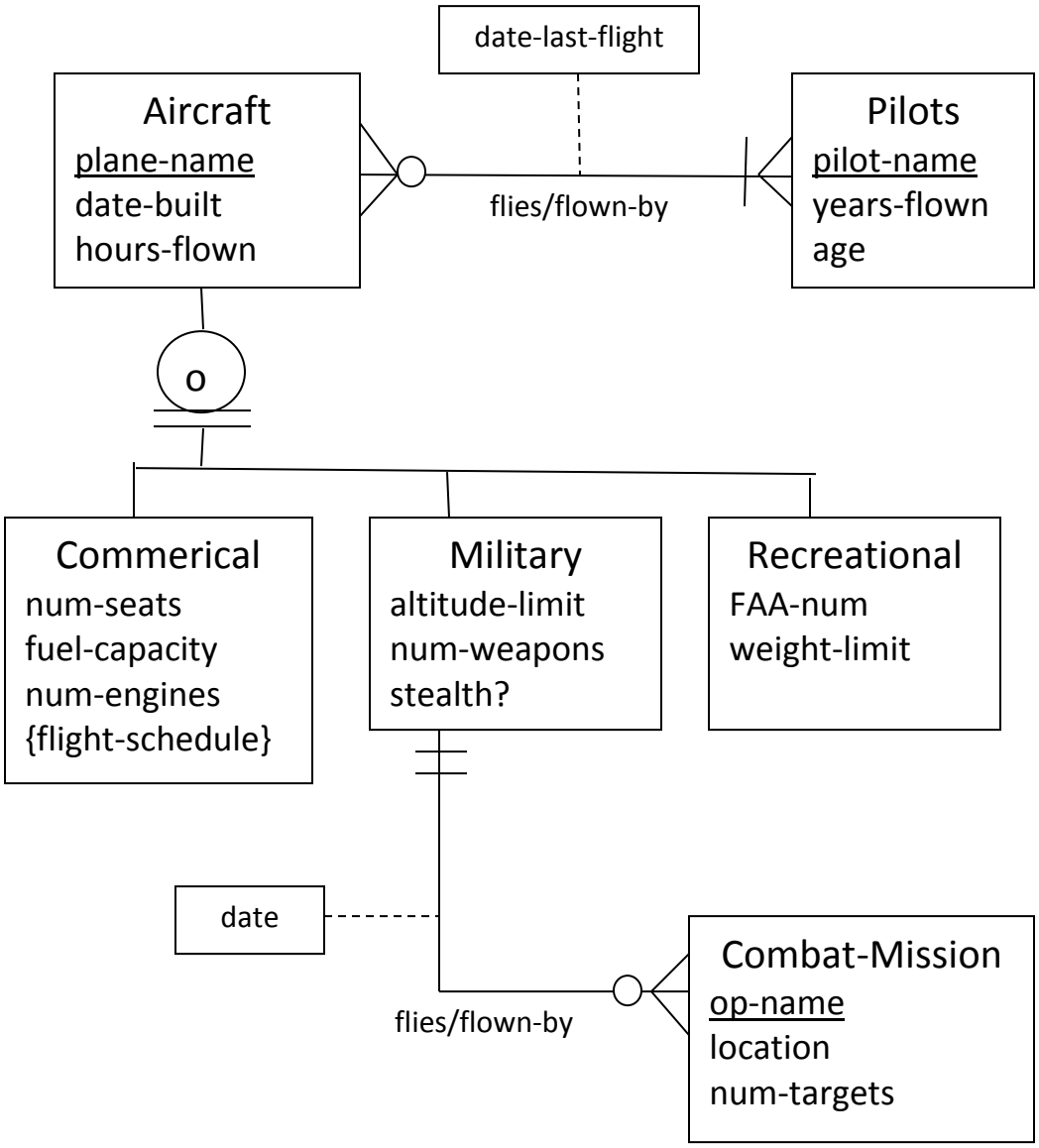


(a) (b)

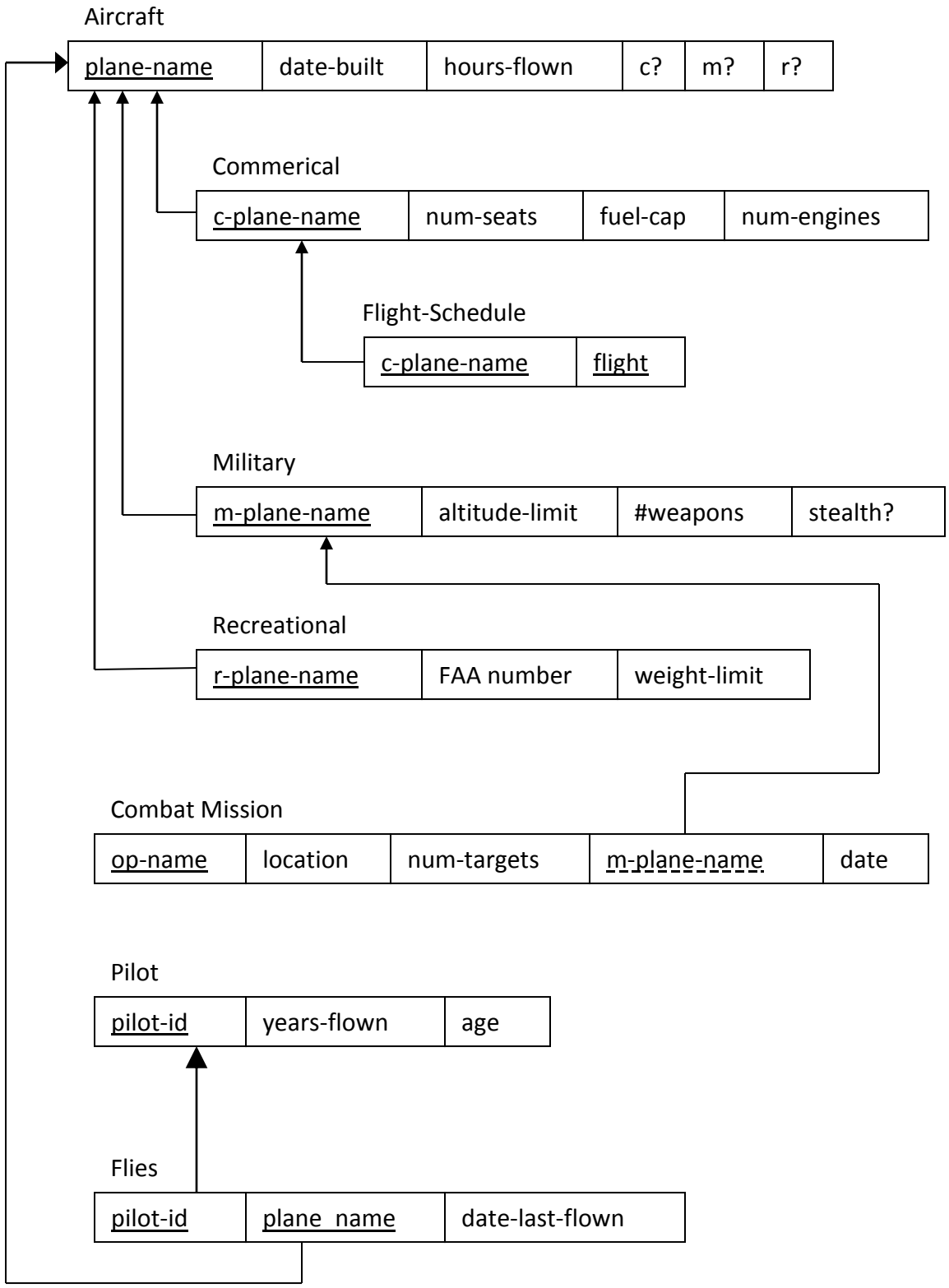
Neither ERD is correct. ERD (a) is not correct because it implies that a rider can have only one finishing position. ERD (b) is not correct because it implies that a given race can have only one finishing position.

3. (30 points)

Using the conversion rules we discussed in class, convert the E-R diagram shown below into a set of relation schemas. Be sure to include referential integrity constraints. Use the next page for your answer.



Solution Page For Problem 3



4. (35 points)

"Martial Arts R Us" (MARU) needs a database. MARU is a martial arts school with hundreds of students. It is necessary to keep track of all the different classes that are being offered, who is assigned to teach each class, and which students attend each class. Also, it is important to track the progress of each student as they advance. Create a complete Crow's Foot ERD for these requirements:

- Students are given a student number when they join the school. This is stored along with their name, date of birth, and the date they joined the school.
- All instructors are also students, but clearly, not all students are instructors. In addition to the normal student information, for each instructor, the date that they start working as an instructor must be recorded, along with their instructor status (compensated or volunteer).
- An instructor may be assigned to teach any number of classes, but each class has one and only one assigned instructor. Some instructors, especially volunteer instructors, may not be assigned to any class.
- A class is offered for a specific level at a specific time, day of the week, and location.
- Students may attend any class of the appropriate level during each week so there is no expectation that any particular student will attend any particular class session. Therefore, the actual attendance of students at each individual class meeting must be tracked.
- A student will attend many different class meetings; and each class meeting is normally attended by many students. Some class meetings may have no students show up for that meeting. New students may not have attended any class meetings yet.
- At any given meeting of a class, instructors other than the assigned instructor may show up to help. Therefore, a given class meeting may have several instructors (a head instructor and many assistant instructors), but it will always have at least the one instructor that is assigned to that class. For each class meeting, the date that the class was taught and the instructors' roles (head instructor or assistant instructor) need to be recorded. For example, Mr. Cehnes is assigned to teach the Monday, 5:00 pm, intermediate class in Room #1. During one particular meeting of that class, Mr. Cehnes was present as the head instructor and Ms. Jones came to help as an assistant instructor.
- Each student holds a rank in the martial arts. The rank name, belt color, and rank requirements are stored. Each rank will have numerous rank requirements. Each requirement is considered a requirement just for the rank at which the

requirement is introduced. Every requirement is associated with a particular rank. All ranks except white belt have at least one requirement.

- A given rank may be held by many students. While it is customary to think of a student as having a single rank, it is necessary to track each student's progress through the ranks. Therefore, every rank that a student attains is kept in the system. New students joining the school are automatically given a white belt rank. All ranks have at least one student that has achieved that rank at some time.

Solution