Homework - 2

Important note: All homework is to be done individually -- you are not to work with others on it.
Total Points: **20**
1 point per Question

Part 1

a. Can a relation schema have two primary keys? (yes or no) no.

b. Fill in the blank: every operation of relation algebra produces a relation as output.

c. When union is applied to two tables, the tables have to be compatible. In what sense do they have to be compatible? They must have the same attributes.

d. Answer the question "what are the IDs of instructors who teach CS-138" using Relational Algebra. Use TEACHES relation $\Pi_{ID}(\sigma_{course\_id = 'CS\text{-}138'}(TEACHES))$

e. Answer the question "which departments have a budget of over $60,000" using Relational Algebra. Use DEPARTMENT relation $\Pi_{dept\_name}(\sigma_{budget > 60,000}(DEPARTMENT))$

f. In many programming languages there are functions that will append one list to another list. Compare the 'union' operation of relational algebra with the append function by giving one way in which they are different. In relational algebra, duplicate rows are deleted, whereas in the append function, duplicate rows may exist, depending on the database design.

Part 2

Use hospital.sql to answer following SQL queries.

.read hospital.sql

1. what are the first and last names of the female patients?

```
sqlite> select last_name, first_name from patient where sex = 'F';
last_name  first_name
---------  ----------
Wells      Chris
Brown      Brenda
sqlite>
```

2. what are the patient numbers and wards of all patients?

```
sqlite> select patient_no, ward from patient;
patient_no  ward
----------  ----
223         8
234         7
244         6
454         6
597         3
```

3.what are the first and last names of patients are in either ward 6 or ward 7?

```
sqlite> select last_name, first_name from patient where ward = 6 or ward = 7;
last_name  first_name
---------  ----------
Jenkins    Alan
Wells      Chris
Smith      John
sqlite>
```

4.what are the last names of patients that are either in ward 3 or are male?

```
sqlite> select last_name from patient where ward = 3 or sex = 'M';
last_name
---------
Jones
Jenkins
Smith
Brown
```

Part 3

Use census-summary.sql (uploaded under datasets module) to answer following SQL queries.

.read census-summary.sql

1. show the age of the males in the data set
   select age from census where sex = 'Male';

2. show all columns for the people with a usid between 100 and 120
   select * from census where usid > 100 and usid < 120; (assuming exclusive)
   select * from census where usid >= 100 and usid <= 120; (assuming inclusive)

3. show the workclass and education of people under 20
   select workclass, education from census where age < 20;

4. show all columns for people over 80
   select * from census where age > 80;

5. show the sex of people who are over 80 and have never married
   select sex from census where age > 80 and marital_status = 'Never_married';

6. what 'relationship' values appear in the data
   select distinct relationship from census;

7. what are the minimum and maximum number of years of education
   select min(education_num), max(education_num) from census;

8. which native countries end with "a"
   select distinct native_country from census where native_country like '%a';

9. which native countries do not have "a" anywhere in their name
   select distinct native_country from census where native_country not like '%a%';

10. what is the average age of people who have never worked?

select avg(age) from census where workclass = 'Never_worked';

Average age = 20.57