

## Extra exercises 1 SQL and Relational Algebra

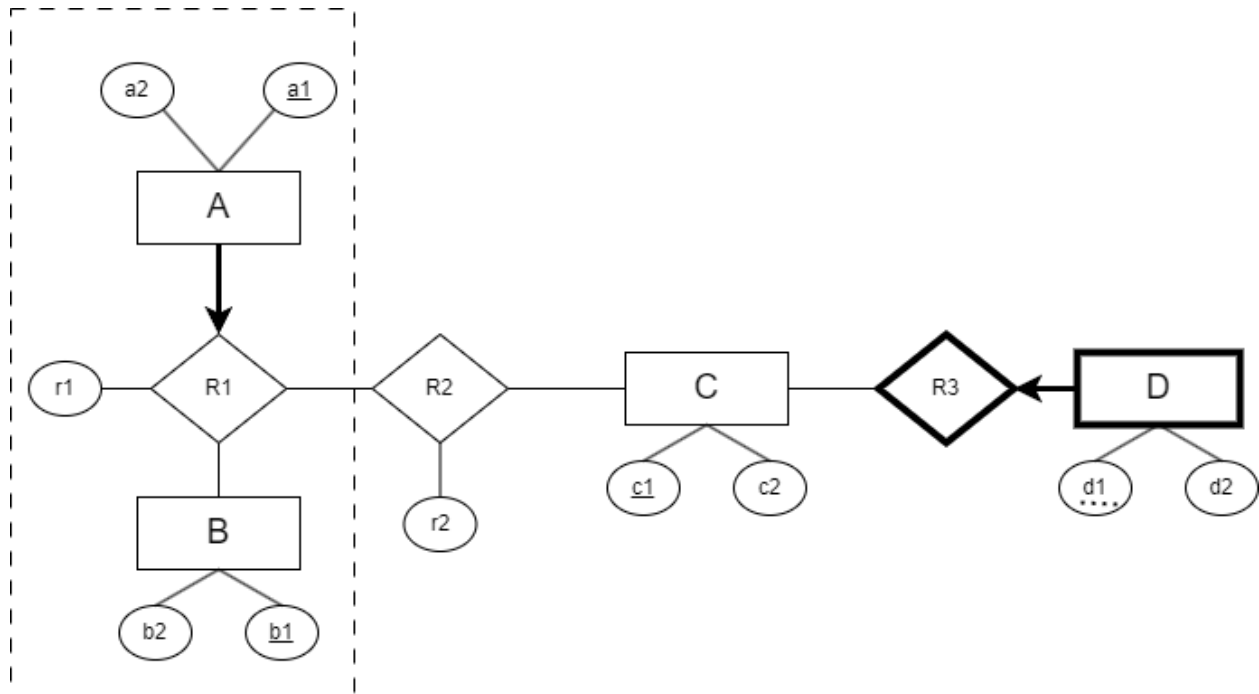
**Question 1:** Every superkey is a candidate key.

- A) True
- B) False

**Question 2:** Every candidate key is a superkey.

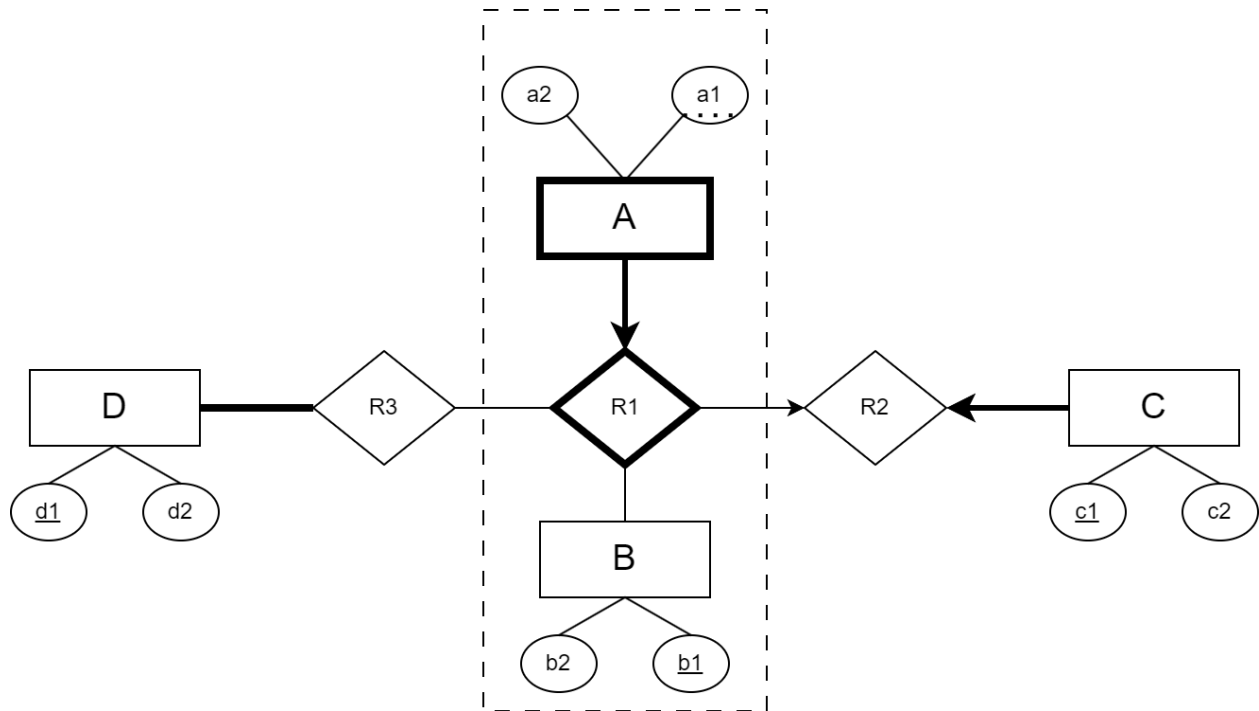
- A) True
- B) False

**Question 3:** Given the provided Entity-Relationship (ER) diagram, which of the options represents the most suitable schema for designing the Relational Model based on the ER diagram?



- A)  $AR1(\underline{a1}, a2, r1, b1, b2), B(\underline{b1}, b2), R2(\underline{a1}, a2, r2, \underline{c1}), C(\underline{c1}, c2), DR3(\underline{c1}, \underline{d1}, d2)$
- B)  $A(\underline{a1}, a2), B(\underline{b1}, b2), C(\underline{c1}, c2), DR3(\underline{c1}, \underline{d1}, d2), R1(\underline{a1}, \underline{b1}, r1), R2(\underline{c1}, \underline{b1}, \underline{a1}, r2)$
- C)  $AR1B(\underline{a1}, a2, r1, \underline{b1}, b2), R2(\underline{a1}, a2, r2, \underline{c1}), C(\underline{c1}, c2), DR3(\underline{c1}, \underline{d1}, d2)$
- D)  $A(\underline{a1}, a2), B(\underline{b1}, b2), C(\underline{c1}, c2), D(\underline{d1}, d2), R1(\underline{a1}, \underline{b1}, r1), R2(\underline{c1}, \underline{b1}, \underline{a1}, r2), R3(\underline{c1}, \underline{d1})$

**Question 4:** Examine the following ER diagram and its subsequent SQL representation (all data types are integers):



- CREATE TABLE D (
 d1 integer,
 d2 integer,
 primary key (d1));
- CREATE TABLE B (
 b1 integer,
 b2 integer,
 primary key (b1));
- CREATE TABLE CR2 (
 c1 integer,
 c2 integer,
 a1 integer NOT NULL,
 b1 integer NOT NULL,
 primary key (c1),
 foreign key (a1, b1) REFERENCES AR1(a1, b1));
- CREATE TABLE R3 (
 d1 integer,
 a1 integer,

b1 integer,  
primary key (a1, b1, d1),  
foreign key (a1, b1) REFERENCES AR1(a1, b1),  
foreign key (d1) REFERENCES D);

Which of the following represents an appropriate SQL code for creating the AR1 table?

- A) CREATE TABLE AR1(  
    a1 integer,  
    b1 integer,  
    a2 integer,  
    primary key (a1, b1),  
    foreign key(b1) REFERENCES B ON DELETE CASCADE);
- B) CREATE TABLE AR1(  
    a1 integer,  
    b1 integer,  
    a2 integer,  
    primary key (a1, b1),  
    foreign key(b1) REFERENCES B ON DELETE NO ACTION);
- C) CREATE TABLE AR1(  
    a1 integer,  
    b1 integer,  
    a2 integer,  
    primary key (a1),  
    foreign key(b1) REFERENCES B ON DELETE NO ACTION);
- D) CREATE TABLE AR1(  
    a1 integer,  
    b1 integer,  
    a2 integer,  
    primary key (a1),  
    foreign key(b1) REFERENCES B ON DELETE CASCADE);

**Questions 5, and 6:** Consider the following database schema for a movies website:

- Films(filmId: integer, title: string, year: integer, length: integer)

- Genres(genreId: integer, genreName: string)
- People(personId: integer, name: string, age: integer, gender: string, nationality: string)
- FilmsActors(filmId: integer, personId: integer)
- FilmsDirectors(filmId: integer, personId: integer)
- FilmsGenres(filmId: integer, genreId: integer)

**Question 5:** Which of the options results from the following relational algebra expression?

$$L \leftarrow \pi_{name}((\sigma_{genreName='Action'}(FilmsGenres \bowtie Genres)) \bowtie People \bowtie FilmsDirectors)$$

$$\pi_{name}(People \bowtie FilmsDirectors) - L$$

- A) Directors' names who directed at least one film in the genre "Action".
- B) Directors' names who directed films only in the genre "Action".
- C) Directors' names who did not direct any films in the genre "Action".
- D) People who did not play any films in the genre "Action".

**Question 6:** What is the optimized version of the following relational algebra expression?

$$\pi_{name}(\pi_{name,age}(\sigma_{age>50 \vee age<20}(\sigma_{gender='male'}(People))))$$

- A)  $\pi_{age}(\sigma_{age>50 \vee age<20 \vee gender='male'}(People))$
- B)  $\pi_{age}(\sigma_{gender='male' \wedge (age>50 \vee age<20)}(People))$
- C)  $\pi_{name}(\sigma_{gender='male' \wedge (age>50 \vee age<20)}(People))$
- D)  $\pi_{name}(\sigma_{gender='male' \vee (age>50 \vee age<20)}(People))$

**Questions 7, 8, 9, 10 and 11:** Consider the following relations A(a1, a2, a3), B(b1, b2, b3) and C(a1, c1, c2, c3) and the corresponding tables:

A:

<u>a1</u>	a2	a3
1	S	F
2	Q	H
3	Y	H
4	U	J

B:

<u>b1</u>	b2	b3
1	Q	F
3	S	G
5	Y	H
7	U	J
9	K	K

C:

<u>a1</u>	<u>c1</u>	c2	c3
2	1	A	G
3	1	B	H
4	2	C	I
6	3	D	J
7	4	E	K
8	5	F	L

**Question 7:** What is the number of tuples obtained by applying Cross-product over A and C?

**Question 8:** What is the number of tuples obtained by applying  $A \bowtie B$  (with  $a1 = b1$  as the join condition)?

**Question 9:** What is the number of tuples obtained by joining the result of the previous questions with C?  $(A \bowtie B) \bowtie C$  (with  $A.a1 = C.a1$  as the join condition)

**Question 10:** The number of tuples obtained by applying  $(A \bowtie B) \bowtie C$  differs from the number obtained by applying  $(A \bowtie C) \bowtie B$ .

- A) True
- B) False

## **Extra exercises 1 SQL and Relational Algebra Solutions**

**Answer 1: B**

**Answer 2: A**

**Answer 3: A**

**Answer 4: A**

**Answer 5: C**

**Answer 6: C**

**Answer 7: 24**

**Answer 8: 2**

**Answer 9: 1**

**Answer 10: B**