Lab 1: Relational Model and Keys

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Part 1: English to Schema

- Grocery store:

Product [__SKU (string)__, name (string), Price(real)]

Inventory [__SKU (string)__, quantity (integer), Price (real)]

- Car

Car [__VIN (string)__, make (string), model (string), year (integer), color (string)]

Salesperson [__ssn (string)__, name (string)]

Sales [__VIN (string)__, __ssn (string)__]

Part 2: SQL Table Declarations

```
CREATE TABLE Patrons (
Name string,
CardNum integer PRIMARY KEY, Address string,
Phone string
);

CREATE TABLE Phones (
CardNum integer,
Phone string,
PRIMARY KEY (CardNum, Phone),
FOREIGN KEY (CardNum) REFERENCES Patrons(CardNum)
);
```

```
CREATE TABLE CheckedOut (
 ISBN string,
CardNum integer,
DueDate string,
PRIMARY KEY (ISBN, CardNum),
FOREIGN KEY (CardNum) REFERENCES Patrons(CardNum)
 );

CREATE TABLE Inventory (
 ISBN string PRIMARY KEY,
Title string,
Author string,
CatalogNum integer UNIQUE
);

CREATE TABLE Titles (
 ISBN string,
Title string,
PRIMARY KEY (ISBN, Title)
);
```

Part 3: Fill in Tables

Car [__VIN (string)__, make (string), model (string), year (integer), color (string)]

- Cars:
  VIN11111, Toyota, Tacoma, 2008, Red
  VIN22222, Toyota, Tacoma, 1999, Green
  VIN33333, Tesla, Model 3, 2018, White
  VIN44444, Subaru, WRX, 2016, Blue
  VIN55555, Ford, F150, 2004, Red

Salesperson [__ssn (string)__, name (string)]

- Salespeople:
  SSN11111, Arnold
  SSN22222, Hannah
  SSN33333, Steve

Part 4: Keys and Superkeys

A1	A2	A3
X	4.0	q
y	4.0	p
z	3.1	p
z	4.0	p

Attribute Sets	Superkey	Proper Subsets	Key
{A1}	No	None	No
{A2}	No	None	No
{A3}	No	None	No
{A1, A2}	Yes	{A1}, {A2}	Yes
{A1, A3}	No	{A1}, {A3}	No
{A2, A3}	No	{A2}, {A3}	No
{A1, A2, A3}	Yes	{A1}, {A2}, {A3}, {A1, A2}, {A1, A3}, {A2, A3}	No

Part 5: Abstract Reasoning

1. If {x} is a superkey, then any set containing x is also a superkey.

True. If {x} is a superkey, it uniquely identifies tuples, and any superset containing x will also uniquely identify tuples.

2. If {x} is a key, then any set containing x is also a key.

False. A key is a minimal superkey. If {x} is a key, then adding more attributes to it would create a superkey, but not a key, since it would no longer be minimal.

3. If {x} is a key, then {x} is also a superkey.

True. By definition, a key is a minimal superkey. Therefore, if {x} is a key, it is also a superkey.

4. If {x, y, z} is a superkey, then one of {x}, {y}, or {z} must also be a superkey.

False. {x, y, z} being a superkey means it uniquely identifies tuples, but it doesn't necessitate that any of its subsets must also be superkeys.

5. If an entire schema consists of the set {x, y, z}, and if none of the proper subsets of {x, y, z} are keys, then {x, y, z} must be a key.

True. If none of the proper subsets are keys, and the entire set {x, y, z} uniquely identifies tuples, then {x, y, z} must be a key.