Keys

No two tuples in a relation are allowed to have exactly the same value for all attributes

Key Attribute: Minimum number of fields/attributes using which we can differentiate all tuples of the relation.

Sid	Sname	Ppno	Lno	Dob	Fname

Sid- student id, Sname- student name, Ppno- passport number, Lno- Driving license number, Dob- date of birth, Fname- father name

Assumption- No two students with the same Dob and father name

Key Attribute Set: A set of key attributes.

First key attribute/candidate key = **Sid**
Second key attribute/candidate key = **Ppno**
Third key attribute/candidate key = **Lno**
Fourth key attribute/candidate key = **(Dob, Fname)**

Key Attribute Set = {Sid, Ppno, Lno, (Dob, Fname)}

(Sid, Sname) is not a key attribute/candidate key

Candidate key: Same as key attribute (Minimum number of fields/attributes using which we can differentiate all tuples of the relation.)

Possibly many candidate keys (specified using UNIQUE), one of which is chosen as the primary key.

It is common to designate one of the candidate keys as the primary key of the relation

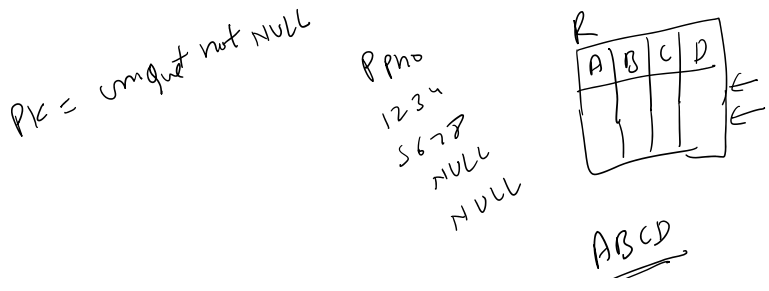
Primary key: a candidate key chosen as the principal means of identifying tuples within a relation
- Should choose an attribute whose value never, or very rarely, changes.
- E.g. email address is unique, but may change

Alternate Key or Secondary Key is the key that has not been selected to be the primary key, but are candidate keys. However, it is considered a candidate key for the primary key.

A candidate key not selected as a primary key is called alternate or secondary key. Candidate key is an attribute or set of attributes that you can consider as a Primary key.

Primary key - Sid
Alternate Keys - Ppno, Lno, (Dob, Fname)

Primary key: NULL values not allowed, use **PRIMARY KEY** to define
Alternate Key: NULL values allowed, use **UNIQUE** to define



```
CREATE TABLE Student (Sid   VARCHAR(15)   PRIMARY KEY,
                      Sname   VARCHAR(50)   NOT NULL,
                      Ppno    VARCHAR(50)  UNIQUE,
                      Lno     VARCHAR(50)   UNIQUE,
                      Dob   DATE,
                      Fname    VARCHAR(50),
                       UNIQUE (Dob, Fname))
```

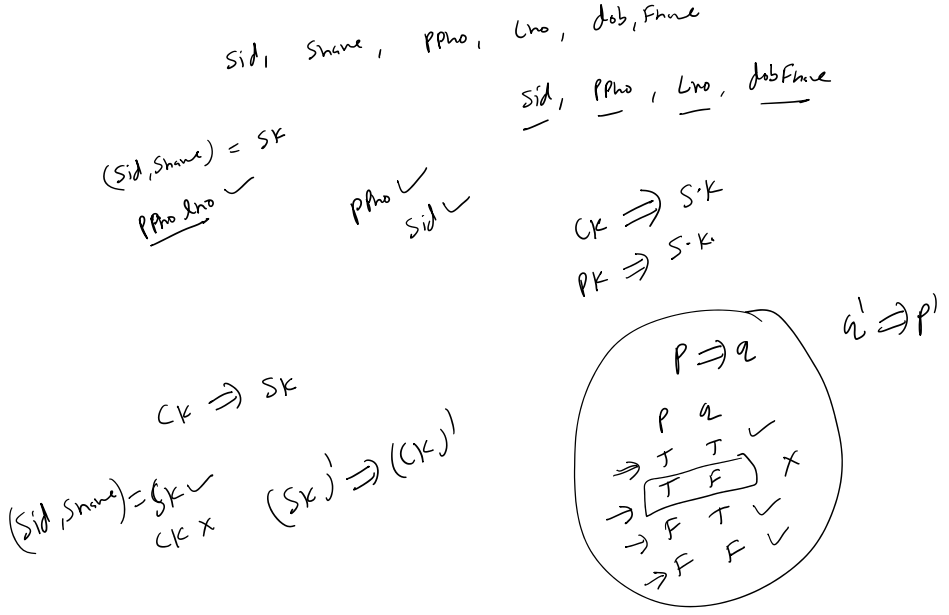
Superkey

A superkey is a set of one or more attributes that, taken collectively, allow us to identify uniquely a tuple in the relation.

Every relation has at least one default superkey— the set of all its attributes.

A candidate key is a minimal superkey.

superkey: Superset of attributes to the candidate key



$R(A_1, A_2, A_3, \ldots A_n)$ How many Superkeys are possible?

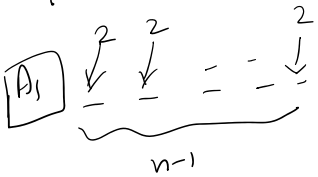
(1) only one $CK = A_1$

2^{n-1}

A_1

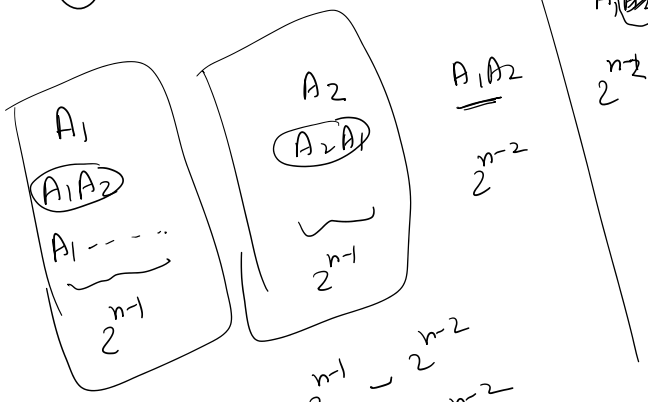
$A_1 A_2$

$A_1 A_2 A_3$



2^{n-1}

② CK = A_1, A_2



A_1A_2 2^{n-2}

$2 \cdot 2^{n-1} - 2^{n-2}$

$2^n - 2^{n-2}$

A_2 A_1A_2

A_2A_1 $A_1A_2A_3$

2^{n-2} 2^{n-2}

$3 \cdot 2^{n-2}$

$(4-1)2^{n-2} = 2^n - 2^{n-2}$

---

③ CK1 A_1A_2 , CK2 A_3A_4

A_1A_2 A_3A_4 $(A_1A_2A_3A_4)$

$2^{n-2} + 2^{n-2} - 2^{n-4}$

$= 2^{n-1} - 2^{n-4}$

$= 7 \cdot 2^{n-4}$

④ A_1A_2 , A_2A_3 $3 \cdot 2^{n-3} = (4-1)2^{n-3}$

A_1A_2 A_2A_3 $A_1A_2A_3$

$2^{n-2} + 2^{n-2} - 2^{n-3}$

$= 2^{n-1} - 2^{n-3}$