Functional dependency:

universal
relation

Suppose relational DB n attributes $R = \{A, \ldots, A$

relational state r of R

Attribute sets X and Y of R

functional dependency between X and Y

if tuplues $t_1$ and $t_2$ from r

we have $t_1[X] = t_2[X]$

$$\Rightarrow t_1[Y] = t_2[Y]$$

(said as Y is functionally dependent on X)

written as   $X \longrightarrow Y$

lhs

rhs

## EMP_PROJ

| Ssn | Pnumber | Hours | Ename | Pname | Plocation |
|---|---|---|---|---|---|
| 123456789 | 1 | 32.5 | Smith, John B. | ProductX | Bellaire |
| 123456789 | 2 | 7.5 | Smith, John B. | ProductY | Sugarland |
| 666884444 | 3 | 40.0 | Narayan, Ramesh K. | ProductZ | Houston |
| 453453453 | 1 | 20.0 | English, Joyce A. | ProductX | Bellaire |
| 453453453 | 2 | 20.0 | English, Joyce A. | ProductY | Sugarland |
| 333445555 | 2 | 10.0 | Wong, Franklin T. | ProductY | Sugarland |
| 333445555 | 3 | 10.0 | Wong, Franklin T. | ProductZ | Houston |
| 333445555 | 10 | 10.0 | Wong, Franklin T. | Computerization | Stafford |
| 333445555 | 20 | 10.0 | Wong, Franklin T. | Reorganization | Houston |
| 999887777 | 30 | 30.0 | Zelaya, Alicia J. | Newbenefits | Stafford |
| 999887777 | 10 | 10.0 | Zelaya, Alicia J. | Computerization | Stafford |
| 987987987 | 10 | 35.0 | Jabbar, Ahmad V. | Computerization | Stafford |
| 987987987 | 30 | 5.0 | Jabbar, Ahmad V. | Newbenefits | Stafford |
| 987654321 | 30 | 20.0 | Wallace, Jennifer S. | Newbenefits | Stafford |
| 987654321 | 20 | 15.0 | Wallace, Jennifer S. | Reorganization | Houston |
| 888665555 | 20 | Null | Borg, James E. | Reorganization | Houston |

Redundancy — Redundancy

$X = \{ Ssn, Pnumber \}$

$t_1[X]$

### EMP_PROJ

| Ssn | Pnumber | Hours | Ename | Pname | Plocation |
|---|---|---|---|---|---|

FD1
FD2
FD3
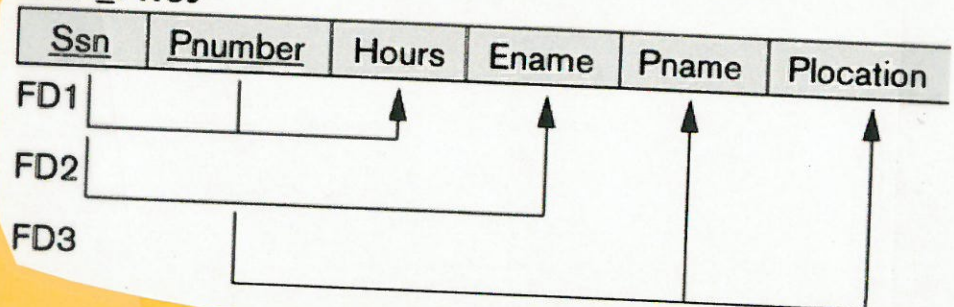
Examples:

$Ssn \rightarrow Ename$

$Pnumber \rightarrow \{ Pname, Plocation \}$

$\{ Ssn, Pnumber \} \rightarrow \{ Hours \}$

Props of FDs
- X is a key of r(R)
    ⇒ X → Y for any subset of
        attributes of R

- X → Y does not imply Y → X

| Person | | |
| --- | --- | --- |
| SSs* | Fname | Lname |
| 123 | Alice | A |
| 456 | Bob | B |
| 789 | Charlie | C |
| 011 | Alice | C |

Summary

- X → Y always true

- to show Y is not FD X, produce example
    eg (123, Alice, A) & (011, Alice, C) ~~Fname → Lname~~ Lname