RELATIONAL DATA LANGUAGES

Part 2

Union (denoted by U)

- RU S is a Binary Operation
- $r \cup s = \{t \mid t \in r \text{ or } t \in s\}$
- R and S should be type compatible
  - *R and S should have same number of attributes*
  - *Each pair of corresponding attributes must be type compatible (have same or compatible domains)*

- Tuples present in R or S or both are retrieved.
- Duplicate tuples are eliminated.

- Ex : Purchase_Invoice U Sales_Invoice

Union Example

- Find ISBN, title of the books that were published in 2009 or belongs to NEWS category

ISBN	Title	Year	Category	Publ_code
B111	FISH	2007	ARTICLE	P010
B112	GLOW	2009	ARTICLE	P212
B110	FERT	2010	NEWS	P010
B113	FINE ARTS	2009	NEWS	P010
B114	INDU – THE MAID	2008	NOVEL	P201

- Result1 <- $\Pi_{ISBN, Title}(\sigma_{year=2009}$ (Book))
- Result2 <- $\Pi_{ISBN, Title}(\sigma_{Category='NEWS'}$ (Book))
- Result **<- Result1 U Result2**

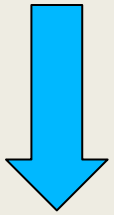
ISBN	Title	Year	Category	Publ_code
B112	GLOW	2009	ARTICLE	P212
B110	FERT	2010	NEWS	P010
B113	FINE ARTS	2009	NEWS	P010

Intersection

$r \cap s = \{ t \mid t \in r \text{ and } t \in s \}$

- Find ISBN, title of the books that were published in 2009 and belongs to NEWS category
- Result1 <- $\Pi_{ISBN,\ Title}(\sigma_{year=2009}\ (Book))$
- Result2 <- $\Pi_{ISBN,\ Title}(\sigma_{Category='NEWS'}\ (Book))$
- Result **<- Result1 ∩ Result2**

ISBN	Title	Year	Category	Publ_code
B111	FISH	2007	ARTICLE	P010
B112	GLOW	2009	ARTICLE	P212
B110	FERT	2010	NEWS	P010
B113	FINE ARTS	2009	NEWS	P010
B114	INDU – THE MAID	2008	NOVEL	P201



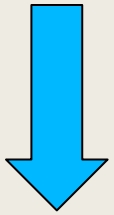
ISBN	Title	Year	Category	Publ_code
B113	FINE ARTS	2009	NEWS	P010

Set Difference

$r - s = \{t \mid t \in r \text{ and } t \notin s\}$

- Find ISBN, title of the books that were published in 2009 and does not belong to NEWS category
- Result1 <- $\Pi_{ISBN,\ Title}(\sigma_{year=2009}\ (Book))$
- Result2 <- $\Pi_{ISBN,\ Title}(\sigma_{Category='NEWS'}\ (Book))$
- Result **<- Result1 - Result2**

ISBN	Title	Year	Category	Publ_code
B111	FISH	2007	ARTICLE	P010
B112	GLOW	2009	ARTICLE	P212
B110	FERT	2010	NEWS	P010
B113	FINE ARTS	2009	NEWS	P010
B114	INDU – THE MAID	2008	NOVEL	P201

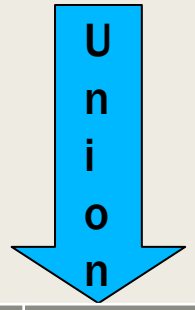


ISBN	Title	Year	Category	Publ_code
B112	GLOW	2009	ARTICLE	P212

Set operations on different relations

P_Inv_No	Date	Publ_code
PI_1001	29/10/2009	P010
PI_2001	1/2/2001	P212
PI_1002	12/4/2007	P010
PI_1045	5/2/2006	P010

S_Inv_No	Date	Cust_code
SI_1001	29/10/2009	C010
SI_2001	1/2/2001	C212
SI_1002	12/4/2007	C010
SI_1045	5/2/2006	C010



P_Inv_No	Date	Publ_code
PI_1001	29/10/2009	P010
PI_2001	1/2/2001	P212
PI_1002	12/4/2007	P010
PI_1045	5/2/2006	P010
SI_1001	29/10/2009	C010
SI_2001	1/2/2001	C212
SI_1002	12/4/200	C010

Properties of Union, Intersect, Difference

- Commutative
  - *Satisfied by Union and Intersect*
- Associative
  - *Satisfied by Union and Intersect*

- Distributive
  - *R U (S-T) = (R U S) – (R U T)*

- R-(R-S) = Which Operation ?
- (R U S) – ((R – S) U (S- R)) = Which operation ?
- R-S ≠ S-R

Cartesian Product

- Combine tuples from two different relations
- Combinatorial manner
- *R X S* $r \times s = \{t\ q \mid t \in r \text{ and } q \in s\}$
- R(A1, A2, . . ., An) **X** S(B1, B2, . . ., Bm)
- Q(A1, A2, . . ., An, B1, B2, . . ., Bm) is the result
- Number of columns in Q

  cQ = cR + cS
- Number of tuples in Q

  *nQ = nR * nS*

CARTESIAN PRODUCT

ISBN	Title	Category	Publ_code
B111	FISH	ARTICLE	P010
B112	GLOW	ARTICLE	P212
B110	FERT	NEWS	P010

Publ_code	Name	Address
P011	Pub1	Add1
P212	Pub2	Add2
P010	Pub3	Add3

Book X Publisher

ISBN	Title	Category	Publ_code	Publ_code	Name	Address
B111	FISH	ARTICLE	P010	P011	Pub1	Add1
B111	FISH	ARTICLE	P010	P212	Pub2	Add2
B111	FISH	ARTICLE	P010	P010	Pub3	Add3
B112	GLOW	ARTICLE	P212	P011	Pub1	Add1
B112	GLOW	ARTICLE	P212	P212	Pub2	Add2
B112	GLOW	ARTICLE	P212	P010	Pub3	Add3
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Joins

- To give meaningful representation for the cartesian product.

ISBN	Title	Category	Publ_code
B111	FISH	ARTICLE	P010
B112	GLOW	ARTICLE	P212
B110	FERT	NEWS	P010

Publ_code	Name	Address
P011	Pub1	Add1
P212	Pub2	Add2
P010	Pub3	Add3

Book ⋈ Publisher

ISBN	Title	Category	Publ_code
B111	FISH	ARTICLE	P010
B112	GLOW	ARTICLE	P212
B110	FERT	NEWS	P010

Publ_code	Name	Address
P010	Pub3	Add3
P212	Pub2	Add2
P010	Pub3	Add3

Join (denoted by ⋈)

- Derivative of Cartesian product
- Allows to combine tuples from different relations based on some meaningful condition
- Θ-join
  - *Join based on any of the binary comparison operators (>,=,<,>=,>=,!= et. al)*
  - *Any boolean formula*

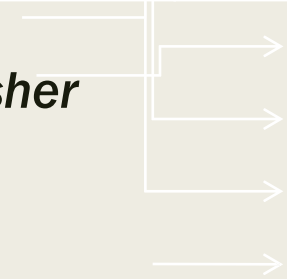
- R $\bowtie_{F>}$S ; F is a join condition
- F = R.a Θ S.b
- Can you Express R$\bowtie_{F}$S in terms of other operation ? $\sigma_F (R \times S)$

Join Example

- Get the publishers name of each book

ISBN	Title	Category	Pub_cd
B111	FISH	ARTICLE	P010
B112	GLOW	ARTICLE	P212
B110	FERT	NEWS	P010

Pbl_code	Publ_name	Publ_phone
P212	Pearson	3452198
P010	McGraw	8930287



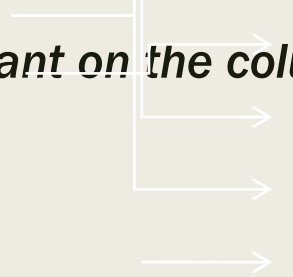
- $Book \bowtie_{pub\_cd=pbl\_code} Publisher$

Natural Join

- Get the publishers name of each book

ISBN	Title	Category	Publ_code
B111	FISH	ARTICLE	P010
B112	GLOW	ARTICLE	P212
B110	FERT	NEWS	P010

Publ_code	Publ_name	Publ_phone
P212	Pearson	3452198
P010	McGraw	8930287



  - *Book * Publisher*
  - *The join condition is dependant on the columns with same attribute names*