

The Relational Database Query Operations

in Relational Algebra and ANSI SQL

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Operation	Relational Algebra	ANSI SQL:1999	Notes
	r	SELECT * FROM r	Retrieves all tuples from relation r
PROJECTION	$\Pi_{A1,A2} r$	SELECT A1, A2 FROM r	Retrieves attributes (columns) A1 and A2 from relation r. <i>Dicing of relation r</i>
SELECTION	$\sigma_{A1>10 \wedge A2='F'} r$	SELECT * FROM r WHERE A1 > 10 AND A2 = 'F'	Retrieves all tuples from relation r that satisfy the condition(s). <i>Slicing of relation r</i> , also referred to as a <i>filter</i> .
CARTESIAN PRODUCT	$r \times s$	SELECT * FROM r, s	Concatenates each tuple of r with tuples in s. Gives all possible combinations.
INNER JOIN	$r \bowtie_{a=b} s$	SELECT * FROM r INNER JOIN s ON a = b	Concatenates each tuple of r with <i>corresponding</i> tuples in s based on the join criteria (e.g.: a=b)
NATURAL JOIN	$r \bowtie s$	SELECT * FROM r NATURAL JOIN s	A join performed on all the common attributes of r and s.
Restricted NATURAL JOIN	$r \bowtie_{a,b} s$	SELECT * FROM r INNER JOIN s USING(a, b)	A join performed on the attributes a and b, which are common to both relations
SET UNION	$r_1 \cup r_2$	SELECT * FROM r1 UNION SELECT * FROM r2	Gives tuples that are in relation r1 or in relation r2. The relations must be union compatible
SET DIFFERENCE	$r_1 - r_2$	SELECT * FROM r1 EXCEPT SELECT * FROM r2	Gives tuples in relation r1 that are not in relation r2. The relations must be union compatible
SET INTERSECT	$r_1 \cap r_2$	SELECT * FROM r1 INTERSECT SELECT * FROM r2	Gives tuples that are in relation r1 and also in relation r2. The relations must be union compatible
PSJ query	$\Pi_{A2,A3} [\sigma_{A1>10} (r \bowtie_{a=b} s)]$	SELECT A2, A3 FROM r INNER JOIN s ON a = b WHERE A1>10	A common pattern of queries is to perform the join operation first, followed by selection, and finally projection

NOTES: The set operators (Union, Difference, Intersect) can only be performed on relations that are [Union Compatible](#). Two relations r_1 and r_2 are union compatible if they have the same number of attributes, corresponding attributes have the same names in both relations, and corresponding attributes have the same domain.