

## BD - Lab 5

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# Overview

- 1 Projection
- 2 Selection
- 3 Cross Join
- 4 Vertical Join
- 5 Inner Join
- 6 Outer Join

# Projection( $\pi$ )

- operatia care afiseaza selectiv anumite coloane din una sau mai multe tabele
- ex.  $\pi_{Artist, Genre}(SONGS)$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| Artist          | Genre   |
|-----------------|---------|
| Mozart          | Classic |
| Queen           | Rock    |
| Michael Jackson | Pop     |
| Queen           | Rock    |
| Louis Armstrong | Jazz    |
| Ozzie Nelson    | Jazz    |
| Vanilla Ice     | Hip Hop |

# Selectia sau Restrictia( $\sigma$ )

- este operatia care preia si afiseaza toate liniile(sau liniile care indeplinesc una sau mai multe conditii) din una sau mai multe tabele
- ex.  $\sigma_{Genre=Rock}(SONGS)$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| SongID | Title                | Artist | Genre | Released | Inspired By |
|--------|----------------------|--------|-------|----------|-------------|
| 2      | Under Pressure       | Queen  | Rock  | 1982     |             |
| 4      | I Want to Break Free | Queen  | Rock  | 1984     |             |

# Cross Join( $\times$ )

- este operatia care preia si afiseaza toate liniile (sau liniile care indeplinesc una sau mai multe conditii) din una sau mai multe tabele
- ex.  $\sigma_{Genre=Rock}(\pi_{Title,Artist,Genre,Released}(SONGS)) \times GENERATIONS$

| GENERATIONS        |           |            |           |            |
|--------------------|-----------|------------|-----------|------------|
| Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
| The Depression Era | 1912      | 1921       | 1930      | 1939       |
| WW2                | 1922      | 1927       | 1940      | 1945       |
| Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Boomers II         | 1955      | 1965       | 1973      | 1983       |
| Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Millennials        | 1977      | 1994       | 1998      | 2006       |
| Gen-Z              | 1995      | 2012       | 2013      | 2020       |

| SongID | Title                | Artist | Genre | Released | Inspired By |
|--------|----------------------|--------|-------|----------|-------------|
| 2      | Under Pressure       | Queen  | Rock  | 1982     |             |
| 4      | I Want to Break Free | Queen  | Rock  | 1984     |             |

| Title                | Artist | Genre | Released | Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
|----------------------|--------|-------|----------|--------------------|-----------|------------|-----------|------------|
| Under Pressure       | Queen  | Rock  | 1982     | The Depression Era | 1912      | 1921       | 1930      | 1939       |
| I Want to Break Free | Queen  | Rock  | 1984     | WW2                | 1922      | 1927       | 1940      | 1945       |
| Under Pressure       | Queen  | Rock  | 1982     | Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| I Want to Break Free | Queen  | Rock  | 1984     | Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Under Pressure       | Queen  | Rock  | 1982     | Boomers II         | 1955      | 1965       | 1973      | 1983       |
| I Want to Break Free | Queen  | Rock  | 1984     | Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Under Pressure       | Queen  | Rock  | 1982     | Millennials        | 1977      | 1994       | 1998      | 2006       |
| I Want to Break Free | Queen  | Rock  | 1984     | Gen-Z              | 1995      | 2012       | 2013      | 2020       |
| Under Pressure       | Queen  | Rock  | 1982     | The Depression Era | 1912      | 1921       | 1930      | 1939       |
| I Want to Break Free | Queen  | Rock  | 1984     | WW2                | 1922      | 1927       | 1940      | 1945       |
| Under Pressure       | Queen  | Rock  | 1982     | Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| I Want to Break Free | Queen  | Rock  | 1984     | Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Under Pressure       | Queen  | Rock  | 1982     | Boomers II         | 1955      | 1965       | 1973      | 1983       |
| I Want to Break Free | Queen  | Rock  | 1984     | Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Under Pressure       | Queen  | Rock  | 1982     | Millennials        | 1977      | 1994       | 1998      | 2006       |
| I Want to Break Free | Queen  | Rock  | 1984     | Gen-Z              | 1995      | 2012       | 2013      | 2020       |

# Cross Join( $\times$ )



```
1 SELECT *
2 FROM
3     (SELECT Title,
4           Artist,
5           Genre,
6           Released
7        FROM SONGS
8        WHERE Genre='Rock' )
9 CROSS JOIN
10    GENERATIONS;
```

# Vertical Join - Union( $\cup$ )

- este rezultatul obtinut prin afisarea liniilor comune si neconune dintre doua sau mai multe tabele
- ex.  $\sigma_{Genre=Rock}(SONGS) \cup \sigma_{Genre=HipHop}(SONGS)$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

|   |                            |                 |         |      |   |
|---|----------------------------|-----------------|---------|------|---|
| 5 | What a Wonderful World     | Louis Armstrong | Jazz    | 1967 |   |
| 6 | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931 |   |
| 7 | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989 | 2 |

## Vertical Join - Union( $\cup$ )



```
1 SELECT *
2 FROM SONGS
3 WHERE GENRE='Jazz'
4 UNION
5 SELECT *
6 FROM SONGS
7 WHERE GENRE='Hip Hop';
```



# Vertical Join - Intersect( $\cap$ )

- este rezultatul obtinut prin afisarea liniilor comune dintre două sau mai multe tabele
- ex.  $\pi_{Artist}(\sigma_{Released=1982}(SONGS)) \cap \pi_{Artist}(\sigma_{Released=1984}(SONGS))$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

Queen

## Vertical Join - Intersect( $\cap$ )



```
1 SELECT Artist
2 FROM SONGS
3 WHERE Released=1982
4 INTERSECT
5 SELECT Artist
6 FROM SONGS
7 WHERE Released=1984
```

# Vertical Join - Minus( $\setminus$ )

- este rezultatul obtinut prin afisarea liniilor care apartin numai unei singure tabele conform conditiilor specificate
- ex.  $\pi_{Artist}(\sigma_{Released=1982}(SONGS)) \setminus \pi_{Artist}(\sigma_{Released=1984}(SONGS))$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

Michael Jackson

## Vertical Join - Minus(\)



```
1 SELECT Artist
2 FROM SONGS
3 WHERE Released=1982
4 MINUS
5 SELECT Artist
6 FROM SONGS
7 WHERE Released=1984
```

# Inner Join - Natural Join( $\bowtie$ )

- combină liniile din două relații, cu condiția ca atributele comune să aibă valori identice;
- ex.  $\pi_*(SONGS) \bowtie \pi_*(FOLDERS)$

| SONGS  |                            |                 |         |          |             |          |
|--------|----------------------------|-----------------|---------|----------|-------------|----------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By | FolderId |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             | 1        |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             | 2        |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             | 3        |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             | 2        |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             | 4        |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             | 4        |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           | 5        |

| FOLDERS  |                       |
|----------|-----------------------|
| FolderId | Path                  |
| 1        | ~/music/classic_songs |
| 2        | ~/music/rock_songs    |
| 3        | ~/music/pop_songs     |
| 4        | ~/music/jazz_songs    |
| 5        | ~/music/hip_hop_songs |

| SongID | Title                      | Artist          | Genre   | Released | Inspired By | FolderId | Path                  |
|--------|----------------------------|-----------------|---------|----------|-------------|----------|-----------------------|
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             | 1        | ~/music/classic_songs |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             | 2        | ~/music/rock_songs    |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             | 3        | ~/music/pop_songs     |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             | 2        | ~/music/rock_songs    |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             | 4        | ~/music/jazz_songs    |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             | 4        | ~/music/jazz_songs    |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           | 5        | ~/music/hip_hop_songs |

## Inner Join - Natural Join( $\bowtie$ )



```
1 SELECT *  
2 FROM SONGS  
3 NATURAL JOIN  
4 FOLDERS
```

# Inner Join - Equi Join( $\bowtie_{=}$ )

- este rezultatul obținut prin concatenarea coloanelor din una sau mai multe tabele conform condițiilor specificate (in acest caz se pun conditii de egalitate)
- ex.

$\pi_{Title, Artist}(SONGS\ s1) \bowtie_{s1.InspiredBy=s2.SongId} \pi_{Title, Artist}(SONGS\ s2)$

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| Title        | Artist | Title     | Artist |
|--------------|--------|-----------|--------|
| Ice Ice Baby | Mozart | Lacrimosa | Mozart |

## Inner Join - Equi Join( $\bowtie_{=}$ )



```
1 SELECT
2     s1.Title,
3     s1.Artist,
4     s2.Title,
5     s2.Artist
6 FROM SONGS s1
7     INNER JOIN SONGS s2
8     ON s1.Inspired=s2.SongId;
```



## Inner Join - Theta Join( $\bowtie_{\theta}$ )

- este rezultatul obținut prin concatenarea coloanelor din una sau mai multe tabele conform condițiilor specificate (în acest caz fie tabelele nu au coloane comune, fie sunt folosi și alți operatori în afara de =)
- ex.

$\pi_{Title, Artist, Released}(SONGS)$

$\bowtie_{SONGS.Release \in [GENERATIONS.AdultLow, Generations.AdultHigh]}$

$\pi_{Name, AdultLow, AdultHigh}(GENERATIONS)$

# Inner Join - Theta Join( $\bowtie_{\theta}$ )

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| GENERATIONS        |           |            |           |            |
|--------------------|-----------|------------|-----------|------------|
| Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
| The Depression Era | 1912      | 1921       | 1930      | 1939       |
| WW2                | 1922      | 1927       | 1940      | 1945       |
| Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Boomers II         | 1955      | 1965       | 1973      | 1983       |
| Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Millennials        | 1977      | 1994       | 1998      | 2006       |
| Gen-Z              | 1995      | 2012       | 2013      | 2020       |

| Title                      | Artist          | Released | Generation Name    | Adult Low | Adult High |
|----------------------------|-----------------|----------|--------------------|-----------|------------|
| Ice Ice Baby               | Vanilla Ice     | 1989     | Gen-X              | 1988      | 1994       |
| Billie Jean                | Michael Jackson | 1982     | Boomers II         | 1973      | 1983       |
| Under Pressure             | Queen           | 1982     | Boomers II         | 1973      | 1983       |
| What a Wonderful World     | Louis Armstrong | 1967     | Baby Boomers       | 1963      | 1972       |
| Dream a Little Dream of Me | Ozzie Nelson    | 1931     | The Depression Era | 1930      | 1939       |

# Inner Join - Theta Join( $\bowtie_{\theta}$ )



```
1 SELECT
2     s.Title,
3     s.Artist,
4     s.Released,
5     g.Name,
6     g.adult_year_left_bound,
7     g.adult_year_right_bound
8 FROM SONGS s
9     INNER JOIN GENERATIONS g
10    ON s.Released BETWEEN g.adult_year_left_bound AND g.adult_year_right_bound;
```

- **A LEFT OUTER JOIN B** returnează toate înregistrările din tabela A și, în cazul în care nu găsește o corespondență în tabela B va întoarce NULL, altfel va întoarce valorile selectate din tabela B.
- **A RIGHT OUTER JOIN B** returnează toate înregistrările din tabela B și, în cazul în care nu găsește o corespondență în tabela A va întoarce NULL, altfel va întoarce valorile selectate din tabela A.
- **A FULL OUTER JOIN B** returnează toate înregistrările din tabela A și B și, în cazul în care nu găsește o corespondență în tabela A sau B va întoarce NULL, altfel va întoarce valorile selectate din tabela A sau B.

# Left Outer Join

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| GENERATIONS        |           |            |           |            |
|--------------------|-----------|------------|-----------|------------|
| Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
| The Depression Era | 1912      | 1921       | 1930      | 1939       |
| WW2                | 1922      | 1927       | 1940      | 1945       |
| Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Boomers II         | 1955      | 1965       | 1973      | 1983       |
| Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Millennials        | 1977      | 1994       | 1998      | 2006       |
| Gen-Z              | 1995      | 2012       | 2013      | 2020       |

|                            |                 |      |                    |      |      |
|----------------------------|-----------------|------|--------------------|------|------|
| Ice Ice Baby               | Vanilla Ice     | 1990 | Gen-X              | 1988 | 1994 |
| I Want to Break Free       | Queen           | 1984 |                    |      |      |
| Billie Jean                | Michael Jackson | 1982 | Boomers II         | 1973 | 1983 |
| Under Pressure             | Queen           | 1982 | Boomers II         | 1973 | 1983 |
| What a Wonderful World     | Louis Armstrong | 1967 | Baby Boomers       | 1963 | 1972 |
| Dream a Little Dream of Me | Ozzie Nelson    | 1931 | The Depression Era | 1930 | 1939 |
| Lacrimosa                  | Mozart          | 1791 |                    |      |      |

# Left Outer Join



```
1 SELECT
2     s.Title,
3     s.Artist,
4     s.Released,
5     g.Name,
6     g.adult_year_left_bound,
7     g.adult_year_right_bound
8 FROM SONGS s
9     LEFT OUTER JOIN GENERATIONS g
10    ON s.Released BETWEEN g.adult_year_left_bound AND g.adult_year_right_bound;
```

# Right Outer Join

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| GENERATIONS        |           |            |           |            |
|--------------------|-----------|------------|-----------|------------|
| Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
| The Depression Era | 1912      | 1921       | 1930      | 1939       |
| WW2                | 1922      | 1927       | 1940      | 1945       |
| Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Boomers II         | 1955      | 1965       | 1973      | 1983       |
| Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Millennials        | 1977      | 1994       | 1998      | 2006       |
| Gen-Z              | 1995      | 2012       | 2013      | 2020       |

|                            |                 |      |                    |      |      |
|----------------------------|-----------------|------|--------------------|------|------|
| Dream a Little Dream of Me | Ozzie Nelson    | 1931 | The Depression Era | 1930 | 1939 |
|                            |                 |      | WW2                | 1940 | 1945 |
|                            |                 |      | Post War Cohort    | 1946 | 1963 |
| What a Wonderful World     | Louis Armstrong | 1967 | Baby Boomers       | 1963 | 1972 |
| Under Pressure             | Queen           | 1982 | Boomers II         | 1973 | 1983 |
| Billie Jean                | Michael Jackson | 1982 | Boomers II         | 1973 | 1983 |
| Ice Ice Baby               | Vanilla Ice     | 1990 | Gen-X              | 1988 | 1994 |
|                            |                 |      | Millennials        | 1998 | 2006 |
|                            |                 |      | Gen-Z              | 2013 | 2020 |

# Right Outer Join



```
1 SELECT
2     s.Title,
3     s.Artist,
4     s.Released,
5     g.Name,
6     g.adult_year_left_bound,
7     g.adult_year_right_bound
8 FROM SONGS s
9     RIGHT OUTER JOIN GENERATIONS g
10    ON s.Released BETWEEN g.adult_year_left_bound AND g.adult_year_right_bound;
```



# Full Outer Join

| SONGS  |                            |                 |         |          |             |
|--------|----------------------------|-----------------|---------|----------|-------------|
| SongID | Title                      | Artist          | Genre   | Released | Inspired By |
| 1      | Lacrimosa                  | Mozart          | Classic | 1791     |             |
| 2      | Under Pressure             | Queen           | Rock    | 1982     |             |
| 3      | Billie Jean                | Michael Jackson | Pop     | 1982     |             |
| 4      | I Want to Break Free       | Queen           | Rock    | 1984     |             |
| 5      | What a Wonderful World     | Louis Armstrong | Jazz    | 1967     |             |
| 6      | Dream a Little Dream of Me | Ozzie Nelson    | Jazz    | 1931     |             |
| 7      | Ice Ice Baby               | Vanilla Ice     | Hip Hop | 1989     | 2           |

| GENERATIONS        |           |            |           |            |
|--------------------|-----------|------------|-----------|------------|
| Generation Name    | Birth Low | Birth High | Adult Low | Adult High |
| The Depression Era | 1912      | 1921       | 1930      | 1939       |
| WW2                | 1922      | 1927       | 1940      | 1945       |
| Post War Cohort    | 1928      | 1945       | 1946      | 1963       |
| Baby Boomers       | 1946      | 1954       | 1963      | 1972       |
| Boomers II         | 1955      | 1965       | 1973      | 1983       |
| Gen-X              | 1966      | 1976       | 1988      | 1994       |
| Millennials        | 1977      | 1994       | 1998      | 2006       |
| Gen-Z              | 1995      | 2012       | 2013      | 2020       |

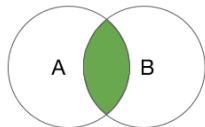
|                            |                 |      |                    |      |      |
|----------------------------|-----------------|------|--------------------|------|------|
| Ice Ice Baby               | Vanilla Ice     | 1990 | Gen-X              | 1988 | 1994 |
| I Want to Break Free       | Queen           | 1984 |                    |      |      |
| Billie Jean                | Michael Jackson | 1982 | Boomers II         | 1973 | 1983 |
| Under Pressure             | Queen           | 1982 | Boomers II         | 1973 | 1983 |
| What a Wonderful World     | Louis Armstrong | 1967 | Baby Boomers       | 1963 | 1972 |
| Dream a Little Dream of Me | Ozzie Nelson    | 1931 | The Depression Era | 1930 | 1939 |
| Lacrimosa                  | Mozart          | 1791 |                    |      |      |
|                            |                 |      | WW2                | 1940 | 1945 |
|                            |                 |      | Post War Cohort    | 1946 | 1963 |
|                            |                 |      | Millennials        | 1998 | 2006 |
|                            |                 |      | Gen-Z              | 2013 | 2020 |

# Full Outer Join

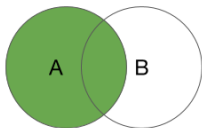


```
1 SELECT
2     s.Title,
3     s.Artist,
4     s.Released,
5     g.Name,
6     g.adult_year_left_bound,
7     g.adult_year_right_bound
8 FROM SONGS s
9     FULL OUTER JOIN GENERATIONS g
10    ON s.Released BETWEEN g.adult_year_left_bound AND g.adult_year_right_bound;
```

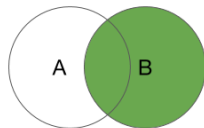
# Join Types



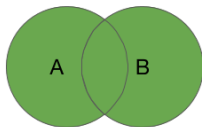
INNER JOIN



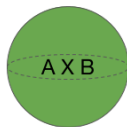
LEFT OUTER JOIN



RIGHT OUTER JOIN



FULL OUTER JOIN



CARTESIAN  
(CROSS) JOIN

The End