# (T32)比較 GroupingSet、Rollup、Cube。比較 Grouping Function、Grouping、IDFunction
CourseGUID: e48417fc-9db5-4e99-822c-706c5ccef6cc
==================================================================
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## 0. Summary

1.
GROUPING SETS   V.S.   ROLLUP  V.S.  CUBE
Reference:
https://technet.microsoft.com/zh-cn/library/bb522495(v=sql.105).aspx
https://technet.microsoft.com/zh-cn/library/bb522631(v=sql.105).aspx
https://technet.microsoft.com/zh-cn/library/bb510427(v=sql.105).aspx
https://technet.microsoft.com/en-us/library/bb522495(v=sql.105).aspx
https://technet.microsoft.com/en-us/library/bb510427(v=sql.105).aspx
1.1.
```
--GROUP BY GROUPING SETS (
--    (ColumnA, ColumnB, ...), --GroupingSet1
```

--    (ColumnB ...), --GroupingSet2
--    ...
--)
GROUP BY GROUPING SETS do aggregate operation
and UNION ALL all other aggregate operation.
1.2.
--GROUP BY ROLLUP (C1, C2, ..., Cn-1, Cn)
or
--GROUP BY C1, C2, ..., Cn-1, Cn WITH ROLLUP
ROLLUP do aggregate operation on multiple levels in hierarchy.
1.3.
--GROUP BY CUBE (C1, C2, ..., Cn-1, Cn)
or
--GROUP BY C1, C2, ..., Cn-1, Cn WITH CUBE
CUBE produces the result set
by generating all combinations of columns
specified in GROUP BY CUBE().
--------------------------------------------------------------------
2.
Syntax
--GROUP BY GROUPING SETS (
--    (ColumnA, ColumnB, ...), --GroupingSet1
--    (ColumnB ...), --GroupingSet2
--    ...
--)
2.1.
This is like
--Group By (ColumnA, ColumnB, ...)
--Union ALL
--Group By (ColumnB, ...)
--Union ALL ...
Problem about Union ALL is that
if you Union ALL 4 SELECT ... GROUP BY ...
then the table need to be accessed 4 times.
IF you use GROUP BY GROUPING SETS,
then the table need to be accessed 1 time.
Thus, GROUPING SETS is faster than UNION ALL 4 times of SELECT ... GROUP BY ...
2.2.
--ORDER BY GROUPING(ColumnA);
or
----ORDER BY ColumnA;
The order of the rows of GROUP BY GROUPING SETS in the result set
is not the same as UNION ALL query.
We can use Order By with GROUP BY GROUPING SETS to control the order.
However, we cannot use use Order By with Union ALL.
To control the order use order by as shown below.
--------------------------------------------------------------------
3.
3.1.
The following clauses return the same grand totals:
3.1.1.
--GROUP BY GROUPING SETS ( () )
3.1.2.
--GROUP BY ()
------------------------------
3.2.
The following clauses return the same single sets
3.2.1.
--GROUP BY GROUPING SETS ( (C1, C2, ..., Cn) )
3.2.2.
--GROUP BY C1, C2, ..., Cn
------------------------------
3.3.
The following clauses are equivalent:
3.3.1.

```
--GROUP BY ROLLUP (C1, C2, ..., Cn-1, Cn)
3.3.2.
--GROUP BY C1, C2, ..., Cn-1, Cn WITH ROLLUP
3.3.3.
--GROUP BY GROUPING SETS ( (C1, C2, ..., Cn-1, Cn)
--    ,(C1, C2, ..., Cn-1)
--    ...
--    ,(C1, C2)
--    ,(C1)
--    ,() )
3.3.4.
--SELECT ...FROM...GROUP BY C1, C2, ..., Cn-1, Cn
--UNION ALL
--SELECT ...FROM...GROUP BY C1, C2, ..., Cn-1
--SELECT ...FROM...UNION ALL
--...
--UNION ALL
--SELECT ...FROM...GROUP BY C1, C2
--UNION ALL
--SELECT ...FROM...GROUP BY C1
--UNION ALL
--SELECT ...FROM...
-------------------------------
3.4.
The following clauses are equivalent:
3.4.1.
--GROUP BY CUBE (C1, C2, C3)
3.4.2.
--GROUP BY GROUPING SETS (
--    (C1, C2, C3)
--    ,(C1, C2)
--    ,(C1, C3)
--    ,(C2, C3)
--    ,(C1)
--    ,(C2)
--    ,(C3)
--    ,() )
-------------------------------
3.5.
The following clauses are equivalent:
3.5.1.
--GROUP BY ROLLUP (C1, C2, C3)
3.5.2.
--GROUP BY C1, C2, C3 WITH ROLLUP
3.5.3.
--GROUP BY GROUPING SETS (
--    ,(C1, C2, C3)
--    ,(C1, C2)
--    ,(C1)
--    ,() )
-------------------------------
3.6.
The following clauses are equivalent:
3.6.1.
--GROUP BY ROLLUP(A, (C1, C2, ..., Cn) )
3.6.2.
--GROUP BY ROLLUP( (A), (C1, C2, ..., Cn) )
3.6.3.
--GROUP BY ( (A), (C1, C2, ..., Cn) ) WITH ROLLUP
3.6.3.
--GROUP BY GROUPING SETS (
--    (A, C1, C2, ..., Cn),
--    (A),
--    ()
--)
```

```
-------------------------------
3.7.
The following clauses are equivalent:
3.7.1.
--GROUP BY CUBE(A, (C1, C2, ..., Cn) )
3.7.2.
--GROUP BY CUBE( (A), (C1, C2, ..., Cn) )
3.7.3.
--GROUP BY GROUPING SETS (
--    (),
--    (A),
--    (C1, C2, ..., Cn),
--    (A, C1, C2, ..., Cn) )
-------------------------------
--**
3.8.
The following clauses are equivalent:
3.8.1.
GROUP BY A, CUBE (B, C)
3.8.2.
GROUP BY GROUPING SETS (
    (A),
    (A, B),
    (A, C),
    (A, B, C ))
-------------------------------
--**
3.9.
The following clauses are equivalent:
3.9.1.
--GROUP BY A, GROUPING SETS ( (B), (C) )
3.9.2.
--GROUP BY GROUPING SETS (
--    (A, B),
--    (A, C) )
-------------------------------
--**
3.10.
The following clauses are equivalent:
3.10.1.
--GROUP BY GROUPING SETS ( (A), ROLLUP (B, C) )
3.10.2.
--GROUP BY GROUPING SETS (
--    (A),
--    (B,C),
--    (B),
--    ()
--)
-------------------------------
--**
3.11.
The following clauses are equivalent:
3.11.1.
--GROUP BY GROUPING SETS(A, (B, ROLLUP(C, D)) )
3.11.2.
--GROUP BY GROUPING SETS (
--    A,
--    B,
--    (B,C),
--    (B, C, D)
--    ()
--)
------------------------------------------------------------------------
4.
--Grouping(columnA)
```

Syntax
```
--SELECT  ColumnA ,
--       SUM(ColumnB) AS TotalB ,
--       GROUPING(ColumnA) AS 'GroupingColumnA'
--FROM    dbo.TableName
--GROUP BY ROLLUP(ColumnA);
```
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-transact-sql
https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-transact-sql
4.1.
if the columnA in a GROUP BY list is aggregated(Count, Sum, Avg, Min, Max)
then Grouping(columnA) return 1, otherwise return 0.
4.2.
When using ROLLUP, CUBE or GROUPING SETS,
the NULL returned might be normal standard null values,
or the NULL returned might be a column placeholder and means all.
4.3.
If SELECT Grouping(columnA) for that row return 0,
it means columnA in a GROUP BY list for that row is normal standard null values.
4.4.
If SELECT Grouping(columnA) for that row return 1,
it means columnA in a GROUP BY list for that row is a column placeholder
from ROLLUP, CUBE or GROUPING SETS, and it means all.
4.5.
Grouping(columnA) can be used in the
SELECT <select> list,
HAVING, and
ORDER BY clauses
when GROUP BY is specified.
-----------------------------------------------------------------------
5.
--Grouping(columnA)
E.g.
```
--SELECT  HouseType ,
--       SUM(SoldPrice) AS TotalSold ,
--       GROUPING(HouseType) AS 'GroupingHouseType'
--FROM    dbo.HouseSold
--GROUP BY ROLLUP(HouseType);
```
Output as following
```
--HouseType   TotalSold   GroupingHouseType
--NULL        493000.00       0
--Type1        1320000.00    0
--Type2        1400000.00    0
--NULL        3213000.00    1
```
The result set shows two NULL values under HouseType Column.
5.1.
```
--NULL    493000.00       0
```
The 1st NULL value under HouseType Column
means HouseType Column in a GROUP BY list for that row
is normal standard null values.
It represents the group of null values from the HouseType Column.
Thus, SELECT Grouping(HouseType) for that row will return 0,
5.2.
```
--NULL    3213000.00    1
```
The 2nd NULL value under HouseType Column
means HouseType Column in a GROUP BY list for that summary row is a column placeholder
from ROLLUP, CUBE or GROUPING SETS, and it means all.
Thus, SELECT Grouping(HouseType) for that row will return 1,
if the columnA in a GROUP BY list is aggregated(Count, Sum, Avg, Min, Max)
then Grouping(columnA) return 1, otherwise return 0.
-----------------------------------------------------------------------
6.
--GROUPING_ID(C1,C2,...Cn)
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-id-transact-sql

https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-id-transact-sql
6.1.
Syntax
```
--SELECT  C1,C2,...Cn ,
--       SUM(ColumnB) AS TotalB ,
--       GROUPING_ID(C1,C2,...Cn) AS 'GPID'
--FROM    dbo.TableName
--GROUP BY ROLLUP(C1,C2,...Cn);
```
6.1.1.
GROUPING_ID(C1,C2,...Cn) function concatenates
all the GOUPING(C1), GOUPING(C2),...GOUPING(Cn) functions,
and then perform the binary string to decimal conversion.
6.1.2.
The column list of GROUPING_ID(C1,C2,...Cn) must match
the column list of GROUP BY ROLLUP(C1,C2,...Cn).
6.1.3.
GROUPING_ID(C1,C2,...Cn) function computes the level of grouping.
We normally use GROUPING_ID(C1,C2,...Cn) in ORDER BY and HAVING clause to
order the ROLLUP or CUBE.
6.1.4.
GROUPING_ID(C1,C2,...Cn) can be used in the
SELECT <select> list,
HAVING, and
ORDER BY clauses
when GROUP BY is specified.
This usage is same as Grouping(C1) function
6.2.
E.g.
```
--SELECT  C1,C2,C3,
--       SUM(ColumnB) AS TotalB ,
--       GROUPING_ID(C1,C2,C3) AS 'GPID'
--FROM    dbo.TableName
--GROUP BY ROLLUP(C1,C2,C3);
```
GROUPING_ID(C1,C2,C3) binary string =
CAST(GROUPING(C1) AS NVARCHAR(1)) +
CAST(GROUPING(C2) AS NVARCHAR(1)) +
CAST(GROUPING(C3) AS NVARCHAR(1));
GROUPING_ID(C1,C2,C3) = convert GROUPING_ID(C1,C2,C3)BinaryString to decimal.
Grouping(C1), Grouping(C2), or Grouping(C3) will return 1 or 0.
GROUPING_ID(C1,C2,C3) function concatenates
all the GOUPING(C1), GOUPING(C2),GOUPING(C3) functions,
and then perform the binary string to decimal conversion.
-------------------------------------------------------------------------
7.
Reference:
http://improve.dk/converting-between-base-2-10-and-16-in-t-sql/
```
----If function exists then DROP it
--IF ( EXISTS ( SELECT    *
--            FROM      INFORMATION_SCHEMA.ROUTINES
--            WHERE     ROUTINE_TYPE = 'FUNCTION'
--                      AND LEFT(ROUTINE_NAME, 2) NOT IN ( '@@' )
--                      AND SPECIFIC_NAME = 'fnBinaryStrToDecimal' ) )
--    BEGIN
--       DROP FUNCTION fnBinaryStrToDecimal;
--    END;
--GO -- Run the previous command and begins new batch
--CREATE FUNCTION [dbo].[fnBinaryStrToDecimal] ( @Input VARCHAR(255) )
--RETURNS BIGINT
--AS
--    BEGIN
--       DECLARE @Cnt TINYINT = 1;
--       DECLARE @Len TINYINT = LEN(@Input);
--       DECLARE @Output BIGINT = CAST(SUBSTRING(@Input, @Len, 1) AS BIGINT);
--       WHILE ( @Cnt < @Len )
--           BEGIN
--              SET @Output = @Output
--                  + POWER(CAST(SUBSTRING(@Input, @Len - @Cnt, 1) * 2 AS BIGINT),
--                          @Cnt);
--              SET @Cnt = @Cnt + 1;
--          END;
--      RETURN @Output;
--   END;
--GO -- Run the previous command and begins new batch
--PRINT dbo.fnBinaryStrToDecimal('111')
```

==================================================

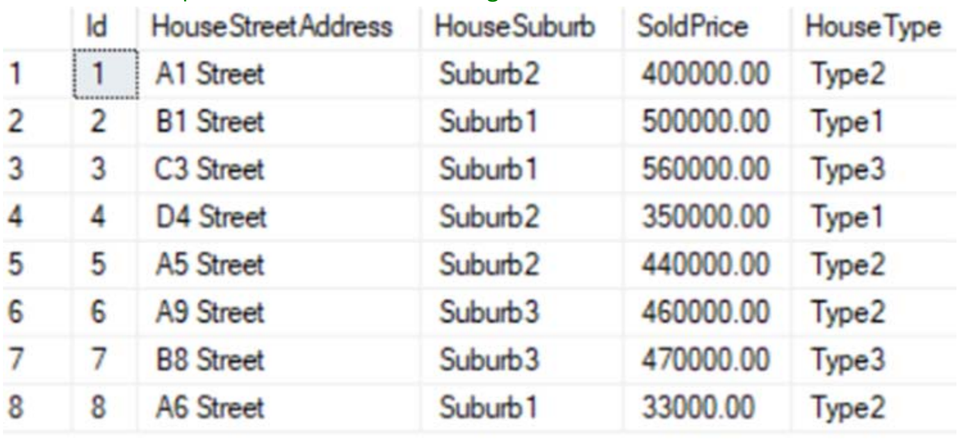
# 1. GroupingSets

```
--==========================================================================
--T032_01_GroupingSets
--==========================================================================
```

## 1.1. Create Sample data

```
--==========================================================================
--T032_01_01
--Create Sample data
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', 560000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', 350000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb2', 440000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'A9 Street', N'Suburb3', 460000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', 470000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', 33000, N'Type2' );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
```

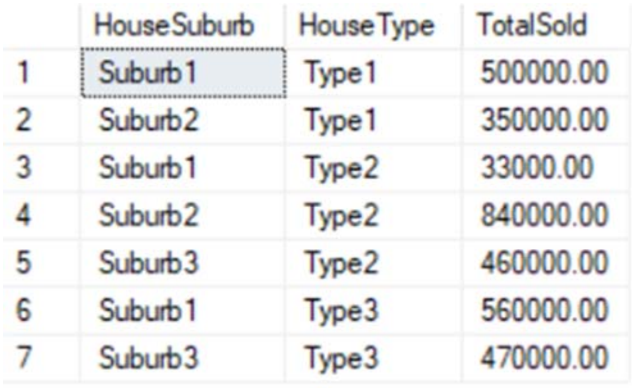
```
GO -- Run the previous command and begins new batch
```



|   | Id | HouseStreetAddress | HouseSuburb | SoldPrice | HouseType |
|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | 560000.00 | Type3 |
| 4 | 4 | D4 Street | Suburb2 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb2 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb3 | 460000.00 | Type2 |
| 7 | 7 | B8 Street | Suburb3 | 470000.00 | Type3 |
| 8 | 8 | A6 Street | Suburb1 | 33000.00 | Type2 |

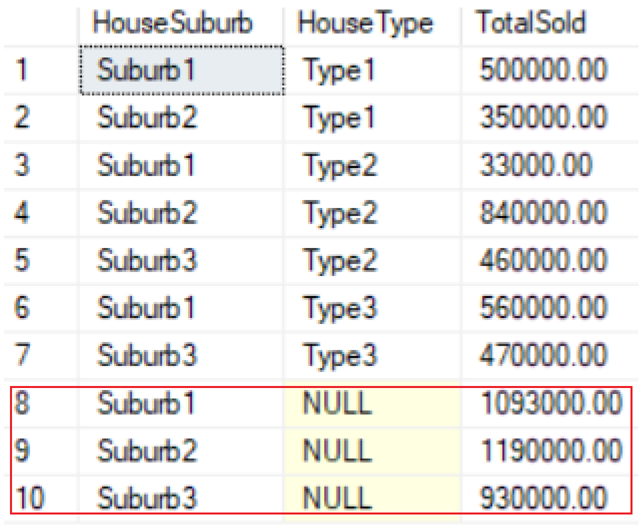
## 1.2. Group By ... Union All...

```
--==========================================================================
--T032_01_02
--Group By ... Union All...
----------------------------------------------------------------------------
--T032_01_02_01
--calculate Sum of SoldPrice by HouseSuburb and HouseType
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb ,
        HouseType;
GO -- Run the previous command and begins new batch
```



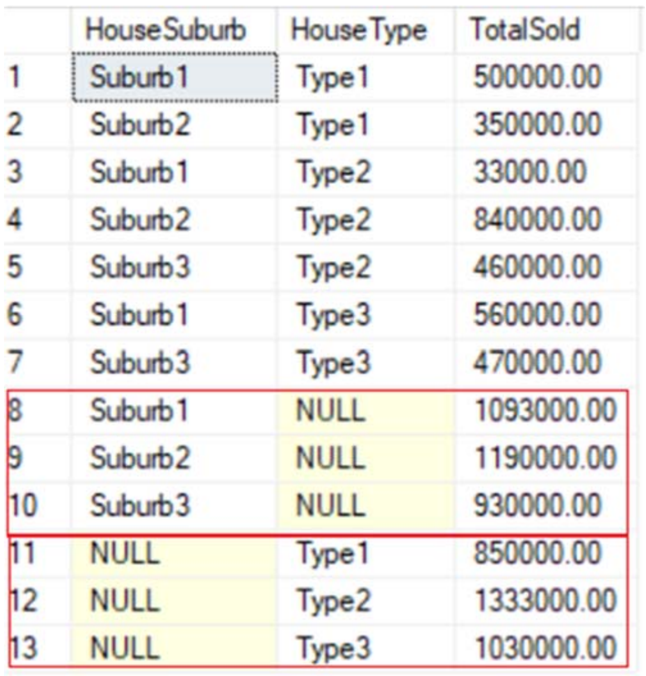
|   | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |

```
----------------------------------------------------------------------------
--T032_01_02_02
--calculate Sum of SoldPrice by HouseSuburb and HouseType
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb ,
        HouseType
UNION ALL
--calculate Sum of SoldPrice by HouseSuburb
SELECT  HouseSuburb ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb;
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |

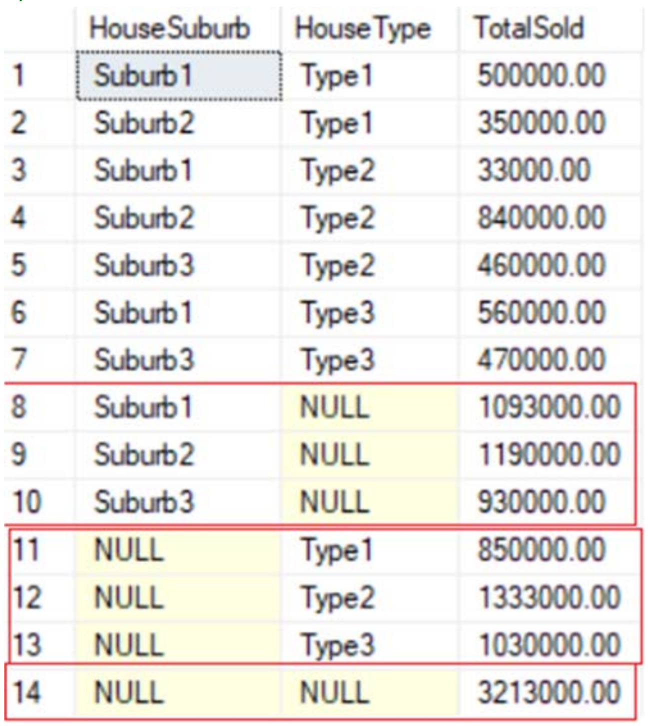
```
--------------------------------------------------------------------------
--T032_01_02_03
--calculate Sum of SoldPrice by HouseSuburb and HouseType
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb ,
        HouseType
UNION ALL
--calculate Sum of SoldPrice by HouseSuburb
SELECT  HouseSuburb ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb
UNION ALL
--calculate Sum of SoldPrice by HouseType
SELECT  NULL ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseType;
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type2 | 1333000.00 |
| 13 | NULL | Type3 | 1030000.00 |

```
--------------------------------------------------------------------------
--T032_01_02_04
--calculate Sum of SoldPrice by HouseSuburb and HouseType
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb ,
        HouseType
UNION ALL
--calculate Sum of SoldPrice by HouseSuburb
SELECT  HouseSuburb ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseSuburb
UNION ALL
--calculate Sum of SoldPrice by HouseType
SELECT  NULL ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY HouseType
UNION ALL
--calculate Sum of SoldPrice
SELECT  NULL ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold;
--ORDER BY dbo.HouseSold.HouseSuburb, dbo.HouseSold.HouseType, dbo.HouseSold.SoldPrice
GO -- Run the previous command and begins new batch
/*
1.
--ORDER BY dbo.HouseSold.HouseSuburb, dbo.HouseSold.HouseType, dbo.HouseSold.SoldPrice
Reference:
https://stackoverflow.com/questions/27819047/group-by-and-order-by-with-union-all
You can not use order by with Group by and Union All in this way.
However, please see the reference
if you really want to know how to use GROUP BY, UNION ALL, and ORDER BY all together.
```

```
*/
```

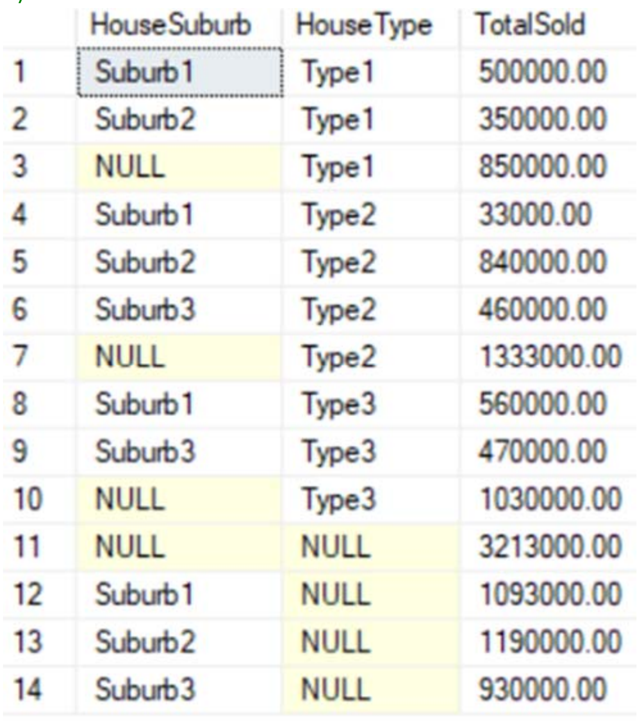


|   | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type2 | 1333000.00 |
| 13 | NULL | Type3 | 1030000.00 |
| 14 | NULL | NULL | 3213000.00 |

## 1.3. Group BY GROUPING SETS ...

```
--==========================================================================
--T032_01_03
--Group BY GROUPING SETS ...
----------------------------------------------------------------------------
--T032_01_03_01
--Group BY GROUPING SETS ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                      ( HouseSuburb ,
                        HouseType
                      ), -- Sum of SoldPrice by HouseSuburb and HouseType
                      ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                      ( HouseType ), -- Sum of SoldPrice by HouseType
                      ( )-- Grand Total Sold
      );
GO -- Run the previous command and begins new batch
/*
1.
Syntax
--GROUP BY GROUPING SETS (
--      (ColumnA, ColumnB, ...), --GroupingSet1
--      (ColumnB ...), --GroupingSet2
--      ...
--)
1.1.
This is like
--Group By (ColumnA, ColumnB, ...)
--Union ALL
--Group By (ColumnB, ...)
--Union ALL ...
Problem about Union ALL is that
if you Union ALL 4 SELECT ... GROUP BY ...
then the table need to be accessed 4 times.
```

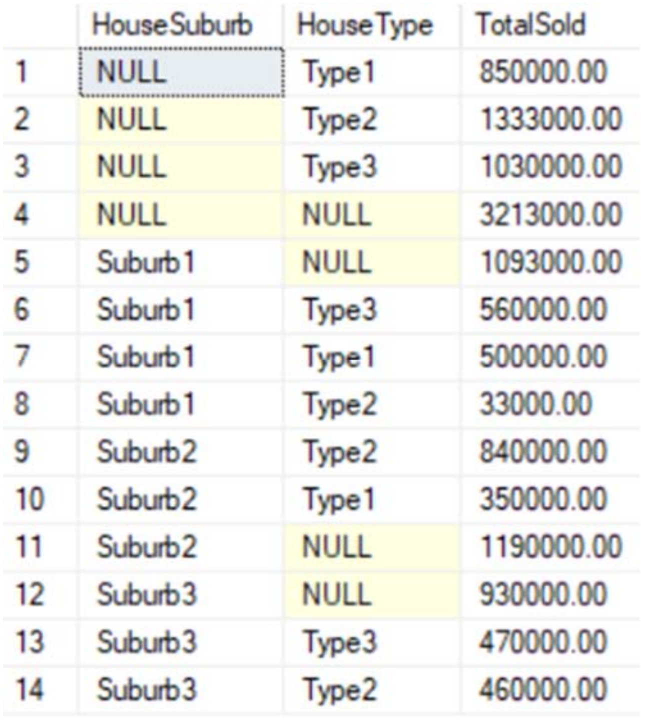
```
IF you use GROUP BY GROUPING SETS,
then the table need to be accessed 1 time.
Thus, GROUPING SETS is faster than UNION ALL 4 times of SELECT ... GROUP BY ...
1.2.
We can use Order By with GROUP BY GROUPING SETS.
But we cannot use use Order By with Union ALL.
1.3.
The following clauses are equivalent:
E.g.1.
--GROUP BY GROUPING SETS(
--                        ( HouseSuburb ,
--                          HouseType
--                        ), -- Sum of SoldPrice by HouseSuburb and HouseType
--                        ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
--                        ( HouseType ), -- Sum of SoldPrice by HouseType
--                        ( )-- Grand Total Sold
--      );
E.g.2.
--Group By (HouseSuburb, HouseType, ...)
--Union ALL
--Group By (HouseSuburb)
--Union ALL
--Group By (HouseType)
--Union ALL
--Group By ()
*/
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | NULL | Type1 | 850000.00 |
| 4 | Suburb1 | Type2 | 33000.00 |
| 5 | Suburb2 | Type2 | 840000.00 |
| 6 | Suburb3 | Type2 | 460000.00 |
| 7 | NULL | Type2 | 1333000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | NULL | Type3 | 1030000.00 |
| 11 | NULL | NULL | 3213000.00 |
| 12 | Suburb1 | NULL | 1093000.00 |
| 13 | Suburb2 | NULL | 1190000.00 |
| 14 | Suburb3 | NULL | 930000.00 |

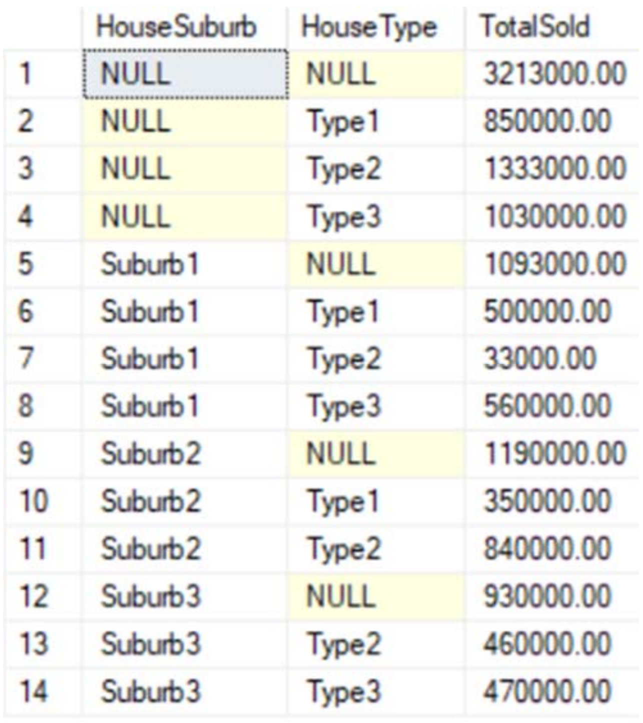
```
--------------------------------------------------------------------------
--T032_01_03_02
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                      ( HouseSuburb ,
                        HouseType
                      ), -- Sum of SoldPrice by HouseSuburb and HouseType
                      ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                      ( HouseType ), -- Sum of SoldPrice by HouseType
                      ( )-- Grand Total Sold
```

```
      )
ORDER BY HouseSuburb;
GO -- Run the previous command and begins new batch
```



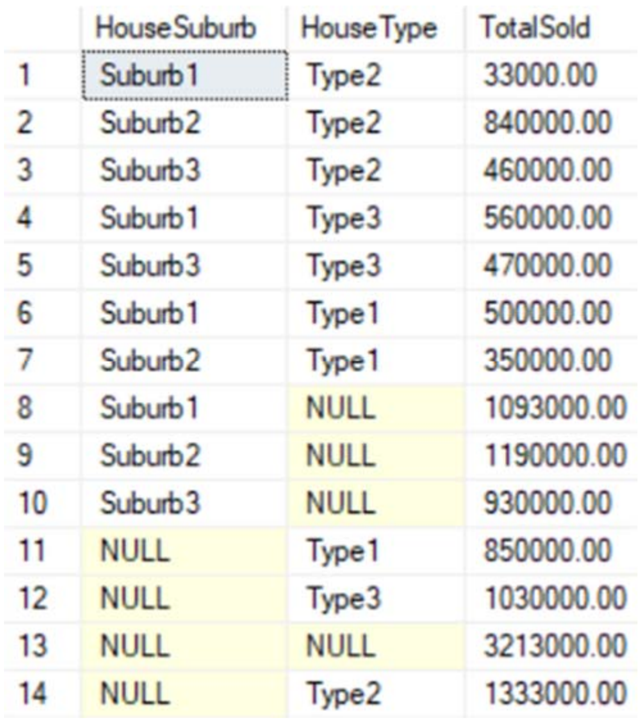
|  | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | NULL | Type1 | 850000.00 |
| 2 | NULL | Type2 | 1333000.00 |
| 3 | NULL | Type3 | 1030000.00 |
| 4 | NULL | NULL | 3213000.00 |
| 5 | Suburb1 | NULL | 1093000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb1 | Type1 | 500000.00 |
| 8 | Suburb1 | Type2 | 33000.00 |
| 9 | Suburb2 | Type2 | 840000.00 |
| 10 | Suburb2 | Type1 | 350000.00 |
| 11 | Suburb2 | NULL | 1190000.00 |
| 12 | Suburb3 | NULL | 930000.00 |
| 13 | Suburb3 | Type3 | 470000.00 |
| 14 | Suburb3 | Type2 | 460000.00 |

```
--------------------------------------------------------------------------
--T032_01_03_03
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                        ( HouseSuburb ,
                          HouseType
                        ), -- Sum of SoldPrice by HouseSuburb and HouseType
                        ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                        ( HouseType ), -- Sum of SoldPrice by HouseType
                        ( )-- Grand Total Sold
      )
ORDER BY HouseSuburb ,
        HouseType;
GO -- Run the previous command and begins new batch
```



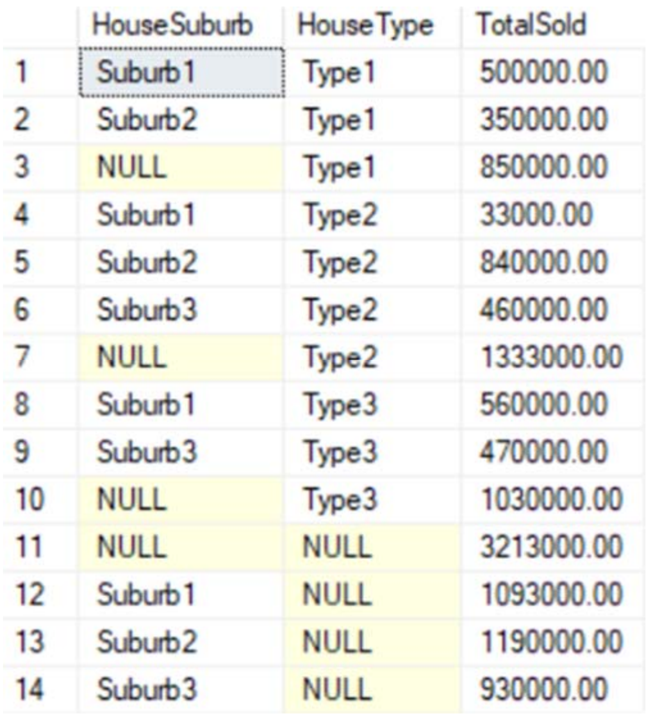
| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | NULL | NULL | 3213000.00 |
| 2 | NULL | Type1 | 850000.00 |
| 3 | NULL | Type2 | 1333000.00 |
| 4 | NULL | Type3 | 1030000.00 |
| 5 | Suburb1 | NULL | 1093000.00 |
| 6 | Suburb1 | Type1 | 500000.00 |
| 7 | Suburb1 | Type2 | 33000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb2 | Type1 | 350000.00 |
| 11 | Suburb2 | Type2 | 840000.00 |
| 12 | Suburb3 | NULL | 930000.00 |
| 13 | Suburb3 | Type2 | 460000.00 |
| 14 | Suburb3 | Type3 | 470000.00 |

```
--------------------------------------------------------------------------
--T032_01_03_04
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                      ( HouseSuburb ,
                        HouseType
                      ), -- Sum of SoldPrice by HouseSuburb and HouseType
                      ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                      ( HouseType ), -- Sum of SoldPrice by HouseType
                      ( )-- Grand Total Sold
      )
ORDER BY GROUPING(HouseSuburb);
GO -- Run the previous command and begins new batch
```



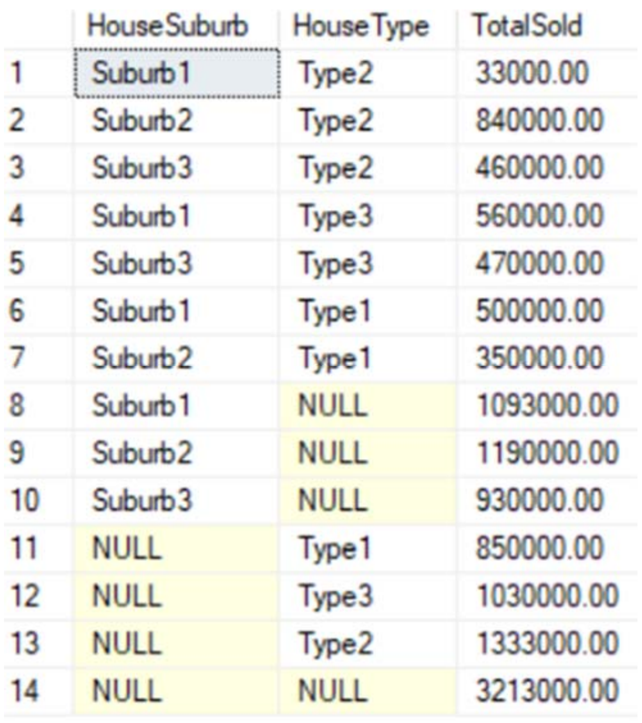
| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type2 | 33000.00 |
| 2 | Suburb2 | Type2 | 840000.00 |
| 3 | Suburb3 | Type2 | 460000.00 |
| 4 | Suburb1 | Type3 | 560000.00 |
| 5 | Suburb3 | Type3 | 470000.00 |
| 6 | Suburb1 | Type1 | 500000.00 |
| 7 | Suburb2 | Type1 | 350000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type3 | 1030000.00 |
| 13 | NULL | NULL | 3213000.00 |
| 14 | NULL | Type2 | 1333000.00 |

```
--------------------------------------------------------------------------
--T032_01_03_05
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                      ( HouseSuburb ,
                        HouseType
                      ), -- Sum of SoldPrice by HouseSuburb and HouseType
                      ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                      ( HouseType ), -- Sum of SoldPrice by HouseType
                      ( )-- Grand Total Sold
      )
ORDER BY GROUPING(HouseType);
GO -- Run the previous command and begins new batch
```



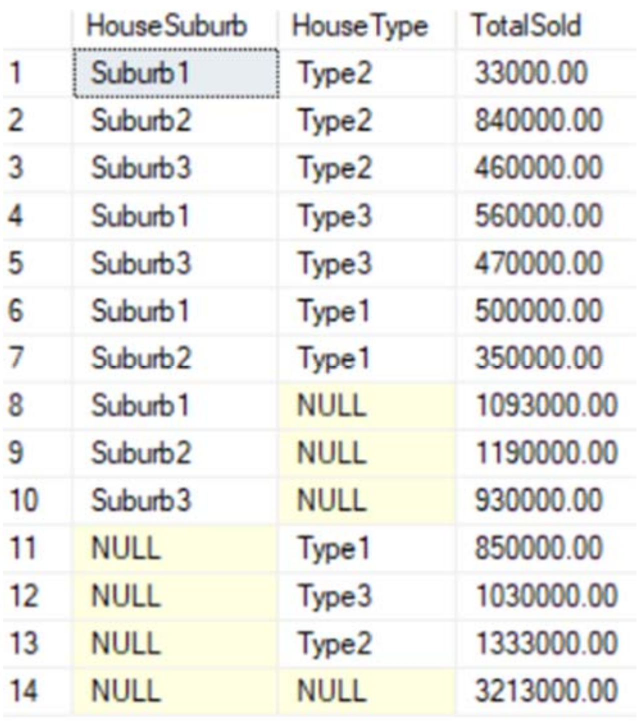
|  | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | NULL | Type1 | 850000.00 |
| 4 | Suburb1 | Type2 | 33000.00 |
| 5 | Suburb2 | Type2 | 840000.00 |
| 6 | Suburb3 | Type2 | 460000.00 |
| 7 | NULL | Type2 | 1333000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | NULL | Type3 | 1030000.00 |
| 11 | NULL | NULL | 3213000.00 |
| 12 | Suburb1 | NULL | 1093000.00 |
| 13 | Suburb2 | NULL | 1190000.00 |
| 14 | Suburb3 | NULL | 930000.00 |

```
-------------------------------------------------------------------------
--T032_01_03_06
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                      ( HouseSuburb ,
                        HouseType
                      ), -- Sum of SoldPrice by HouseSuburb and HouseType
                      ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                      ( HouseType ), -- Sum of SoldPrice by HouseType
                      ( )-- Grand Total Sold
     )
ORDER BY GROUPING(HouseSuburb) ,
       GROUPING(HouseType);
GO -- Run the previous command and begins new batch
```



|    | HouseSuburb | HouseType | TotalSold |
|----|-------------|-----------|-----------|
| 1  | Suburb1 | Type2 | 33000.00 |
| 2  | Suburb2 | Type2 | 840000.00 |
| 3  | Suburb3 | Type2 | 460000.00 |
| 4  | Suburb1 | Type3 | 560000.00 |
| 5  | Suburb3 | Type3 | 470000.00 |
| 6  | Suburb1 | Type1 | 500000.00 |
| 7  | Suburb2 | Type1 | 350000.00 |
| 8  | Suburb1 | NULL | 1093000.00 |
| 9  | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type3 | 1030000.00 |
| 13 | NULL | Type2 | 1333000.00 |
| 14 | NULL | NULL | 3213000.00 |

```
--------------------------------------------------------------------------------
--T032_01_03_07
--Group BY GROUPING SETS ...ORDER BY ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    dbo.HouseSold
GROUP BY GROUPING SETS(
                       ( HouseSuburb ,
                         HouseType
                       ), -- Sum of SoldPrice by HouseSuburb and HouseType
                       ( HouseSuburb ), -- Sum of SoldPrice by HouseSuburb
                       ( HouseType ), -- Sum of SoldPrice by HouseType
                       ( )-- Grand Total Sold
      )
ORDER BY GROUPING(HouseSuburb) ,
        GROUPING(HouseType) ,
        HouseType;
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type2 | 33000.00 |
| 2 | Suburb2 | Type2 | 840000.00 |
| 3 | Suburb3 | Type2 | 460000.00 |
| 4 | Suburb1 | Type3 | 560000.00 |
| 5 | Suburb3 | Type3 | 470000.00 |
| 6 | Suburb1 | Type1 | 500000.00 |
| 7 | Suburb2 | Type1 | 350000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type3 | 1030000.00 |
| 13 | NULL | Type2 | 1333000.00 |
| 14 | NULL | NULL | 3213000.00 |

## 1.4. Clean up

```
--==========================================================================
--T032_01_04
--Clean up
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
```

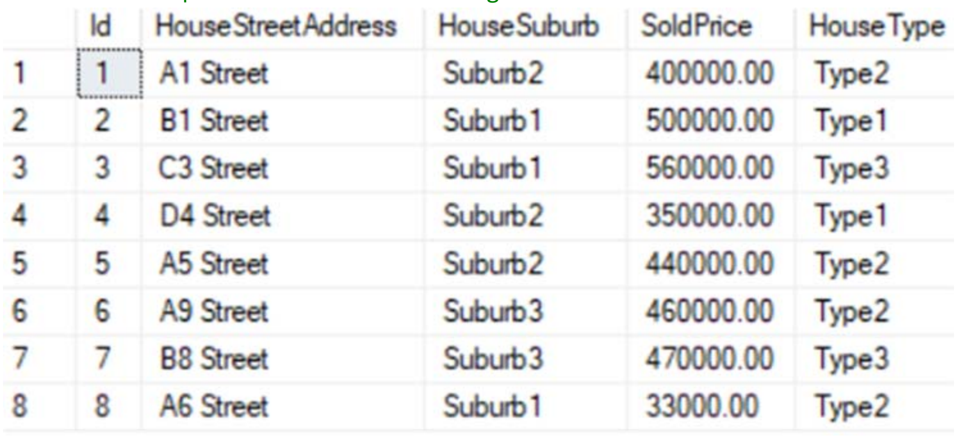
# 2. Rollup

```
--==========================================================================
--T032_02_Rollup
--==========================================================================
/*
1.
--GROUP BY ROLLUP (C1, C2, ..., Cn-1, Cn)
or
--GROUP BY C1, C2, ..., Cn-1, Cn WITH ROLLUP
ROLLUP do aggregate operation on multiple levels in hierarchy.
The following clauses are equivalent:
1.1.
--GROUP BY ROLLUP (C1, C2, C3)
1.2.
--GROUP BY C1, C2, C3 WITH ROLLUP
1.3.
--GROUP BY GROUPING SETS (
--     ,(C1, C2, C3)
--     ,(C1, C2)
--     ,(C1)
--     ,() )
```

```
*/
```

## 2.1. Create Sample data

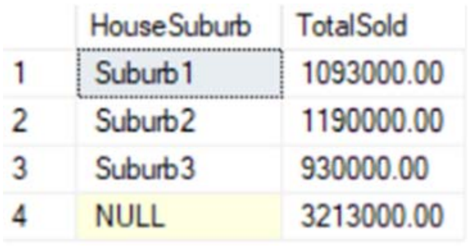
```
--===========================================================================
--T032_02_01
--Create Sample data
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', 560000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', 350000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb2', 440000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'A9 Street', N'Suburb3', 460000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', 470000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', 33000, N'Type2' );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
GO -- Run the previous command and begins new batch
```



| | Id | HouseStreetAddress | HouseSuburb | SoldPrice | HouseType |
|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | 560000.00 | Type3 |
| 4 | 4 | D4 Street | Suburb2 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb2 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb3 | 460000.00 | Type2 |
| 7 | 7 | B8 Street | Suburb3 | 470000.00 | Type3 |
| 8 | 8 | A6 Street | Suburb1 | 33000.00 | Type2 |

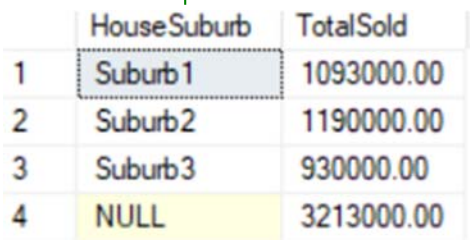
## 2.2. GROUP BY ROLLUP(C1,C2,...)

```
--===========================================================================
--T032_02_02
--GROUP BY ROLLUP(C1,C2,...)
--The following clauses are equivalent.
---------------------------------------------------------------------------
--T032_02_02_01
-- ... UNION ALL ...
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb
UNION ALL
SELECT  NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold;
GO -- Run the previous command and begins new batch
```



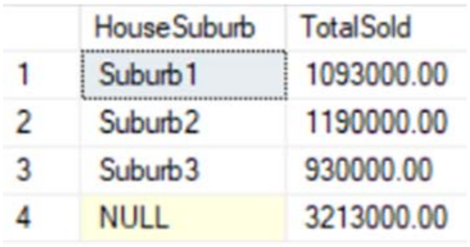
| | HouseSuburb | TotalSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

```
---------------------------------------------------------------------------
--T032_02_02_02
-- GROUP BY GROUPING SETS (...)
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY GROUPING SETS(( HouseSuburb ), ( ));
GO -- Run the previous command and begins new batch
```



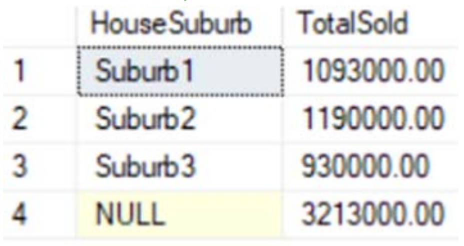
| | HouseSuburb | TotalSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

```
---------------------------------------------------------------------------
--T032_02_02_03
-- GROUP BY ROLLUP(C1,C2,...)
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY ROLLUP(HouseSuburb);
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | TotalSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

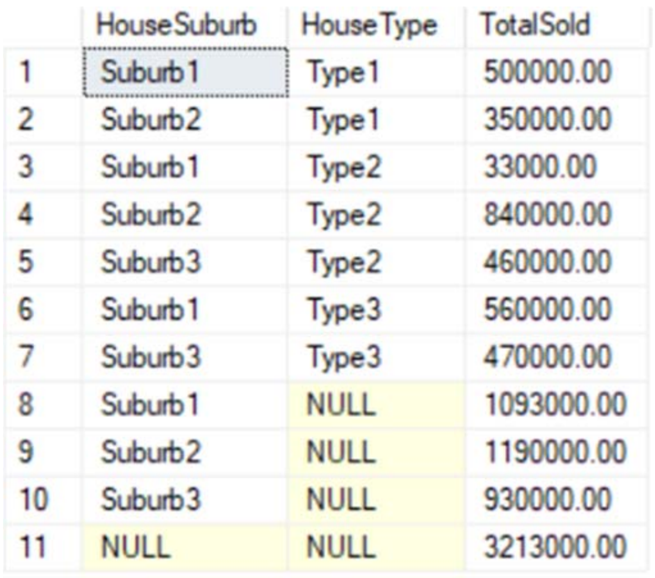
```
--------------------------------------------------------------------------
--T032_02_02_04
-- GROUP BY (C1,C2...) WITH ROLLUP
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb
        WITH ROLLUP;
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | TotalSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

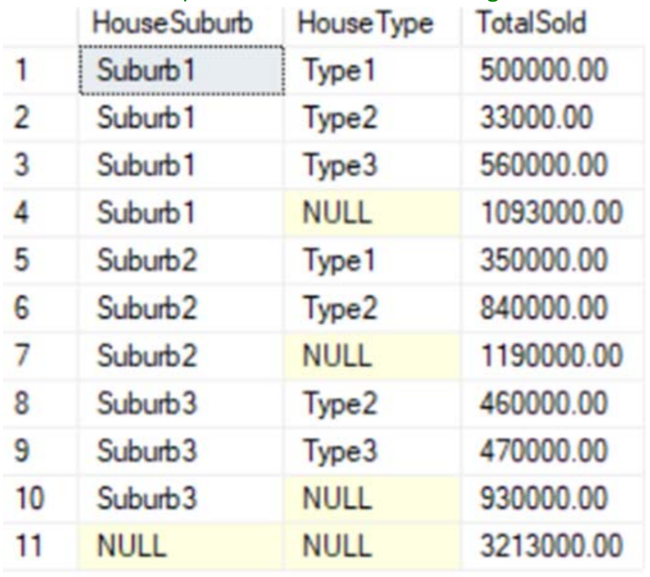
## 2.3. GROUP BY ROLLUP(C1,C2,...)

```
--========================================================================
--T032_02_03
--GROUP BY ROLLUP(C1,C2,...)
--The following clauses are equivalent.
--------------------------------------------------------------------------
--T032_02_03_01
-- ... UNION ALL ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb ,
        HouseType
UNION ALL
SELECT  HouseSuburb ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb
UNION ALL
SELECT  NULL ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold;
GO -- Run the previous command and begins new batch
```



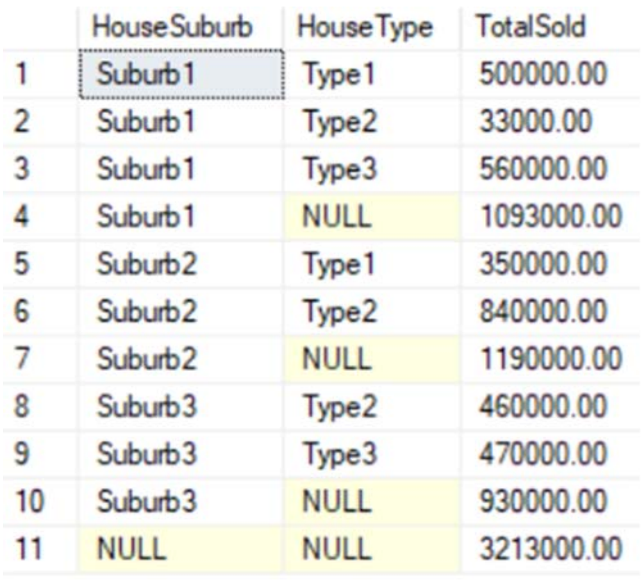
|    | HouseSuburb | HouseType | TotalSold |
|----|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | NULL | 3213000.00 |

```
-------------------------------------------------------------------------
--T032_02_03_02
-- GROUP BY GROUPING SETS (...)
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY GROUPING SETS(
                        ( HouseSuburb ,
                          HouseType
                        ), ( HouseSuburb ), ( ));
GO -- Run the previous command and begins new batch
```



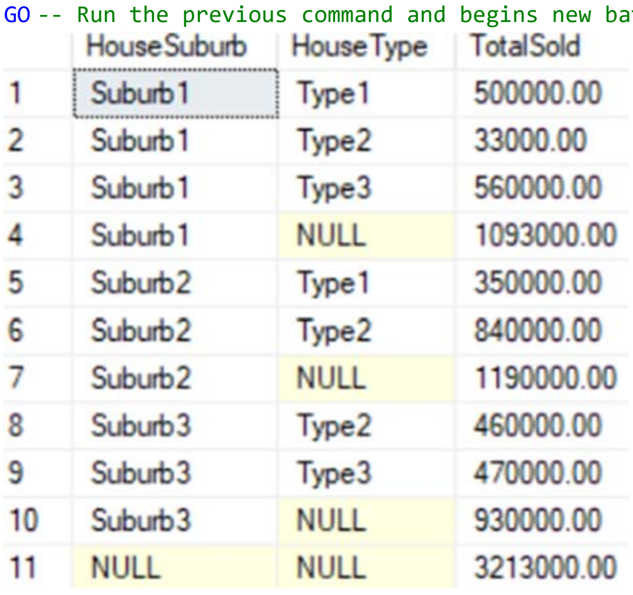
|    | HouseSuburb | HouseType | TotalSold |
|----|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb1 | Type2 | 33000.00 |
| 3 | Suburb1 | Type3 | 560000.00 |
| 4 | Suburb1 | NULL | 1093000.00 |
| 5 | Suburb2 | Type1 | 350000.00 |
| 6 | Suburb2 | Type2 | 840000.00 |
| 7 | Suburb2 | NULL | 1190000.00 |
| 8 | Suburb3 | Type2 | 460000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | NULL | 3213000.00 |

```
-------------------------------------------------------------------------
--T032_02_03_03
-- GROUP BY ROLLUP(C1,C2,...)
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY ROLLUP(HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
```



|  | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb1 | Type2 | 33000.00 |
| 3 | Suburb1 | Type3 | 560000.00 |
| 4 | Suburb1 | NULL | 1093000.00 |
| 5 | Suburb2 | Type1 | 350000.00 |
| 6 | Suburb2 | Type2 | 840000.00 |
| 7 | Suburb2 | NULL | 1190000.00 |
| 8 | Suburb3 | Type2 | 460000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | NULL | 3213000.00 |

```
---------------------------------------------------------------------------
--T032_02_03_04
-- GROUP BY (C1,C2...) WITH ROLLUP
SELECT  HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb ,
        HouseType
       WITH ROLLUP;
GO -- Run the previous command and begins new batch
```



|  | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb1 | Type2 | 33000.00 |
| 3 | Suburb1 | Type3 | 560000.00 |
| 4 | Suburb1 | NULL | 1093000.00 |
| 5 | Suburb2 | Type1 | 350000.00 |
| 6 | Suburb2 | Type2 | 840000.00 |
| 7 | Suburb2 | NULL | 1190000.00 |
| 8 | Suburb3 | Type2 | 460000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | NULL | 3213000.00 |

## 2.4. Clean up

```
--===========================================================================
--T032_02_04
--Clean up
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
```

```
GO -- Run the previous command and begins new batch
================================================
```

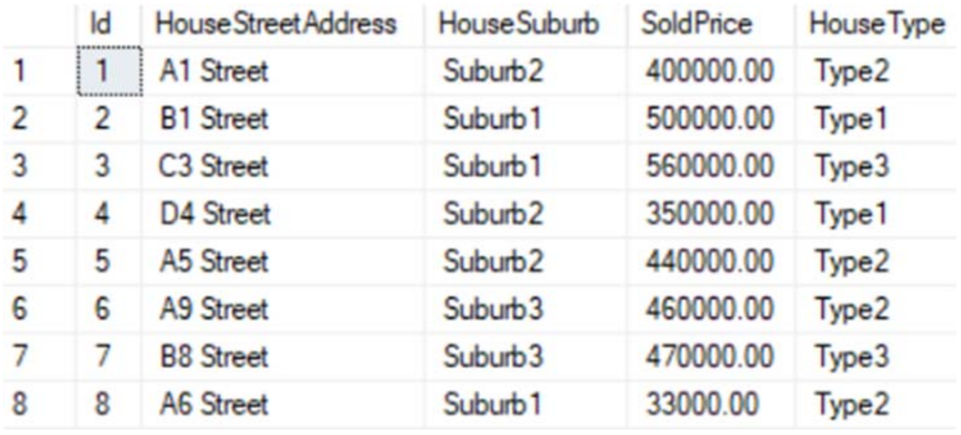
## 3. Cube

```
--==================================================================
--T032_03_Cube
--==================================================================
/*
1.
--GROUP BY CUBE (C1, C2, ..., Cn-1, Cn)
or
--GROUP BY C1, C2, ..., Cn-1, Cn WITH CUBE
CUBE produces the result set
by generating all combinations of columns
specified in GROUP BY CUBE().
The following clauses are equivalent:
1.1.
--GROUP BY CUBE (C1, C2, C3)
1.2.
--GROUP BY GROUPING SETS (
--    (C1, C2, C3)
--    ,(C1, C2)
--    ,(C1, C3)
--    ,(C2, C3)
--    ,(C1)
--    ,(C2)
--    ,(C3)
--    ,() )
*/
```

### 3.1. Create Sample data

```
--==================================================================
--T032_03_01
--Create Sample data
--If Table exists then DROP it
IF ( EXISTS ( SELECT   *
              FROM     INFORMATION_SCHEMA.TABLES
              WHERE    TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', 560000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', 350000, N'Type1' );
```

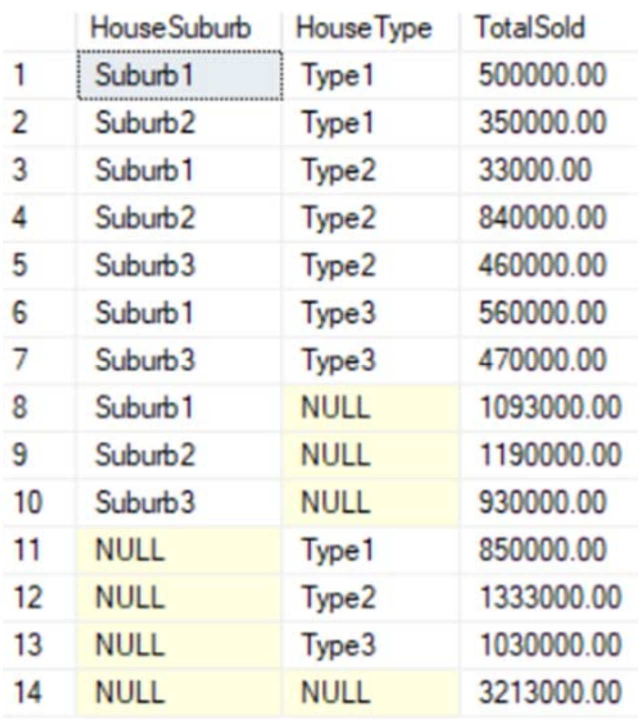
```
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb2', 440000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'A9 Street', N'Suburb3', 460000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', 470000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', 33000, N'Type2' );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
GO -- Run the previous command and begins new batch
```



| | Id | HouseStreetAddress | HouseSuburb | SoldPrice | HouseType |
|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | 560000.00 | Type3 |
| 4 | 4 | D4 Street | Suburb2 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb2 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb3 | 460000.00 | Type2 |
| 7 | 7 | B8 Street | Suburb3 | 470000.00 | Type3 |
| 8 | 8 | A6 Street | Suburb1 | 33000.00 | Type2 |

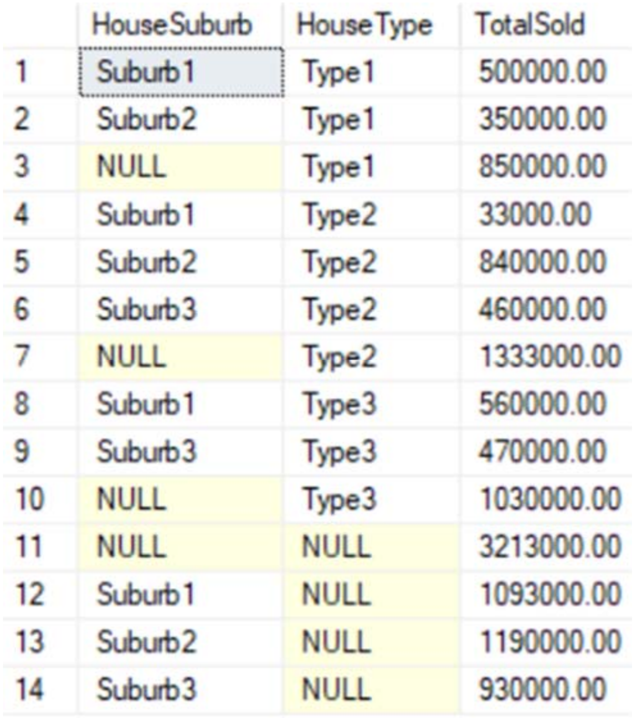
## 3.2. GROUP BY CUBE (C1, C2, ..., Cn-1, Cn)

```
--==========================================================================
--T032_03_02
--GROUP BY CUBE (C1, C2, ..., Cn-1, Cn)
---------------------------------------------------------------------------
--T032_03_02_01
-- ... UNION ALL ...
SELECT  HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb ,
        HouseType
UNION ALL
SELECT  HouseSuburb ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseSuburb
UNION ALL
SELECT  NULL ,
        HouseType ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY HouseType
UNION ALL
SELECT  NULL ,
        NULL ,
        SUM(SoldPrice) AS TotalSold
FROM    HouseSold;
GO -- Run the previous command and begins new batch
```



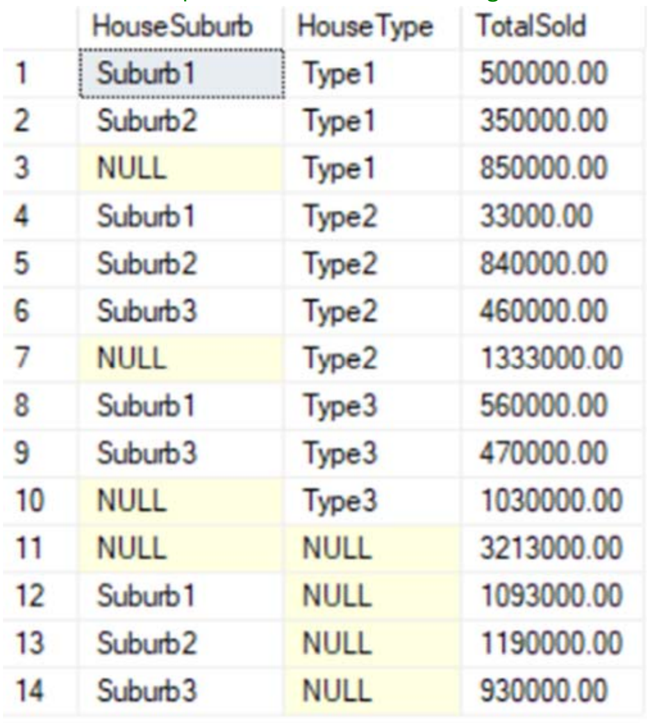
| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | Suburb1 | Type2 | 33000.00 |
| 4 | Suburb2 | Type2 | 840000.00 |
| 5 | Suburb3 | Type2 | 460000.00 |
| 6 | Suburb1 | Type3 | 560000.00 |
| 7 | Suburb3 | Type3 | 470000.00 |
| 8 | Suburb1 | NULL | 1093000.00 |
| 9 | Suburb2 | NULL | 1190000.00 |
| 10 | Suburb3 | NULL | 930000.00 |
| 11 | NULL | Type1 | 850000.00 |
| 12 | NULL | Type2 | 1333000.00 |
| 13 | NULL | Type3 | 1030000.00 |
| 14 | NULL | NULL | 3213000.00 |

```
--------------------------------------------------------------------------
--T032_03_02_02
-- GROUP BY GROUPING SETS (...)
SELECT  HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotalSold
FROM    HouseSold
GROUP BY GROUPING SETS(
                            ( HouseSuburb ,
                              HouseType
                            ), ( HouseSuburb ), ( HouseType ), ( ));
GO -- Run the previous command and begins new batch
```



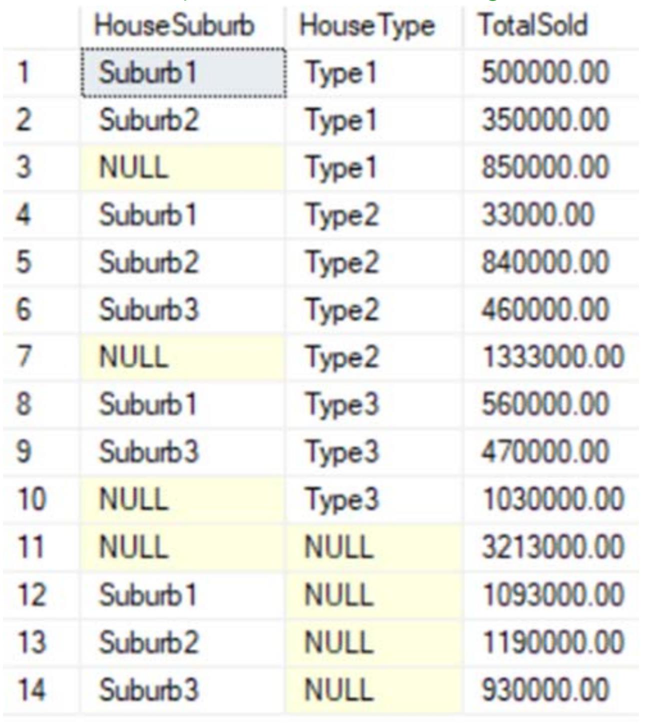
| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | NULL | Type1 | 850000.00 |
| 4 | Suburb1 | Type2 | 33000.00 |
| 5 | Suburb2 | Type2 | 840000.00 |
| 6 | Suburb3 | Type2 | 460000.00 |
| 7 | NULL | Type2 | 1333000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | NULL | Type3 | 1030000.00 |
| 11 | NULL | NULL | 3213000.00 |
| 12 | Suburb1 | NULL | 1093000.00 |
| 13 | Suburb2 | NULL | 1190000.00 |
| 14 | Suburb3 | NULL | 930000.00 |

```
--------------------------------------------------------------------------
--T032_03_02_03
-- GROUP BY CUBE(C1,C2,...)
SELECT  HouseSuburb ,
         HouseType ,
         SUM(SoldPrice) AS TotalSold
FROM     HouseSold
GROUP BY CUBE(HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | NULL | Type1 | 850000.00 |
| 4 | Suburb1 | Type2 | 33000.00 |
| 5 | Suburb2 | Type2 | 840000.00 |
| 6 | Suburb3 | Type2 | 460000.00 |
| 7 | NULL | Type2 | 1333000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | NULL | Type3 | 1030000.00 |
| 11 | NULL | NULL | 3213000.00 |
| 12 | Suburb1 | NULL | 1093000.00 |
| 13 | Suburb2 | NULL | 1190000.00 |
| 14 | Suburb3 | NULL | 930000.00 |

```
--------------------------------------------------------------------------------
--T032_03_02_04
-- GROUP BY (C1,C2...) WITH CUBE
SELECT   HouseSuburb ,
         HouseType ,
         SUM(SoldPrice) AS TotalSold
FROM     HouseSold
GROUP BY HouseSuburb ,
         HouseType
         WITH CUBE;
GO -- Run the previous command and begins new batch
```



| | HouseSuburb | HouseType | TotalSold |
|---|---|---|---|
| 1 | Suburb1 | Type1 | 500000.00 |
| 2 | Suburb2 | Type1 | 350000.00 |
| 3 | NULL | Type1 | 850000.00 |
| 4 | Suburb1 | Type2 | 33000.00 |
| 5 | Suburb2 | Type2 | 840000.00 |
| 6 | Suburb3 | Type2 | 460000.00 |
| 7 | NULL | Type2 | 1333000.00 |
| 8 | Suburb1 | Type3 | 560000.00 |
| 9 | Suburb3 | Type3 | 470000.00 |
| 10 | NULL | Type3 | 1030000.00 |
| 11 | NULL | NULL | 3213000.00 |
| 12 | Suburb1 | NULL | 1093000.00 |
| 13 | Suburb2 | NULL | 1190000.00 |
| 14 | Suburb3 | NULL | 930000.00 |

## 3.3. Clean up

```
--==========================================================================
--T032_03_03
--Clean up
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
```

=================================================

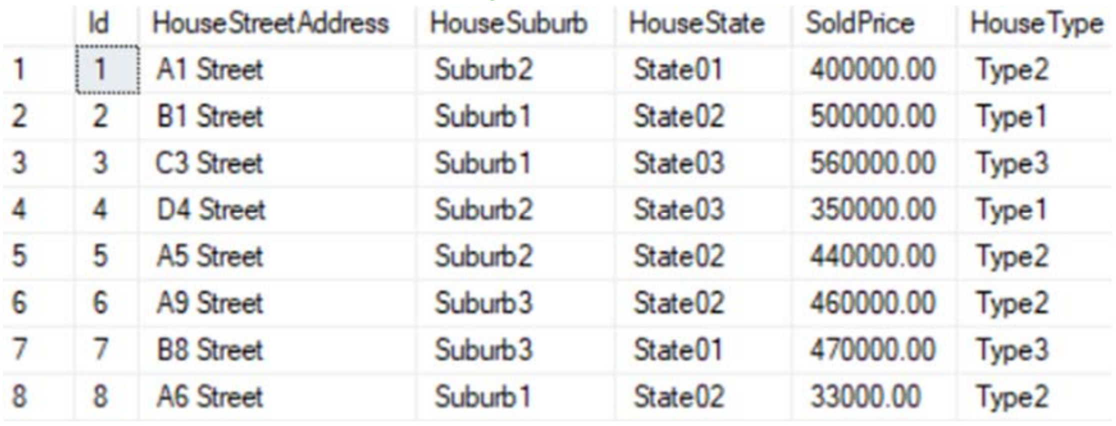
# 4. Cube V.S. Rollup

```
--==========================================================================
--T032_04_Cube V.S. Rollup
--==========================================================================
```

## 4.1. Create Sample data

```
--==========================================================================
--T032_04_01
--Create Sample data
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
        PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  HouseState NVARCHAR(50) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', N'State01', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', N'State02', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', N'State03', 560000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', N'State03', 350000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb2', N'State02', 440000, N'Type2' );
INSERT  dbo.HouseSold
```

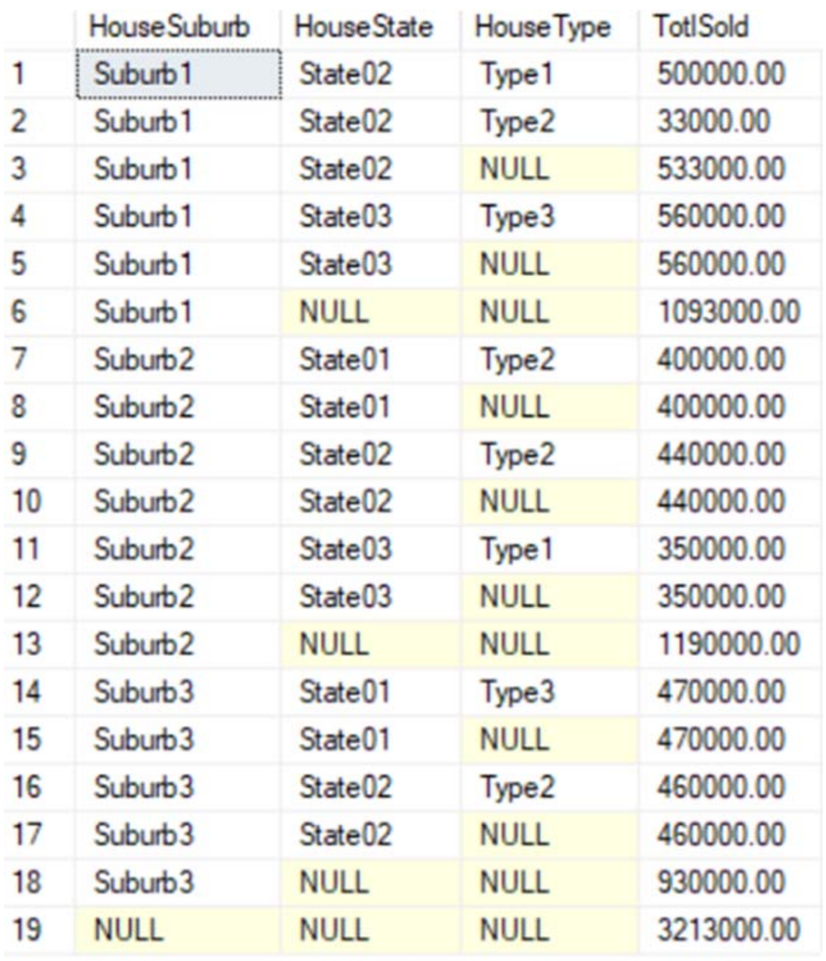
```
VALUES  ( N'A9 Street', N'Suburb3', N'State02', 460000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', N'State01', 470000, N'Type3' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', N'State02', 33000, N'Type2' );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
GO -- Run the previous command and begins new batch
```



|  | Id | HouseStreetAddress | HouseSuburb | HouseState | SoldPrice | HouseType |
|---|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | State01 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | State02 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | State03 | 560000.00 | Type3 |
| 4 | 4 | D4 Street | Suburb2 | State03 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb2 | State02 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb3 | State02 | 460000.00 | Type2 |
| 7 | 7 | B8 Street | Suburb3 | State01 | 470000.00 | Type3 |
| 8 | 8 | A6 Street | Suburb1 | State02 | 33000.00 | Type2 |

## 4.2. GROUP BY ROLLUP(C1,C2,...)

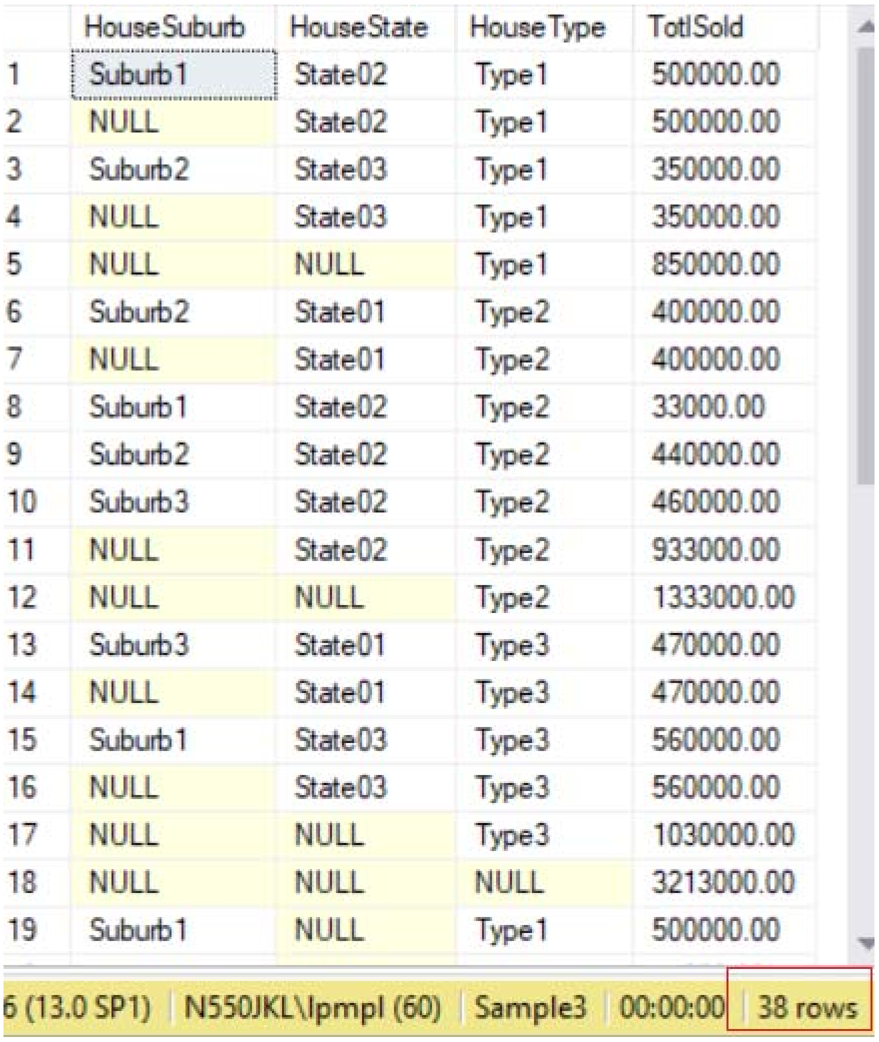
```
--=========================================================================
--T032_04_02
--GROUP BY ROLLUP(C1,C2,...)
SELECT  HouseSuburb ,
        HouseState ,
        HouseType ,
        SUM(SoldPrice) AS TotlSold
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseSuburb, HouseState, HouseType);
--GROUP BY HouseSuburb, HouseState, HouseType  WITH ROLLUP;
GO -- Run the previous command and begins new batch
/*
Output as the following
--HouseSuburb, HouseState, HouseType
--HouseSuburb, HouseState,
--HouseSuburb
--()
*/
```



| | HouseSuburb | HouseState | HouseType | TotlSold |
|---|---|---|---|---|
| 1 | Suburb1 | State02 | Type1 | 500000.00 |
| 2 | Suburb1 | State02 | Type2 | 33000.00 |
| 3 | Suburb1 | State02 | NULL | 533000.00 |
| 4 | Suburb1 | State03 | Type3 | 560000.00 |
| 5 | Suburb1 | State03 | NULL | 560000.00 |
| 6 | Suburb1 | NULL | NULL | 1093000.00 |
| 7 | Suburb2 | State01 | Type2 | 400000.00 |
| 8 | Suburb2 | State01 | NULL | 400000.00 |
| 9 | Suburb2 | State02 | Type2 | 440000.00 |
| 10 | Suburb2 | State02 | NULL | 440000.00 |
| 11 | Suburb2 | State03 | Type1 | 350000.00 |
| 12 | Suburb2 | State03 | NULL | 350000.00 |
| 13 | Suburb2 | NULL | NULL | 1190000.00 |
| 14 | Suburb3 | State01 | Type3 | 470000.00 |
| 15 | Suburb3 | State01 | NULL | 470000.00 |
| 16 | Suburb3 | State02 | Type2 | 460000.00 |
| 17 | Suburb3 | State02 | NULL | 460000.00 |
| 18 | Suburb3 | NULL | NULL | 930000.00 |
| 19 | NULL | NULL | NULL | 3213000.00 |

## 4.3. GROUP BY CUBE(C1,C2,...)

```
--=========================================================================
--T032_04_03
--GROUP BY CUBE(C1,C2,...)
SELECT  HouseSuburb ,
        HouseState ,
        HouseType ,
        SUM(SoldPrice) AS TotlSold
FROM    dbo.HouseSold
GROUP BY CUBE(HouseSuburb, HouseState, HouseType);
--GROUP BY HouseSuburb, HouseState, HouseType  WITH CUBE;
GO -- Run the previous command and begins new batch
/*
Output as the following
--HouseSuburb, HouseState, HouseType
--HouseSuburb, HouseState,
--HouseSuburb, HouseType
--HouseSuburb
--HouseSuburb, HouseType
--HouseState,
--City
--()
*/
```

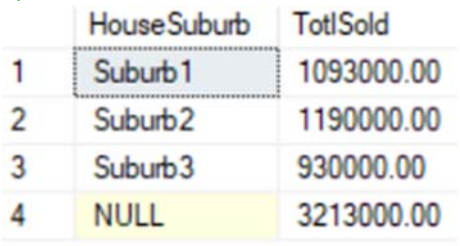


| | HouseSuburb | HouseState | HouseType | TotlSold |
|---|---|---|---|---|
| 1 | Suburb1 | State02 | Type1 | 500000.00 |
| 2 | NULL | State02 | Type1 | 500000.00 |
| 3 | Suburb2 | State03 | Type1 | 350000.00 |
| 4 | NULL | State03 | Type1 | 350000.00 |
| 5 | NULL | NULL | Type1 | 850000.00 |
| 6 | Suburb2 | State01 | Type2 | 400000.00 |
| 7 | NULL | State01 | Type2 | 400000.00 |
| 8 | Suburb1 | State02 | Type2 | 33000.00 |
| 9 | Suburb2 | State02 | Type2 | 440000.00 |
| 10 | Suburb3 | State02 | Type2 | 460000.00 |
| 11 | NULL | State02 | Type2 | 933000.00 |
| 12 | NULL | NULL | Type2 | 1333000.00 |
| 13 | Suburb3 | State01 | Type3 | 470000.00 |
| 14 | NULL | State01 | Type3 | 470000.00 |
| 15 | Suburb1 | State03 | Type3 | 560000.00 |
| 16 | NULL | State03 | Type3 | 560000.00 |
| 17 | NULL | NULL | Type3 | 1030000.00 |
| 18 | NULL | NULL | NULL | 3213000.00 |
| 19 | Suburb1 | NULL | Type1 | 500000.00 |

6 (13.0 SP1) | N550JKL\lpmpl (60) | Sample3 | 00:00:00 | 38 rows

## 4.4. ROLLUP and CUBE on a single column is no different.

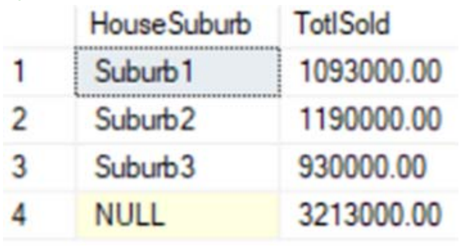
```
--=========================================================================
--T032_04_04
--ROLLUP and CUBE on a single column is no different.
---------------------------------------------------------------------------
--T032_04_04_01
-- GROUP BY ROLLUP(C1,C2,...)
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotlSold
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseSuburb);
--GROUP BY HouseSuburb WITH ROLLUP;
GO -- Run the previous command and begins new batch
/*
Output as the following
--HouseSuburb
--()
*/
```



| | HouseSuburb | TotlSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

```
---------------------------------------------------------------------------
--T032_04_04_02
```

```
-- GROUP BY CUBE(C1,C2,...)
SELECT  HouseSuburb ,
        SUM(SoldPrice) AS TotlSold
FROM    dbo.HouseSold
GROUP BY CUBE(HouseSuburb);
--GROUP BY HouseSuburb WITH CUBE;
GO -- Run the previous command and begins new batch
/*
Output as the following
--HouseSuburb
--()
*/
```



| | HouseSuburb | TotlSold |
|---|---|---|
| 1 | Suburb1 | 1093000.00 |
| 2 | Suburb2 | 1190000.00 |
| 3 | Suburb3 | 930000.00 |
| 4 | NULL | 3213000.00 |

## 4.5. Clean up

```
--==========================================================================
--T032_04_05
--Clean up
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
```

# 5. GroupingFunction

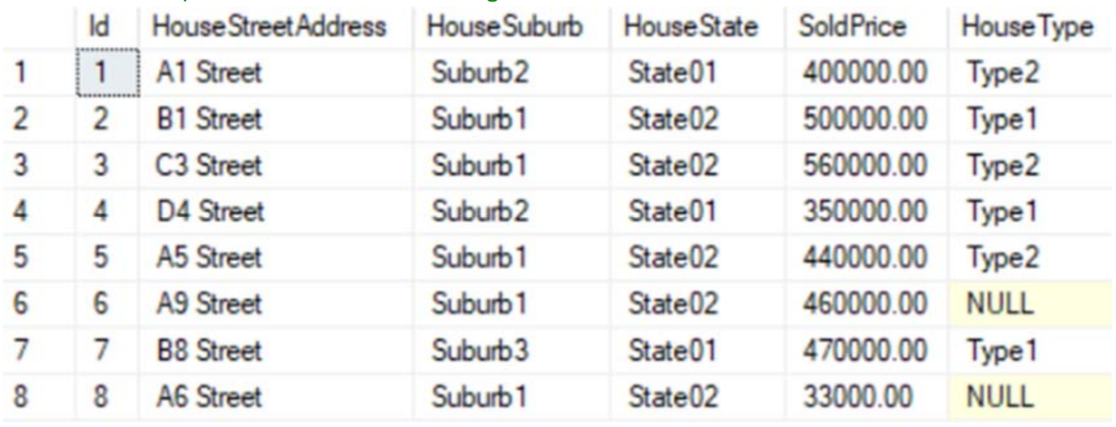
```
--==========================================================================
--T032_05_GroupingFunction
--==========================================================================
/*
1.
--Grouping(columnA)
Syntax
--SELECT  ColumnA ,
--        SUM(ColumnB) AS TotalB ,
--        GROUPING(ColumnA) AS 'GroupingColumnA'
--FROM    dbo.TableName
--GROUP BY ROLLUP(ColumnA);
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-transact-sql
https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-transact-sql
1.1.
if the columnA in a GROUP BY list is aggregated(Count, Sum, Avg, Min, Max)
then Grouping(columnA) return 1, otherwise return 0.
1.2.
When using ROLLUP, CUBE or GROUPING SETS,
the NULL returned might be normal standard null values,
or the NULL returned might be a column placeholder and means all.
```

```
1.3.
If SELECT Grouping(columnA) for that row return 0,
it means columnA in a GROUP BY list for that row is normal standard null values.
1.4.
If SELECT Grouping(columnA) for that row return 1,
it means columnA in a GROUP BY list for that row is a column placeholder
from ROLLUP, CUBE or GROUPING SETS, and it means all.
1.5.
Grouping(columnA) can be used in the
SELECT <select> list,
HAVING, and
ORDER BY clauses
when GROUP BY is specified.
*/
```

## 5.1. Create Sample data

```
--==========================================================================
--T032_05_01
--Create Sample data
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  HouseState NVARCHAR(50) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', N'State01', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', N'State02', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', N'State02', 560000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', N'State01', 350000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb1', N'State02', 440000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'A9 Street', N'Suburb1', N'State02', 460000, NULL );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', N'State01', 470000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', N'State02', 33000, NULL );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
```

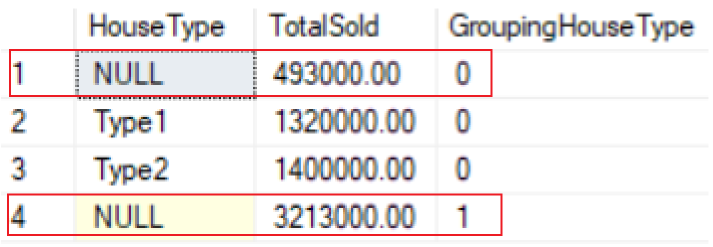
```
GO -- Run the previous command and begins new batch
```



| | Id | HouseStreetAddress | HouseSuburb | HouseState | SoldPrice | HouseType |
|---|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | State01 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | State02 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | State02 | 560000.00 | Type2 |
| 4 | 4 | D4 Street | Suburb2 | State01 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb1 | State02 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb1 | State02 | 460000.00 | NULL |
| 7 | 7 | B8 Street | Suburb3 | State01 | 470000.00 | Type1 |
| 8 | 8 | A6 Street | Suburb1 | State02 | 33000.00 | NULL |

## 5.2. Grouping(columnA)

```
--===========================================================================
--T032_05_02
--Grouping(columnA)
SELECT  HouseType ,
        SUM(SoldPrice) AS TotalSold ,
        GROUPING(HouseType) AS 'GroupingHouseType'
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseType);
--GROUP BY HouseType WITH ROLLUP;
GO -- Run the previous command and begins new batch
```



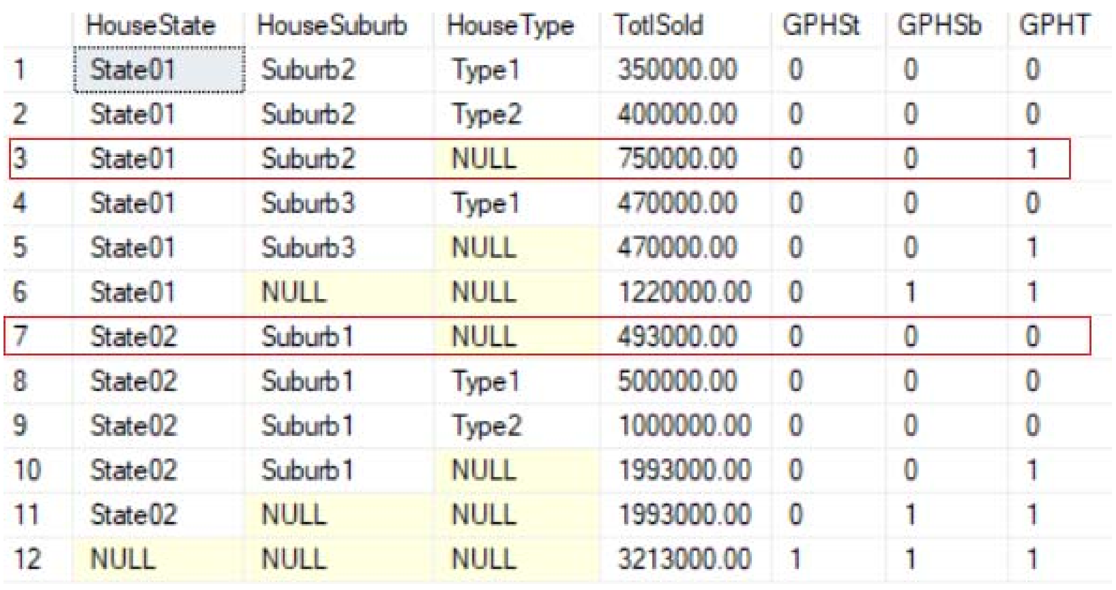
| | HouseType | TotalSold | GroupingHouseType |
|---|---|---|---|
| 1 | NULL | 493000.00 | 0 |
| 2 | Type1 | 1320000.00 | 0 |
| 3 | Type2 | 1400000.00 | 0 |
| 4 | NULL | 3213000.00 | 1 |

```
/*
1.
--Grouping(columnA)
Syntax
--SELECT  ColumnA ,
--        SUM(ColumnB) AS TotalB ,
--        GROUPING(ColumnA) AS 'GroupingColumnA'
--FROM    dbo.TableName
--GROUP BY ROLLUP(ColumnA);
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-transact-sql
https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-transact-sql
1.1.
if the columnA in a GROUP BY list is aggregated(Count, Sum, Avg, Min, Max)
then Grouping(columnA) return 1, otherwise return 0.
1.2.
When using ROLLUP, CUBE or GROUPING SETS,
the NULL returned might be normal standard null values,
or the NULL returned might be a column placeholder and means all.
1.3.
If SELECT Grouping(columnA) for that row return 0,
it means columnA in a GROUP BY list for that row is normal standard null values.
1.4.
If SELECT Grouping(columnA) for that row return 1,
it means columnA in a GROUP BY list for that row is a column placeholder
from ROLLUP, CUBE or GROUPING SETS, and it means all.
1.5.
Grouping(columnA) can be used in the
```

```
SELECT <select> list,
HAVING, and
ORDER BY clauses
when GROUP BY is specified.
2.
--SELECT  HouseType ,
--        SUM(SoldPrice) AS TotalSold ,
--        GROUPING(HouseType) AS 'GroupingHouseType'
--FROM    dbo.HouseSold
--GROUP BY ROLLUP(HouseType);
Output as following
--HouseType   TotalSold   GroupingHouseType
--NULL       493000.00         0
--Type1            1320000.00    0
--Type2            1400000.00    0
--NULL       3213000.00    1
The result set shows two NULL values under HouseType Column.
2.1.
--NULL    493000.00     0
The 1st NULL value under HouseType Column
means HouseType Column in a GROUP BY list for that row
is normal standard null values.
It represents the group of null values from the HouseType Column.
Thus, SELECT Grouping(HouseType) for that row will return 0,
2.2.
--NULL    3213000.00       1
The 2nd NULL value under HouseType Column
means HouseType Column in a GROUP BY list for that summary row is a column placeholder
from ROLLUP, CUBE or GROUPING SETS, and it means all.
Thus, SELECT Grouping(HouseType) for that row will return 1,
if the columnA in a GROUP BY list is aggregated(Count, Sum, Avg, Min, Max)
then Grouping(columnA) return 1, otherwise return 0.
*/
```

## 5.3. Grouping(columnA)

```
--==========================================================================
--T032_05_03
--Grouping(columnA)
SELECT  HouseState ,
        HouseSuburb ,
        HouseType ,
        SUM(SoldPrice) AS TotlSold ,
        GROUPING(HouseState) AS GPHSt ,
        GROUPING(HouseSuburb) AS GPHSb ,
        GROUPING(HouseType) AS GPHT
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
```



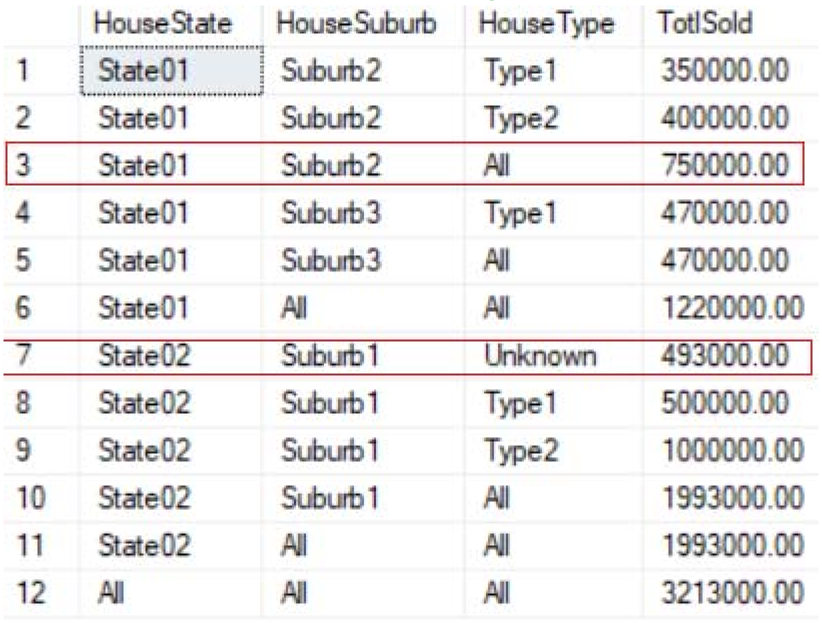
| | HouseState | HouseSuburb | HouseType | TotlSold | GPHSt | GPHSb | GPHT |
|---|---|---|---|---|---|---|---|
| 1 | State01 | Suburb2 | Type1 | 350000.00 | 0 | 0 | 0 |
| 2 | State01 | Suburb2 | Type2 | 400000.00 | 0 | 0 | 0 |
| 3 | State01 | Suburb2 | NULL | 750000.00 | 0 | 0 | 1 |
| 4 | State01 | Suburb3 | Type1 | 470000.00 | 0 | 0 | 0 |
| 5 | State01 | Suburb3 | NULL | 470000.00 | 0 | 0 | 1 |
| 6 | State01 | NULL | NULL | 1220000.00 | 0 | 1 | 1 |
| 7 | State02 | Suburb1 | NULL | 493000.00 | 0 | 0 | 0 |
| 8 | State02 | Suburb1 | Type1 | 500000.00 | 0 | 0 | 0 |
| 9 | State02 | Suburb1 | Type2 | 1000000.00 | 0 | 0 | 0 |
| 10 | State02 | Suburb1 | NULL | 1993000.00 | 0 | 0 | 1 |
| 11 | State02 | NULL | NULL | 1993000.00 | 0 | 1 | 1 |
| 12 | NULL | NULL | NULL | 3213000.00 | 1 | 1 | 1 |

```
/*
1.
Output as the following
--HouseState   HouseSuburb   HouseType   TotlSold  GPHSt  GPHSb  GPHT
--State01       Suburb2       Type1       350000.00 0         0   0
--State01       Suburb2       Type2       400000.00 0         0   0
--State01       Suburb2       NULL            750000.00    0         0   1
--State01       Suburb3       Type1       470000.00 0         0   0
--State01       Suburb3       NULL            470000.00    0         0   1
--State01       NULL              NULL        1220000.00   0         1   1
--State02       Suburb1       NULL            493000.00    0         0   0
--State02       Suburb1       Type1       500000.00 0         0   0
--State02       Suburb1       Type2       1000000.000        0   0
--State02       Suburb1       NULL            1993000.00   0       0    1
--State02       NULL              NULL        1993000.00   0         1   1
--NULL        NULL         NULL         3213000.00   1         1   1
1.1.
--State01       Suburb2       NULL            750000.00    0         0   1
GPHT=1 here means GROUPING(HouseType) for that row is aggregated
from ROLLUP, CUBE or GROUPING SETS, and it means "ALL".
1.2.
--State02       Suburb1       NULL            493000.00    0         0   0
GPHT=0 here means GROUPING(HouseType) for that row is NOT aggregated
from ROLLUP, CUBE or GROUPING SETS.
It is normally standard group of NULL value, means "Unknow"
*/
```

## 5.4. Grouping(columnA)

```
--==========================================================================
--T032_05_04
--Grouping(columnA)
----------------------------------------------------------------------------
--T032_05_04_01
--Replace Null by "ALL" if Grouping(columnA) return 1, otherwise by "Unknow"
SELECT  CASE WHEN GROUPING(HouseState) = 1 THEN 'All'
             ELSE ISNULL(HouseState, 'Unknown')
        END AS HouseState ,
        CASE WHEN GROUPING(HouseSuburb) = 1 THEN 'All'
             ELSE ISNULL(HouseSuburb, 'Unknown')
        END AS HouseSuburb ,
        CASE WHEN GROUPING(HouseType) = 1 THEN 'All'
             ELSE ISNULL(HouseType, 'Unknown')
        END AS HouseType ,
        SUM(SoldPrice) AS TotlSold
```

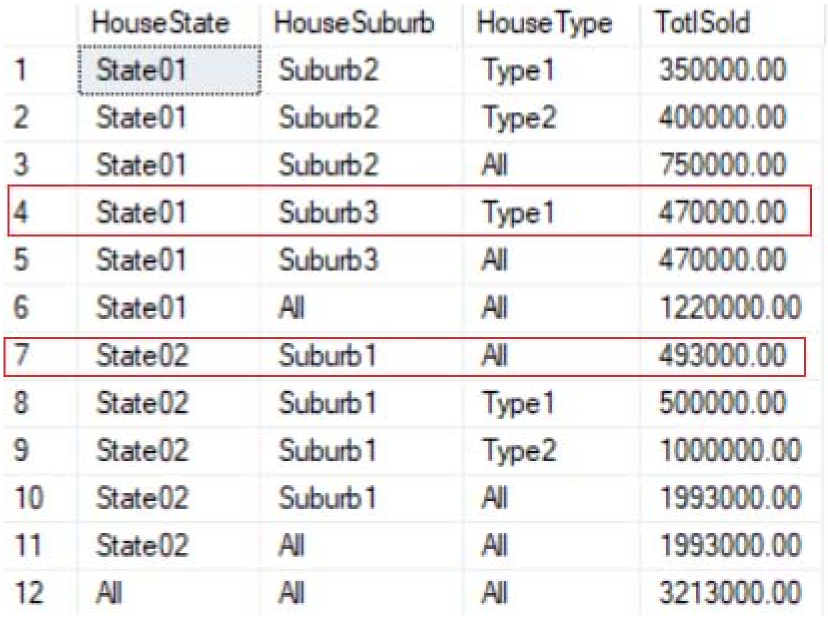
```sql
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
```



|  | HouseState | HouseSuburb | HouseType | TotlSold |
|---|---|---|---|---|
| 1 | State01 | Suburb2 | Type1 | 350000.00 |
| 2 | State01 | Suburb2 | Type2 | 400000.00 |
| 3 | State01 | Suburb2 | All | 750000.00 |
| 4 | State01 | Suburb3 | Type1 | 470000.00 |
| 5 | State01 | Suburb3 | All | 470000.00 |
| 6 | State01 | All | All | 1220000.00 |
| 7 | State02 | Suburb1 | Unknown | 493000.00 |
| 8 | State02 | Suburb1 | Type1 | 500000.00 |
| 9 | State02 | Suburb1 | Type2 | 1000000.00 |
| 10 | State02 | Suburb1 | All | 1993000.00 |
| 11 | State02 | All | All | 1993000.00 |
| 12 | All | All | All | 3213000.00 |

```sql
/*
1.
In previous example.
--SELECT  HouseState ,
--        HouseSuburb ,
--        HouseType ,
--        SUM(SoldPrice) AS TotlSold ,
--        GROUPING(HouseState) AS GPHSt ,
--        GROUPING(HouseSuburb) AS GPHSb ,
--        GROUPING(HouseType) AS GPHT
--FROM    dbo.HouseSold
--GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType);
Output as the following
--HouseState   HouseSuburb   HouseType   TotlSold  GPHSt  GPHSb  GPHT
--State01       Suburb2      Type1        350000.00 0         0   0
--State01       Suburb2      Type2        400000.00 0         0   0
--State01       Suburb2      NULL             750000.00    0         0   1
--State01       Suburb3      Type1        470000.00 0         0   0
--State01       Suburb3      NULL             470000.00    0         0   1
--State01       NULL             NULL         1220000.00   0         1   1
--State02       Suburb1      NULL             493000.00    0         0   0
--State02       Suburb1      Type1        500000.00 0         0   0
--State02       Suburb1      Type2        1000000.000         0   0
--State02       Suburb1      NULL             1993000.00   0      0     1
--State02       NULL             NULL         1993000.00   0         1   1
--NULL        NULL         NULL         3213000.00   1         1   1
2.
In Current example.
--SELECT
--    CASE WHEN
--         GROUPING(HouseState) = 1 THEN 'All' ELSE ISNULL(HouseState, 'Unknown')
--    END AS HouseState,
--    CASE WHEN
--         GROUPING(HouseSuburb) = 1 THEN 'All' ELSE ISNULL(HouseSuburb, 'Unknown')
--    END AS HouseSuburb,
--    CASE
--         WHEN GROUPING(HouseType) = 1 THEN 'All' ELSE ISNULL(HouseType, 'Unknown')
--    END AS HouseType,
--    SUM(SoldPrice) AS TotlSold
--FROM dbo.HouseSold
--GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType)
Output as the following
```

```
--HouseState   HouseSuburb   HouseType   TotlSold
--State01       Suburb2        Type1        350000.00
--State01       Suburb2        Type2        400000.00
--State01       Suburb2        All          750000.00
--State01      Suburb3          Type1        470000.00
--State01       Suburb3        All          470000.00
--State01       All          All      1220000.00
--State02       Suburb1        Unknown   493000.00
--State02       Suburb1        Type1        500000.00
--State02       Suburb1        Type2        1000000.00
--State02       Suburb1        All          1993000.00
--State02       All          All      1993000.00
--All         All            All      3213000.00
2.1.
--State01       Suburb2        All          750000.00
ALL here means GROUPING(HouseType)=1 for that row is aggregated
from ROLLUP, CUBE or GROUPING SETS, and it means "ALL".
2.2.
--State02       Suburb1      NULL             493000.00
NULL here means GROUPING(HouseType)=0 for that row is NOT aggregated
from ROLLUP, CUBE or GROUPING SETS.
It is normally standard group of NULL value, means "Unknow"
*/
--------------------------------------------------------------------------
--T032_05_04_02
/*
Replace Null by "ALL" if Grouping(columnA) return 1, otherwise by "Unknow"
If only using ISNULL, it will cause logic error,
The actuall NULL value in the raw data is also replaced with the word 'All',
which is incorrect. Therefore the need for Grouping function.
*/
SELECT  ISNULL(HouseState, 'All') AS HouseState ,
        ISNULL(HouseSuburb, 'All') AS HouseSuburb ,
        ISNULL(HouseType, 'All') AS HouseType ,
        SUM(SoldPrice) AS TotlSold
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
```



| | HouseState | HouseSuburb | HouseType | TotlSold |
|---|---|---|---|---|
| 1 | State01 | Suburb2 | Type1 | 350000.00 |
| 2 | State01 | Suburb2 | Type2 | 400000.00 |
| 3 | State01 | Suburb2 | All | 750000.00 |
| 4 | State01 | Suburb3 | Type1 | 470000.00 |
| 5 | State01 | Suburb3 | All | 470000.00 |
| 6 | State01 | All | All | 1220000.00 |
| 7 | State02 | Suburb1 | All | 493000.00 |
| 8 | State02 | Suburb1 | Type1 | 500000.00 |
| 9 | State02 | Suburb1 | Type2 | 1000000.00 |
| 10 | State02 | Suburb1 | All | 1993000.00 |
| 11 | State02 | All | All | 1993000.00 |
| 12 | All | All | All | 3213000.00 |

## 5.5. Clean up

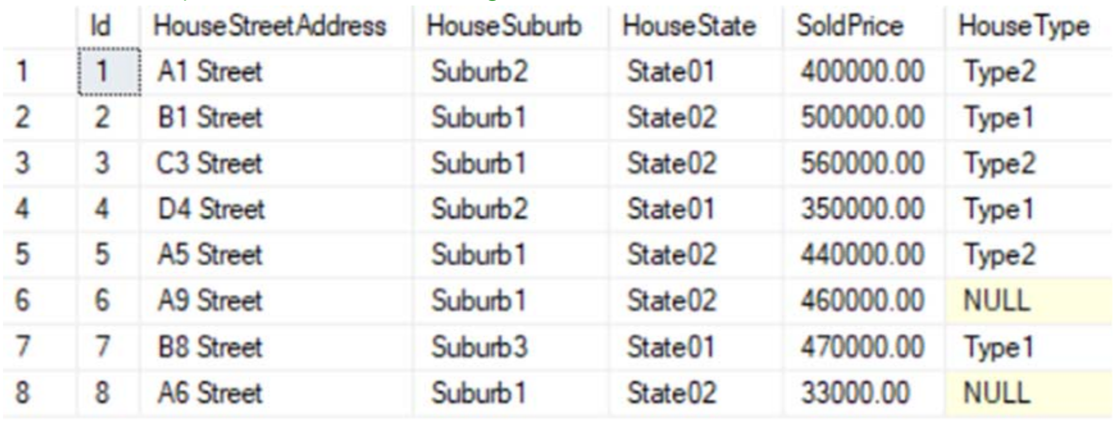
```
--========================================================================
--T032_05_05
--Clean up
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
            FROM      INFORMATION_SCHEMA.TABLES
            WHERE      TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
```

## 6. Grouping_IDFunction

```
--=========================================================================
--T032_06_Grouping_IDFunction
--=========================================================================
/*
1.
--GROUPING_ID(C1,C2,...Cn)
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-id-transact-sql
https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-id-transact-sql
1.1.
Syntax
--SELECT  C1,C2,...Cn ,
--        SUM(ColumnB) AS TotalB ,
--        GROUPING_ID(C1,C2,...Cn) AS 'GPID'
--FROM    dbo.TableName
--GROUP BY ROLLUP(C1,C2,...Cn);
1.1.1.
GROUPING_ID(C1,C2,...Cn) function concatenates
all the GOUPING(C1), GOUPING(C2),...GOUPING(Cn) functions,
and then perform the binary string to decimal conversion.
1.1.2.
The column list of GROUPING_ID(C1,C2,...Cn) must match
the column list of GROUP BY ROLLUP(C1,C2,...Cn).
1.1.3.
GROUPING_ID(C1,C2,...Cn) function computes the level of grouping.
We normally use GROUPING_ID(C1,C2,...Cn) in ORDER BY and HAVING clause to
order the ROLLUP or CUBE.
1.1.4.
GROUPING_ID(C1,C2,...Cn) can be used in the
SELECT <select> list,
HAVING, and
ORDER BY clauses
when GROUP BY is specified.
This usage is same as Grouping(C1) function
1.2.
E.g.
--SELECT  C1,C2,C3,
--        SUM(ColumnB) AS TotalB ,
--        GROUPING_ID(C1,C2,C3) AS 'GPID'
--FROM    dbo.TableName
--GROUP BY ROLLUP(C1,C2,C3);
GROUPING_ID(C1,C2,C3) binary string =
CAST(GROUPING(C1) AS NVARCHAR(1)) +
CAST(GROUPING(C2) AS NVARCHAR(1)) +
CAST(GROUPING(C3) AS NVARCHAR(1));
GROUPING_ID(C1,C2,C3) = convert GROUPING_ID(C1,C2,C3)BinaryString to decimal.
Grouping(C1), Grouping(C2), or Grouping(C3) will return 1 or 0.
GROUPING_ID(C1,C2,C3) function concatenates
all the GOUPING(C1), GOUPING(C2),GOUPING(C3) functions,
and then perform the binary string to decimal conversion.
-----------------------------------------------------------------------
2.
```

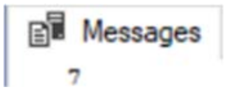
```
----If function exists then DROP it
--IF ( EXISTS ( SELECT    *
--              FROM      INFORMATION_SCHEMA.ROUTINES
--              WHERE     ROUTINE_TYPE = 'FUNCTION'
--                        AND LEFT(ROUTINE_NAME, 2) NOT IN ( '@@' )
--                        AND SPECIFIC_NAME = 'fnBinaryStrToDecimal' ) )
--    BEGIN
--        DROP FUNCTION fnBinaryStrToDecimal;
--    END;
--GO -- Run the previous command and begins new batch
--CREATE FUNCTION [dbo].[fnBinaryStrToDecimal] ( @Input VARCHAR(255) )
--RETURNS BIGINT
--AS
--    BEGIN
--        DECLARE @Cnt TINYINT = 1;
--        DECLARE @Len TINYINT = LEN(@Input);
--        DECLARE @Output BIGINT = CAST(SUBSTRING(@Input, @Len, 1) AS BIGINT);
--        WHILE ( @Cnt < @Len )
--            BEGIN
--                SET @Output = @Output
--                    + POWER(CAST(SUBSTRING(@Input, @Len - @Cnt, 1) * 2 AS BIGINT),
--                            @Cnt);
--                SET @Cnt = @Cnt + 1;
--            END;
--        RETURN @Output;
--    END;
--GO -- Run the previous command and begins new batch
--PRINT dbo.fnBinaryStrToDecimal('111')
*/

--==========================================================================
--T032_06_01
--Create Sample data
--If Table exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE HouseSold
(
  Id INT IDENTITY(1, 1)
         PRIMARY KEY ,
  HouseStreetAddress NVARCHAR(100) ,
  HouseSuburb NVARCHAR(100) ,
  HouseState NVARCHAR(50) ,
  SoldPrice MONEY ,
  HouseType NVARCHAR(100)
);
GO -- Run the previous command and begins new batch
INSERT  dbo.HouseSold
VALUES  ( N'A1 Street', N'Suburb2', N'State01', 400000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'B1 Street', N'Suburb1', N'State02', 500000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'C3 Street', N'Suburb1', N'State02', 560000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'D4 Street', N'Suburb2', N'State01', 350000, N'Type1' );
```

```sql
INSERT  dbo.HouseSold
VALUES  ( N'A5 Street', N'Suburb1', N'State02', 440000, N'Type2' );
INSERT  dbo.HouseSold
VALUES  ( N'A9 Street', N'Suburb1', N'State02', 460000, NULL );
INSERT  dbo.HouseSold
VALUES  ( N'B8 Street', N'Suburb3', N'State01', 470000, N'Type1' );
INSERT  dbo.HouseSold
VALUES  ( N'A6 Street', N'Suburb1', N'State02', 33000, NULL );
GO -- Run the previous command and begins new batch
SELECT  *
FROM    dbo.HouseSold;
GO -- Run the previous command and begins new batch
```



| | Id | HouseStreetAddress | HouseSuburb | HouseState | SoldPrice | HouseType |
|---|---|---|---|---|---|---|
| 1 | 1 | A1 Street | Suburb2 | State01 | 400000.00 | Type2 |
| 2 | 2 | B1 Street | Suburb1 | State02 | 500000.00 | Type1 |
| 3 | 3 | C3 Street | Suburb1 | State02 | 560000.00 | Type2 |
| 4 | 4 | D4 Street | Suburb2 | State01 | 350000.00 | Type1 |
| 5 | 5 | A5 Street | Suburb1 | State02 | 440000.00 | Type2 |
| 6 | 6 | A9 Street | Suburb1 | State02 | 460000.00 | NULL |
| 7 | 7 | B8 Street | Suburb3 | State01 | 470000.00 | Type1 |
| 8 | 8 | A6 Street | Suburb1 | State02 | 33000.00 | NULL |

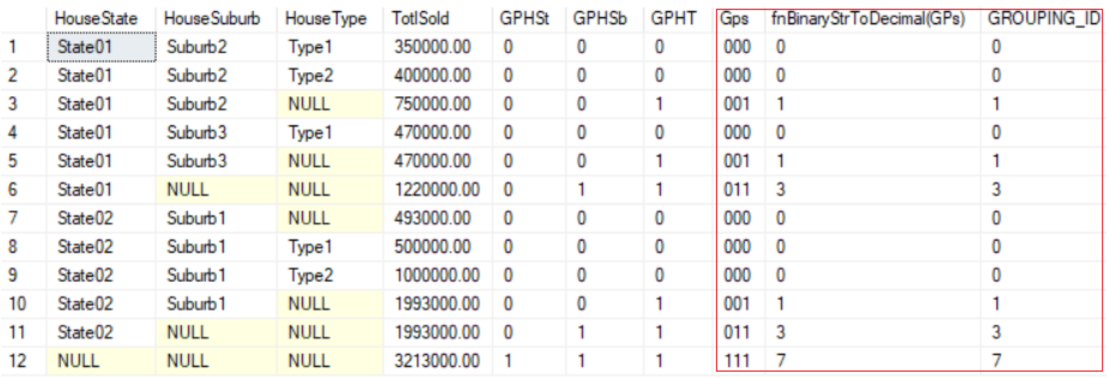
```sql
--==========================================================================
--T032_06_02
--fnBinaryStrToDecimal
--Reference:
--http://improve.dk/converting-between-base-2-10-and-16-in-t-sql/
--If function exists then DROP it
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'FUNCTION'
                        AND LEFT(ROUTINE_NAME, 2) NOT IN ( '@@' )
                        AND SPECIFIC_NAME = 'fnBinaryStrToDecimal' ) )
    BEGIN
        DROP FUNCTION fnBinaryStrToDecimal;
    END;
GO -- Run the previous command and begins new batch
CREATE FUNCTION [dbo].[fnBinaryStrToDecimal] ( @Input VARCHAR(255) )
RETURNS BIGINT
AS
    BEGIN
        DECLARE @Cnt TINYINT = 1;
        DECLARE @Len TINYINT = LEN(@Input);
        DECLARE @Output BIGINT = CAST(SUBSTRING(@Input, @Len, 1) AS BIGINT);
              --Get the most right hand side binary digit as initial.
        WHILE ( @Cnt < @Len )
            BEGIN
                SET @Output = @Output
                    + POWER(CAST(SUBSTRING(@Input, @Len - @Cnt, 1) * 2 AS BIGINT),
                            @Cnt);
                           --Keep Getting the most right hand side binary digit then convert it to
decimal.
                           --1st loop, get the most right hand side binary digit then convert it to
decimal.
                           --2nd loop, get the second last binary digit then convert it to decimal.
                           --...
                SET @Cnt = @Cnt + 1;
            END;
        RETURN @Output;
    END;
GO -- Run the previous command and begins new batch
PRINT dbo.fnBinaryStrToDecimal('111');
```



```
Messages
7
```

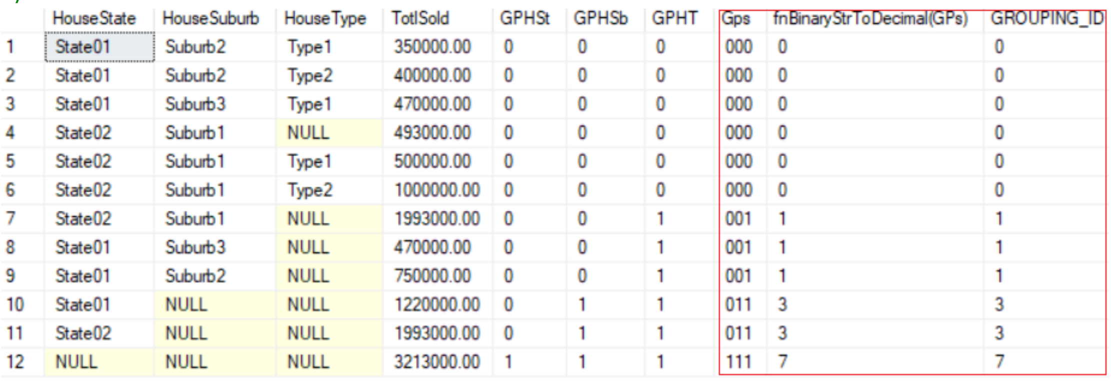
```sql
--==========================================================================
--T032_06_03
--Grouping(columnA)
SELECT  HouseState ,
        HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotlSold ,
       GROUPING(HouseState) AS GPHSt ,
       GROUPING(HouseSuburb) AS GPHSb ,
       GROUPING(HouseType) AS GPHT ,
       CAST(GROUPING(HouseState) AS NVARCHAR(1))
       + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
       + CAST(GROUPING(HouseType) AS NVARCHAR(1)) AS Gps ,
        dbo.fnBinaryStrToDecimal(CAST(GROUPING(HouseState) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseType) AS NVARCHAR(1))) AS [fnBinaryStrToDecimal(GPs)] ,
       GROUPING_ID(HouseState, HouseSuburb, HouseType) AS [GROUPING_ID]
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType);
GO -- Run the previous command and begins new batch
/*
Reference:
https://docs.microsoft.com/en-us/sql/t-sql/functions/grouping-id-transact-sql
https://docs.microsoft.com/zh-cn/sql/t-sql/functions/grouping-id-transact-sql
1.
Output as the following
--HouseState   HouseSuburb   HouseType   TotlSold  GPHSt  GPHSb  GPHT
Gps  fnBinaryStrToDecimal(GPs)  GROUPING_ID
--State01       Suburb2      Type1        350000.00 0         0    0     000   0                    0
--State01       Suburb2      Type2        400000.00 0         0    0     000   0                    0
--
State01       Suburb2      NULL            750000.00    0         0    1     001   1
    1
--State01       Suburb3      Type1        470000.00 0         0    0     000   0                    0
--
State01       Suburb3      NULL            470000.00    0         0    1     001   1
    1
--
State01       NULL             NULL        1220000.00    0         1    1     011   3
    3
--
State02       Suburb1      NULL            493000.00    0         0    0     000   0
    0
--State02       Suburb1      Type1        500000.00 0         0    0     000   0                    0
--State02       Suburb1      Type2        1000000.000         0    0     000   0                    0
--
State02       Suburb1      NULL            1993000.00    0      0      1     001   1
   1
--
State02       NULL             NULL        1993000.00    0         1    1     011   3
    3
```

```
--
NULL        NULL         NULL         3213000.00   1         1    1    111  7                          7
1.1.
--State01       Suburb2      NULL             750000.00    0         0   1  001  1   1
1.1.1.
GPHT=1 here means GROUPING(HouseType) for that row is aggregated
from ROLLUP, CUBE or GROUPING SETS, and it means "ALL".
1.1.2.
GROUPING_ID(C1,C2,C3) binary string =
CAST(GROUPING(C1) AS NVARCHAR(1)) +
CAST(GROUPING(C2) AS NVARCHAR(1)) +
CAST(GROUPING(C3) AS NVARCHAR(1));
GROUPING_ID(C1,C2,C3) = convert GROUPING_ID(C1,C2,C3)BinaryString to decimal.
Grouping(C1), Grouping(C2), or Grouping(C3) will return 1 or 0.
GROUPING_ID(C1,C2,C3) function concatenates
all the GOUPING(C1), GOUPING(C2),GOUPING(C3) functions,
and then perform the binary string to decimal conversion.
1.1.3.
In this case,
GROUPING_ID(HouseState, HouseSuburb, HouseType)
= convert GROUPING_ID(HouseState, HouseSuburb, HouseType)BinaryString to decimal
= fnBinaryStrToDecimal(GPs) = fnBinaryStrToDecimal(001)
= 1
-----------------
1.2.
--State02       Suburb1      NULL             493000.00    0         0   0  000  0   0
1.2.1.
GPHT=0 here means GROUPING(HouseType) for that row is NOT aggregated
from ROLLUP, CUBE or GROUPING SETS.
It is normally standard group of NULL value, means "Unknow"
1.2.2.
In this case,
GROUPING_ID(HouseState, HouseSuburb, HouseType)
= convert GROUPING_ID(HouseState, HouseSuburb, HouseType)BinaryString to decimal
= fnBinaryStrToDecimal(GPs) = fnBinaryStrToDecimal(000)
= 0
---------------
1.3.
--State02       NULL             NULL         1993000.00   0         1    1    011  3  3
1.3.1.
(GPHSb=1 and GPHT=1) here means
(GROUPING(HouseSuburb), and GROUPING(HouseType))
for that row is aggregated
from ROLLUP, CUBE or GROUPING SETS, and it means "ALL".
1.3.2.
In this case,
GROUPING_ID(HouseState, HouseSuburb, HouseType)
= convert GROUPING_ID(HouseState, HouseSuburb, HouseType)BinaryString to decimal
= fnBinaryStrToDecimal(GPs) = fnBinaryStrToDecimal(011)
= 3
---------------
1.4.
--NULL        NULL         NULL         3213000.00   1         1    1    111  7   7
GPHSt  GPHSb  GPHT
1.4.1.
(GPHSt=1, GPHSb=1 and GPHT=1) here means
(GROUPING(HouseState),GROUPING(HouseSuburb), and GROUPING(HouseType))
for that row is aggregated
from ROLLUP, CUBE or GROUPING SETS, and it means "ALL".
1.3.2.
In this case,
GROUPING_ID(HouseState, HouseSuburb, HouseType)
= convert GROUPING_ID(HouseState, HouseSuburb, HouseType)BinaryString to decimal
= fnBinaryStrToDecimal(GPs) = fnBinaryStrToDecimal(111)
= 7
*/
```



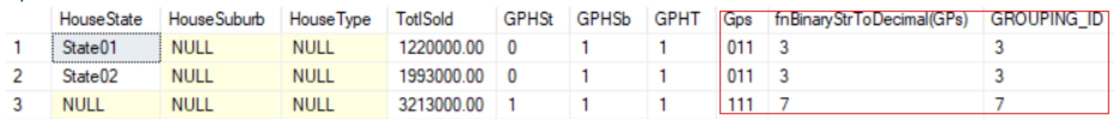
| | HouseState | HouseSuburb | HouseType | TotlSold | GPHSt | GPHSb | GPHT | Gps | fnBinaryStrToDecimal(GPs) | GROUPING_ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | State01 | Suburb2 | Type1 | 350000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 2 | State01 | Suburb2 | Type2 | 400000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 3 | State01 | Suburb2 | NULL | 750000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 4 | State01 | Suburb3 | Type1 | 470000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 5 | State01 | Suburb3 | NULL | 470000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 6 | State01 | NULL | NULL | 1220000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 7 | State02 | Suburb1 | NULL | 493000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 8 | State02 | Suburb1 | Type1 | 500000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 9 | State02 | Suburb1 | Type2 | 1000000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 10 | State02 | Suburb1 | NULL | 1993000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 11 | State02 | NULL | NULL | 1993000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 12 | NULL | NULL | NULL | 3213000.00 | 1 | 1 | 1 | 111 | 7 | 7 |

```
--======================================================================
--T032_06_04
--Grouping(columnA)
SELECT  HouseState ,
        HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotlSold ,
       GROUPING(HouseState) AS GPHSt ,
       GROUPING(HouseSuburb) AS GPHSb ,
       GROUPING(HouseType) AS GPHT ,
       CAST(GROUPING(HouseState) AS NVARCHAR(1))
       + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
       + CAST(GROUPING(HouseType) AS NVARCHAR(1)) AS Gps ,
        dbo.fnBinaryStrToDecimal(CAST(GROUPING(HouseState) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseType) AS NVARCHAR(1))) AS [fnBinaryStrToDecimal(GPs)] ,
       GROUPING_ID(HouseState, HouseSuburb, HouseType) AS [GROUPING_ID]
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType)
ORDER BY [GROUPING_ID];
GO -- Run the previous command and begins new batch
/*
GROUPING_ID(C1,C2,...Cn) function computes the level of grouping.
We normally use GROUPING_ID(C1,C2,...Cn) in ORDER BY and HAVING clause to
order the ROLLUP or CUBE.
*/
```



| | HouseState | HouseSuburb | HouseType | TotlSold | GPHSt | GPHSb | GPHT | Gps | fnBinaryStrToDecimal(GPs) | GROUPING_ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | State01 | Suburb2 | Type1 | 350000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 2 | State01 | Suburb2 | Type2 | 400000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 3 | State01 | Suburb3 | Type1 | 470000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 4 | State02 | Suburb1 | NULL | 493000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 5 | State02 | Suburb1 | Type1 | 500000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 6 | State02 | Suburb1 | Type2 | 1000000.00 | 0 | 0 | 0 | 000 | 0 | 0 |
| 7 | State02 | Suburb1 | NULL | 1993000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 8 | State01 | Suburb3 | NULL | 470000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 9 | State01 | Suburb2 | NULL | 750000.00 | 0 | 0 | 1 | 001 | 1 | 1 |
| 10 | State01 | NULL | NULL | 1220000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 11 | State02 | NULL | NULL | 1993000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 12 | NULL | NULL | NULL | 3213000.00 | 1 | 1 | 1 | 111 | 7 | 7 |

```
--======================================================================
--T032_06_05
--Grouping(columnA)
SELECT  HouseState ,
        HouseSuburb ,
        HouseType ,
       SUM(SoldPrice) AS TotlSold ,
       GROUPING(HouseState) AS GPHSt ,
        GROUPING(HouseSuburb) AS GPHSb ,
        GROUPING(HouseType) AS GPHT ,
        CAST(GROUPING(HouseState) AS NVARCHAR(1))
        + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
        + CAST(GROUPING(HouseType) AS NVARCHAR(1)) AS Gps ,
         dbo.fnBinaryStrToDecimal(CAST(GROUPING(HouseState) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseSuburb) AS NVARCHAR(1))
                                 + CAST(GROUPING(HouseType) AS NVARCHAR(1))) AS [fnBinaryStrToDecimal(GPs)] ,
        GROUPING_ID(HouseState, HouseSuburb, HouseType) AS [GROUPING_ID]
FROM    dbo.HouseSold
GROUP BY ROLLUP(HouseState, HouseSuburb, HouseType)
HAVING  GROUPING_ID(HouseState, HouseSuburb, HouseType) > 2
ORDER BY [GROUPING_ID];
GO -- Run the previous command and begins new batch
/*
GROUPING_ID(C1,C2,...Cn) function computes the level of grouping.
We normally use GROUPING_ID(C1,C2,...Cn) in ORDER BY and HAVING clause to
order the ROLLUP or CUBE.
*/
```



| | HouseState | HouseSuburb | HouseType | TotlSold | GPHSt | GPHSb | GPHT | Gps | fnBinaryStrToDecimal(GPs) | GROUPING_ID |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | State01 | NULL | NULL | 1220000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 2 | State02 | NULL | NULL | 1993000.00 | 0 | 1 | 1 | 011 | 3 | 3 |
| 3 | NULL | NULL | NULL | 3213000.00 | 1 | 1 | 1 | 111 | 7 | 7 |

```
--==========================================================================
--T032_06_06
--Clean up
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'HouseSold' ) )
    BEGIN
        TRUNCATE TABLE dbo.HouseSold;
        DROP TABLE HouseSold;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'FUNCTION'
                        AND LEFT(ROUTINE_NAME, 2) NOT IN ( '@@' )
                        AND SPECIFIC_NAME = 'fnBinaryStrToDecimal' ) )
    BEGIN
        DROP FUNCTION fnBinaryStrToDecimal;
    END;
GO -- Run the previous command and begins new batch
```