# (T17)使用 CommonTableExpressions(CTE)
CourseGUID: e48417fc-9db5-4e99-822c-706c5ccef6cc
==========================================================================
(T17)使用 CommonTableExpressions(CTE)
==========================================================================

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

# 0. Summary

## 0.1. Summary

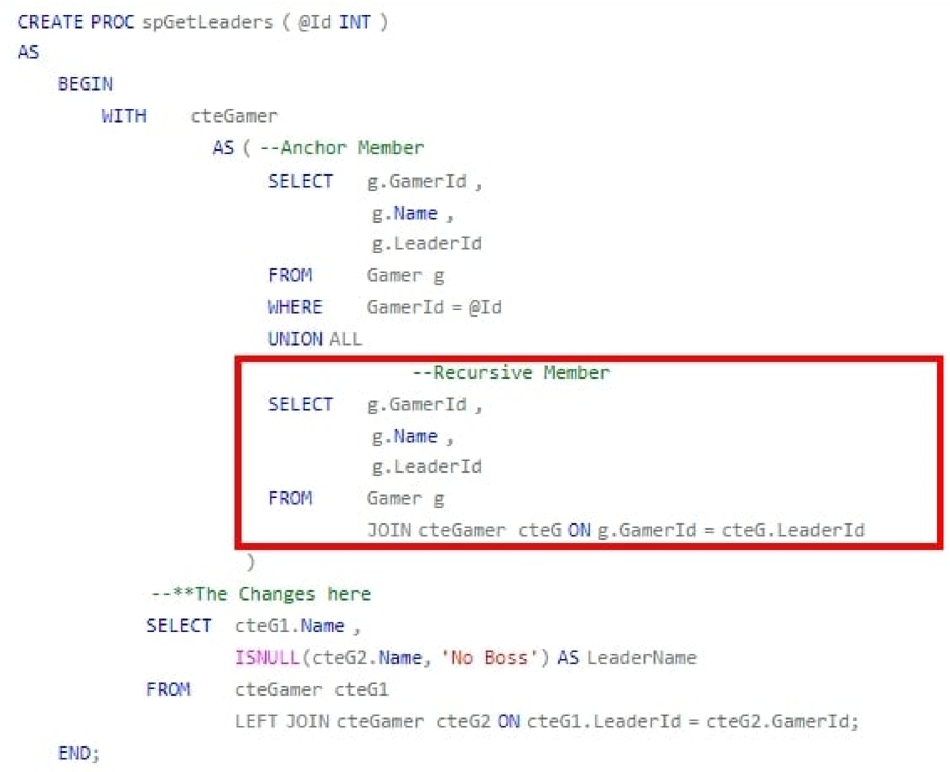
1. Common Table Expressions(CTE) and alternatives
1.1.
VIEW
VIEW can be saved in the database and be re-used some where else.
If you don't want to re-use,
then you may use CTE, Derived Tables, Temp Tables, Table Variable etc.
--------
1.2.
Temp table
Databases --> System Databases --> tempdb --> Tables --> tempTables
Temporary tables are in SystemDatabases TempTB.
1.2.1.
One pund(#) symbol prefix means Local Temporary tables.
Local Temporary tables can only survive
in current connection/session/current Query file.
Local Temporary tables will be destroyed when closing current connection.

1.2.2.
Two pund(##) symbol prefix means Global Temporary tables.
Global Temporary tables can survive
in many connections/sessions/Query files.
Global Temporary tables will be destroyed when closing all connections.
--------
1.3.
Derived Tables
Derived tables are available
only in the context of the current query.
--------
1.4.
Common Table Expressions(CTE)
1.4.1.
Common Table Expressions(CTE) must be used immediately after you defined the CTE.
It can not survive in next next Query.
It is available within a single SELECT, INSERT, UPDATE, DELETE,
or CREATE VIEW statement.
You may define many CommonTableExpressions(CTE)s in ONE With
1.4.2.
Syntax:
--WITH cteName (ColumnA1, ColumnA2, ...)
--AS
--( SELECT   ColumnB1, ColumnB2, ... )
We consider CTE as a normal Table.
In this case, Table Name is cteName, we called it as CTE Name.
Table column is ColumnA1, ColumnA2, ..., We called it as CTE Columns.
We called ( SELECT   ColumnB1, ColumnB2, ... ) as CTE Query.
The ColumnB1, ColumnB2... in the cteQuery
should be able to map to the cteColumns (ColumnA1, ColumnA2, ...).
In this case,
ColumnB1 map to ColumnA1,
ColumnB2 map to ColumnA2...etc.
We normally name ColumnB1 in cteQuery and ColumnA1 in cteColumn
as the same name to avoud confusion.
but it is not necessary.
1.4.3.
Updatable CommonTableExpressions(CTE)
1.4.3.1.
If CTE has only one based table,
then we may update the CommonTableExpressions(CTE).
1.4.3.2.
If CTE has many based tables,
and if UPDATE affects multiple base tables,
then it will return ERROR and terminates the UPDATE.
1.4.3.3.
If CTE has many based tables,
and if UPDATE affects only ONE base table,
then we may update the CommonTableExpressions(CTE).
But it might not work as we expected

## 0.2. Q&A

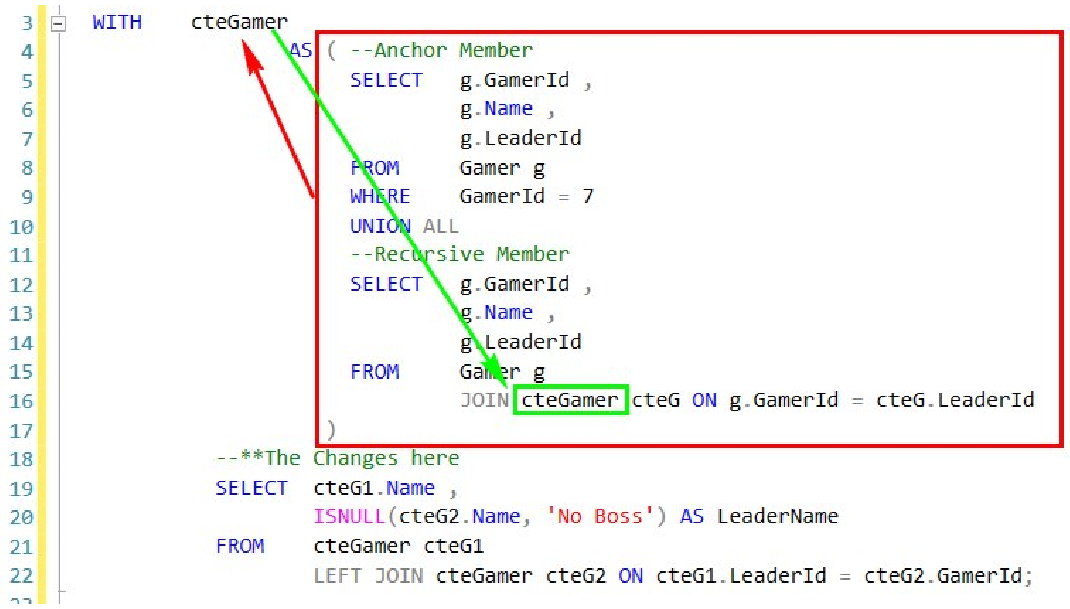
學生提問
https://www.facebook.com/groups/934567793358849/posts/2020993988049552/
影片 T017 02 CommonTableExpressionsCTE
18:27 的位置
依老師影片中所講解的，我的認知，似乎是先執行 Anchor Member 部分的語法，查到 LeaderId，在用該結果(只有一筆)去紅色(Recursive Member)的部分 INNER JOIN Gamer 的 GamerId，再得出該資料列的欄位資訊

例如:
EXEC spGetLeaders 5;
->則在紅色的部分(Recursive Member)查詢出 GamerId 為 4 的相關資料
->再取出 GamerId=4 的 LeaderId->LeaderId = 1，以此為條件，查詢出 GamerId 為 1 的相關資料
我的問題是
1.在查詢出 GamerId 為 4 的相關資料後，該語法為何不會直接執行完畢，並只顯示 GamerId 為 7 及 4 的相關資料，
而會繼續查詢 GamerId 為 1 的相關資料並顯示 GamerId 為 7、4、1 的所有資料呢?
2.請問 CTE 中的 Recursive 的運作原理是什麼，因為看上去語法和直接寫兩個查詢語法並 UNION 起來似乎差不多，其中導致會遞迴查詢的語法結構是哪個部份呢?
感謝!



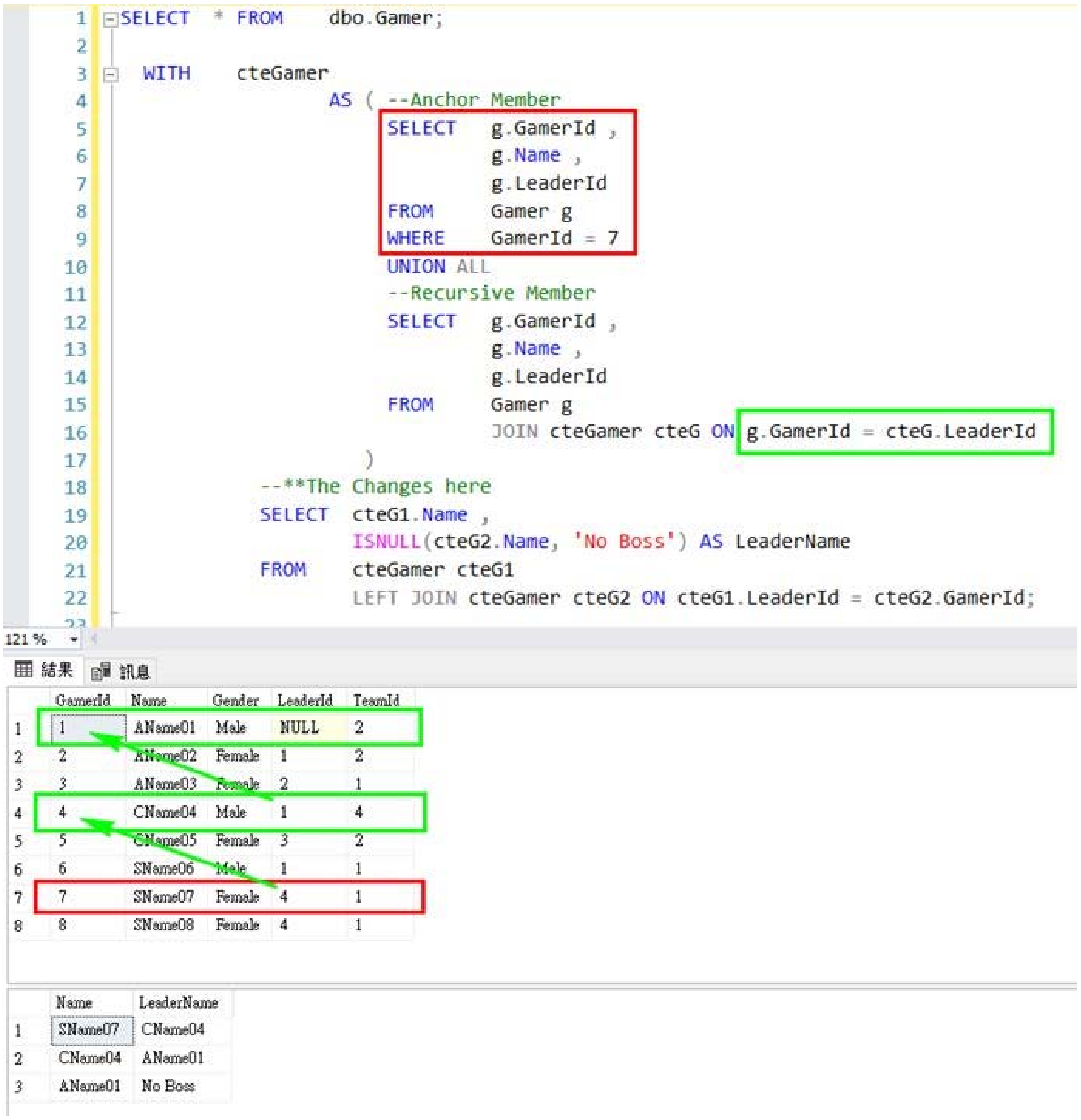
```
CREATE PROC spGetLeaders ( @Id INT )
AS
    BEGIN
        WITH    cteGamer
                  AS ( --Anchor Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                       WHERE    GamerId = @Id
                       UNION ALL
                                  --Recursive Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                                JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
                     )
            --**The Changes here
            SELECT  cteG1.Name ,
                    ISNULL(cteG2.Name, 'No Boss') AS LeaderName
            FROM    cteGamer cteG1
                    LEFT JOIN cteGamer cteG2 ON cteG1.LeaderId = cteG2.GamerId;
    END;
```

---------------------------------------------------------------------
答案:
問題 2，紅框是 CTE 的本體 cteGamer，在裡面又 JOIN 自己，所以形成遞迴



```
WITH    cteGamer
          AS ( --Anchor Member
               SELECT   g.GamerId ,
                        g.Name ,
                        g.LeaderId
               FROM     Gamer g
               WHERE    GamerId = 7
               UNION ALL
               --Recursive Member
               SELECT   g.GamerId ,
                        g.Name ,
                        g.LeaderId
               FROM     Gamer g
                        JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
             )
    --**The Changes here
    SELECT  cteG1.Name ,
            ISNULL(cteG2.Name, 'No Boss') AS LeaderName
    FROM    cteGamer cteG1
            LEFT JOIN cteGamer cteG2 ON cteG1.LeaderId = cteG2.GamerId;
```

問題 1，紅框是資料的起點，接著綠框是繼續找下一筆的遞迴，一直找到最後 LeaderId = NULL，而 GamerId 並沒有 NULL 所以沒有吻合的資料，停止遞迴



```sql
SELECT  * FROM   dbo.Gamer;

WITH    cteGamer
          AS ( --Anchor Member
               SELECT    g.GamerId ,
                         g.Name ,
                         g.LeaderId
               FROM      Gamer g
               WHERE     GamerId = 7
               UNION ALL
               --Recursive Member
               SELECT    g.GamerId ,
                         g.Name ,
                         g.LeaderId
               FROM      Gamer g
                         JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
             )
    --**The Changes here
    SELECT  cteG1.Name ,
            ISNULL(cteG2.Name, 'No Boss') AS LeaderName
    FROM    cteGamer cteG1
            LEFT JOIN cteGamer cteG2 ON cteG1.LeaderId = cteG2.GamerId;
```

| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |
| 2 | 2 | AName02 | Female | 1 | 2 |
| 3 | 3 | AName03 | Female | 2 | 1 |
| 4 | 4 | CName04 | Male | 1 | 4 |
| 5 | 5 | CName05 | Female | 3 | 2 |
| 6 | 6 | SName06 | Male | 1 | 1 |
| 7 | 7 | SName07 | Female | 4 | 1 |
| 8 | 8 | SName08 | Female | 4 | 1 |

| | Name | LeaderName |
|---|---|---|
| 1 | SName07 | CName04 |
| 2 | CName04 | AName01 |
| 3 | AName01 | No Boss |

結論:

Id 等於 1 的就是所有 Gamer 的大領導

所以不管你輸入哪一個 Id，最後一個一定是 GamerId==1

它的原理就是先利用 Anchor 找出 Result 0

然後透過 Member 去遞迴，找出剩下的所有 Result

CTE 搭配 Union 就是 TSQL 遞迴的固定寫法。

如果你只是兩個 Table 單純的 Union

就沒辦法有遞迴唷。

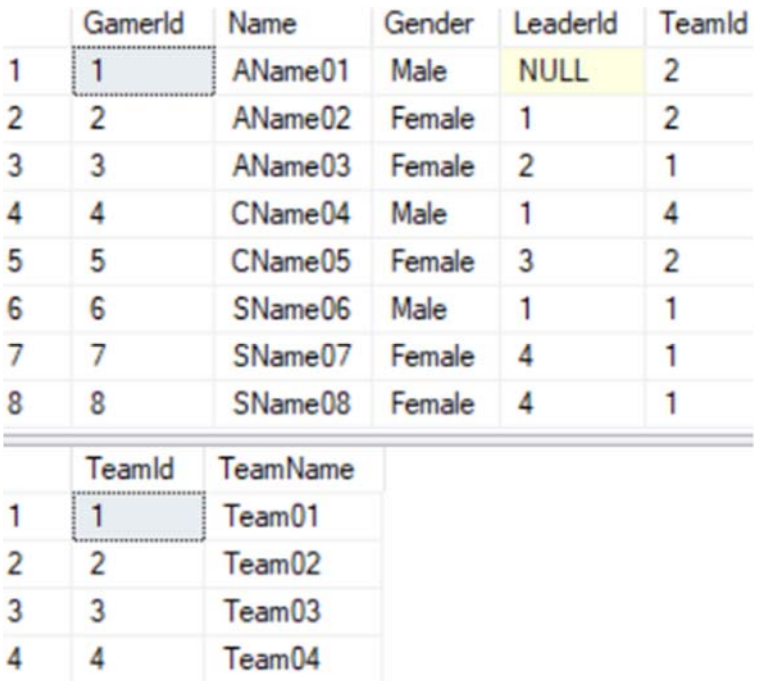
# 1. DerivedTables_CommonTableExpressions(CTE)

```sql
--==================================================================================
--T017_01_DerivedTables_CommonTableExpressions(CTE)
--==================================================================================
```

## 1.1. Create Sample Data

```sql
--==================================================================================
--T017_01_01
--Create Sample Data
--Drop Table if it exists
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'Gamer' ) )
    BEGIN
        TRUNCATE TABLE Gamer;
        DROP TABLE Gamer;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'Team' ) )
    BEGIN
        TRUNCATE TABLE Team;
        DROP TABLE Team;
    END;
GO -- Run the previous command and begins new batch
CREATE TABLE Team
(
  TeamId INT IDENTITY(1, 1)
             PRIMARY KEY ,
  TeamName [NVARCHAR](100) NULL
);
GO -- Run the prvious command and begins new batch
CREATE TABLE Gamer
(
  GamerId INT IDENTITY(1, 1)
              PRIMARY KEY ,
  [Name] NVARCHAR(100) NULL ,
  Gender NVARCHAR(100) NULL ,
  LeaderId INT FOREIGN KEY REFERENCES Gamer ( GamerId )
               NULL ,
  TeamId INT FOREIGN KEY REFERENCES Team ( TeamId )
             NULL
);
GO -- Run the prvious command and begins new batch
INSERT  Team
VALUES  ( N'Team01' );
INSERT  Team
VALUES  ( N'Team02' );
INSERT  Team
VALUES  ( N'Team03' );
INSERT  Team
VALUES  ( N'Team04' );
GO -- Run the prvious command and begins new batch
INSERT  Gamer
VALUES  ( N'AName01', 'Male', NULL, 2 );
INSERT  Gamer
VALUES  ( N'AName02', 'Female', 1, 2 );
INSERT  Gamer
VALUES  ( N'AName03', 'Female', 2, 1 );
INSERT  Gamer
VALUES  ( N'CName04', 'Male', 1, 4 );
INSERT  Gamer
VALUES  ( N'CName05', 'Female', 3, 2 );
INSERT  Gamer
VALUES  ( N'SName06', 'Male', 1, 1 );
INSERT  Gamer
VALUES  ( N'SName07', 'Female', 4, 1 );
```

```
INSERT  Gamer
VALUES  ( N'SName08', 'Female', 4, 1 );
GO -- Run the prvious command and begins new batch
SELECT  *
FROM    dbo.Gamer;
SELECT  *
FROM    dbo.Team;
GO -- Run the prvious command and begins new batch
/*
AName01
  |_______________________
  |          |           |
AName02    CName04      SName06
  |          |_________
  |          |        |
AName03    SName07    SName08
  |
CName05
*/
```

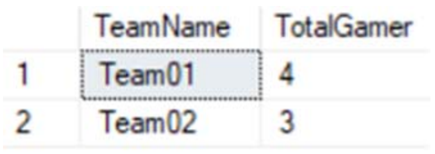


|   | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |
| 2 | 2 | AName02 | Female | 1 | 2 |
| 3 | 3 | AName03 | Female | 2 | 1 |
| 4 | 4 | CName04 | Male | 1 | 4 |
| 5 | 5 | CName05 | Female | 3 | 2 |
| 6 | 6 | SName06 | Male | 1 | 1 |
| 7 | 7 | SName07 | Female | 4 | 1 |
| 8 | 8 | SName08 | Female | 4 | 1 |

|   | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team02 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

## 1.2. Drop View if it exists

```
--==============================================================================================
--T017_01_02
--Drop View if it exists
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'vwGamerCount' ) )
    BEGIN
        DROP VIEW vwGamerCount;
    END;
GO -- Run the previous command and begins new batch
CREATE VIEW vwGamerCount
AS
    SELECT  t.TeamName ,
            g.TeamId ,
            COUNT(*) AS TotalGamer
    FROM     dbo.Gamer g
             JOIN Team t ON g.TeamId = t.TeamId
    GROUP BY t.TeamName ,
              g.TeamId;
GO -- Run the prvious command and begins new batch
--Get TeamName and its TotalGamer.
--Select only when TotalGamer>= 2
SELECT   TeamName ,
         TotalGamer
FROM     vwGamerCount
WHERE    TotalGamer >= 2;
GO -- Run the prvious command and begins new batch
/*
VIEW can be saved in the database and be re-used some where else.
If you don't want to re-use,
then you may use CTE, Derived Tables, Temp Tables, Table Variable etc.
*/
```

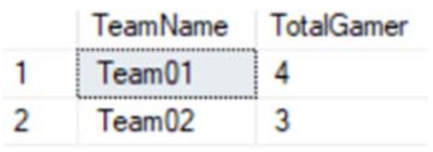


|   | TeamName | TotalGamer |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |

## 1.3. Temp table

```
--===================================================================================================
--T017_01_03
--Temp table
IF OBJECT_ID('tempdb..#TempGamerCount') IS NOT NULL
    BEGIN
        TRUNCATE TABLE #TempGamerCount;
        DROP TABLE #TempGamerCount;
    END;
GO -- Run the previous command and begins new batch
SELECT   t.TeamName ,
         g.TeamId ,
         COUNT(*) AS TotalGamer
--Slect into tamp table
INTO     #TempGamerCount
FROM     dbo.Gamer g
         JOIN Team t ON g.TeamId = t.TeamId
GROUP BY t.TeamName ,
         g.TeamId;
GO -- Run the previous command and begins new batch
--Get TeamName and its TotalGamer.
--Select only when TotalGamer>= 2
SELECT   TeamName ,
         TotalGamer
FROM     #TempGamerCount
WHERE    TotalGamer >= 2;
GO -- Run the previous command and begins new batch
/*
1.
Databases --> System Databases --> tempdb --> Tables --> tempTables
Temporary tables are in SystemDatabases TempTB.
1.1.
One pund(#) symbol prefix means Local Temporary tables.
Local Temporary tables can only survive
in current connection/session/current Query file.
Local Temporary tables will be destroyed when closing current connection.
```

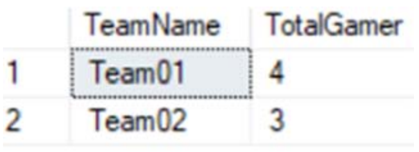
```
1.2.
Two pund(##) symbol prefix means Global Temporary tables.
Global Temporary tables can survive
in many connections/sessions/Query files.
Global Temporary tables will be destroyed when closing all connections.
*/
```



| | TeamName | TotalGamer |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |

## 1.4. Table Variable

```
--==================================================================================================
--T017_01_04
--Table Variable
DECLARE @GamerCount TABLE
(
  TeamName NVARCHAR(50) ,
  TeamID INT ,
  TotalGamer INT
);
--Insert into Table Variable
INSERT  @GamerCount
        SELECT  t.TeamName ,
                g.TeamId ,
                COUNT(*) AS TotalGamer
        FROM    dbo.Gamer g
                JOIN Team t ON g.TeamId = t.TeamId
        GROUP BY t.TeamName ,
                g.TeamId;
--Get TeamName and its TotalGamer.
--Select only when TotalGamer>= 2
SELECT  TeamName ,
        TotalGamer
FROM    @GamerCount
WHERE   TotalGamer >= 2;
GO -- Run the previous command and begins new batch
/*
Table Variable is stored in TempDB and can only survive
in the batch, statement block, or stored procedure.
Table Variable be passed as parameters between procedures.
*/
```

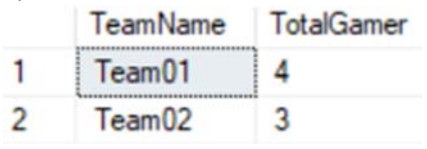


| | TeamName | TotalGamer |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |

## 1.5. Derived Tables

```
--==================================================================================================
--T017_01_05
--Derived Tables
SELECT  TeamName ,
        TotalGamer
FROM    ( SELECT    t.TeamName ,
                    g.TeamId ,
                    COUNT(*) AS TotalGamer
```

```
          FROM      dbo.Gamer g
                    JOIN Team t ON g.TeamId = t.TeamId
          GROUP BY  t.TeamName ,
                     g.TeamId
        ) AS GamerCount
WHERE   TotalGamer >= 2;
GO -- Run the prvious command and begins new batch
/*
Derived tables are available
only in the context of the current query.
*/
```

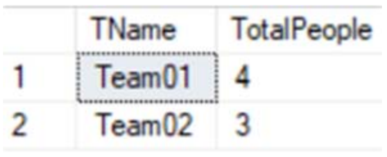


|   | TeamName | TotalGamer |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |

## 1.6. CommonTableExpressions(CTE)

```
--==============================================================================================
--T017_01_06
--CommonTableExpressions(CTE)
WITH    GamerCount ( TName, TId, TotalPeople )
          AS ( SELECT   t.TeamName ,
                         g.TeamId ,
                         COUNT(*) AS TotalGamer
               FROM      dbo.Gamer g
                         JOIN Team t ON g.TeamId = t.TeamId
               GROUP BY t.TeamName ,
                         g.TeamId
             )
    SELECT  TName ,
             TotalPeople
    FROM    GamerCount
    WHERE   TotalPeople >= 2;
GO -- Run the prvious command and begins new batch
/*
1.
Common Table Expressions(CTE)
1.1.
Common Table Expressions(CTE) must be used immediately after you defined the CTE.
It can not survive in next next Query.
It is available within a single SELECT, INSERT, UPDATE, DELETE,
or CREATE VIEW statement.
You may define many CommonTableExpressions(CTE)s in ONE With
1.2.
Syntax:
--WITH cteName (ColumnA1, ColumnA2, ...)
--AS
--( SELECT   ColumnB1, ColumnB2, ... )
We consider CTE as a normal Table.
In this case, Table Name is cteName, we called it as CTE Name.
Table column is ColumnA1, ColumnA2, ..., We called it as CTE Columns.
We called ( SELECT   ColumnB1, ColumnB2, ... ) as CTE Query.
The ColumnB1, ColumnB2... in the cteQuery
should be able to map to the cteColumns (ColumnA1, ColumnA2, ...).
In this case,
ColumnB1 map to ColumnA1,
ColumnB2 map to ColumnA2...etc.
We normally name ColumnB1 in cteQuery and ColumnA1 in cteColumn
as the same name to avoud confusion.
but it is not necessary.
```

```
*/
```



| | TName | TotalPeople |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |

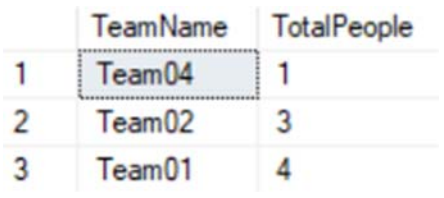
```
=========================================================================
```

## 2. CommonTableExpressions(CTE)

```
--==========================================================================================================
--T017_02_CommonTableExpressions(CTE)
--==========================================================================================================

/*
1.
Common Table Expressions(CTE)
1.1.
Common Table Expressions(CTE) must be used immediately after you defined the CTE.
It can not survive in next next Query.
It is available within a single SELECT, INSERT, UPDATE, DELETE,
or CREATE VIEW statement.
You may define many CommonTableExpressions(CTE)s in ONE With
1.2.
Syntax:
--WITH cteName (ColumnA1, ColumnA2, ...)
--AS
--( SELECT   ColumnB1, ColumnB2, ... )
We consider CTE as a normal Table.
In this case, Table Name is cteName, we called it as CTE Name.
Table column is ColumnA1, ColumnA2, ..., We called it as CTE Columns.
We called ( SELECT   ColumnB1, ColumnB2, ... ) as CTE Query.
The ColumnB1, ColumnB2... in the cteQuery
should be able to map to the cteColumns (ColumnA1, ColumnA2, ...).
In this case,
ColumnB1 map to ColumnA1,
ColumnB2 map to ColumnA2...etc.
We normally name ColumnB1 in cteQuery and ColumnA1 in cteColumn
as the same name to avoud confusion.
but it is not necessary.
*/
```

### 2.1. CommonTableExpressions(CTE)

```
--==========================================================================================================
--T017_02_01
--CommonTableExpressions(CTE) defined and must used immediately.
----------------------------------------------------------------------------------------------------------
--T017_02_01_01
--CommonTableExpressions(CTE) defined and must used immediately.
WITH    GamerCount ( TId, TotalPeople )
          AS ( SELECT   g.TeamId ,
                        COUNT(*) AS TotalGamers
               FROM     Gamer g
               GROUP BY g.TeamId
             )
    SELECT  t.TeamName ,
            TotalPeople
    FROM    GamerCount g
            JOIN Team t ON g.TId = t.TeamId
    ORDER BY g.TotalPeople;
GO -- Run the prvious command and begins new batch
```



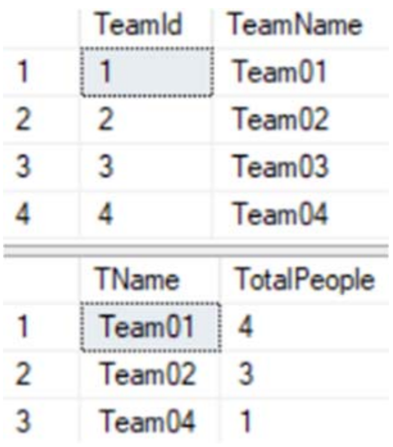
|  | TeamName | TotalPeople |
|---|---|---|
| 1 | Team04 | 1 |
| 2 | Team02 | 3 |
| 3 | Team01 | 4 |

```
------------------------------------------------------------------------------------------------------------
--T017_02_01_02
--Common table expression(CTE) defined but not used immediately.
--ERROR
/*
WITH    GamerCount ( TId, TotalPeople )
          AS ( SELECT   g.TeamId ,
                        COUNT(*) AS TotalGamers
               FROM     Gamer g
               GROUP BY g.TeamId
             )
--Common table expression(CTE) defined but not used immediately.
SELECT  'Hello';
SELECT  t.TeamName ,
        TotalPeople
FROM    GamerCount g
        JOIN Team t ON g.TId = t.TeamId
ORDER BY g.TotalPeople;
GO -- Run the prvious command and begins new batch
*/
/*
Error
--Msg 422, Level 16, State 4, Line 261
--Common table expression defined but not used.
*/
```

## 2.2. Many CommonTableExpressions(CTE)s in ONE With

```
--==========================================================================================================
--T017_02_02
--Many CommonTableExpressions(CTE)s in ONE With
SELECT  *
FROM    Team;
WITH    cteTeam01Team03 ( TName, TotalPeople )
          AS ( SELECT   t.TeamName ,
                        COUNT(g.GamerId) AS TotalGamers
               FROM     Gamer g
                        JOIN Team t ON g.TeamId = t.TeamId
               WHERE    t.TeamName IN ( 'Team01', 'Team03' )
               GROUP BY t.TeamName
             ),
        cteTeam02Team04 ( TName, TotalPeople )
          AS ( SELECT   d.TeamName ,
                        COUNT(g.GamerId) AS TotalGamers
               FROM     Gamer g
                        JOIN Team d ON g.TeamId = d.TeamId
               WHERE    d.TeamName IN ( 'Team02', 'Team04' )
               GROUP BY d.TeamName
```

```
            )
    SELECT  *
    FROM    cteTeam01Team03
    UNION
    SELECT  *
    FROM    cteTeam02Team04;
GO -- Run the prvious command and begins new batch
```



| | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team02 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

| | TName | TotalPeople |
|---|---|---|
| 1 | Team01 | 4 |
| 2 | Team02 | 3 |
| 3 | Team04 | 1 |

```
======================================================================
```

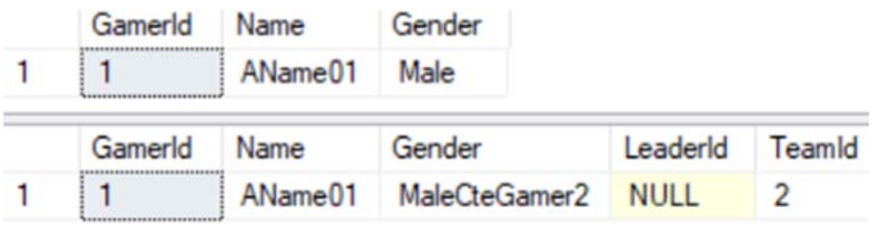
# 3. UpdatableCommonTableExpressions(CTE)

```
--==========================================================================================================
--T017_03_UpdatableCommonTableExpressions(CTE)
--==========================================================================================================
/*
Updatable CommonTableExpressions(CTE)
1.
If CTE has only one based table,
then we may update the CommonTableExpressions(CTE).
2.
If CTE has many based tables,
and if UPDATE affects multiple base tables,
then it will return ERROR and terminates the UPDATE.
3.
If CTE has many based tables,
and if UPDATE affects only ONE base table,
then we may update the CommonTableExpressions(CTE).
But it might not work as we expected
*/
```

## 3.1. If CTE has only one based table

```
--==========================================================================================================
--T017_03_01
--If CTE has only one based table,
--then we may update the CommonTableExpressions(CTE).
WITH    cteGamer
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender
               FROM     Gamer g
             )
    SELECT  *
    FROM    cteGamer
    WHERE   GamerId = 1;
```

```
GO -- Run the prvious command and begins new batch
--update CTE works as expected.
WITH    cteGamer2
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender
               FROM     Gamer g
             )
    UPDATE  cteGamer2
    SET     cteGamer2.Gender += 'CteGamer2'
    WHERE   GamerId = 1;
GO -- Run the prvious command and begins new batch
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
GO -- Run the prvious command and begins new batch
--Cean up
UPDATE  Gamer
SET     Gender = 'Male'
WHERE   GamerId = 1;
GO -- Run the prvious command and begins new batch
/*
If CTE has only one based table,
then we may update the CommonTableExpressions(CTE).
*/
```



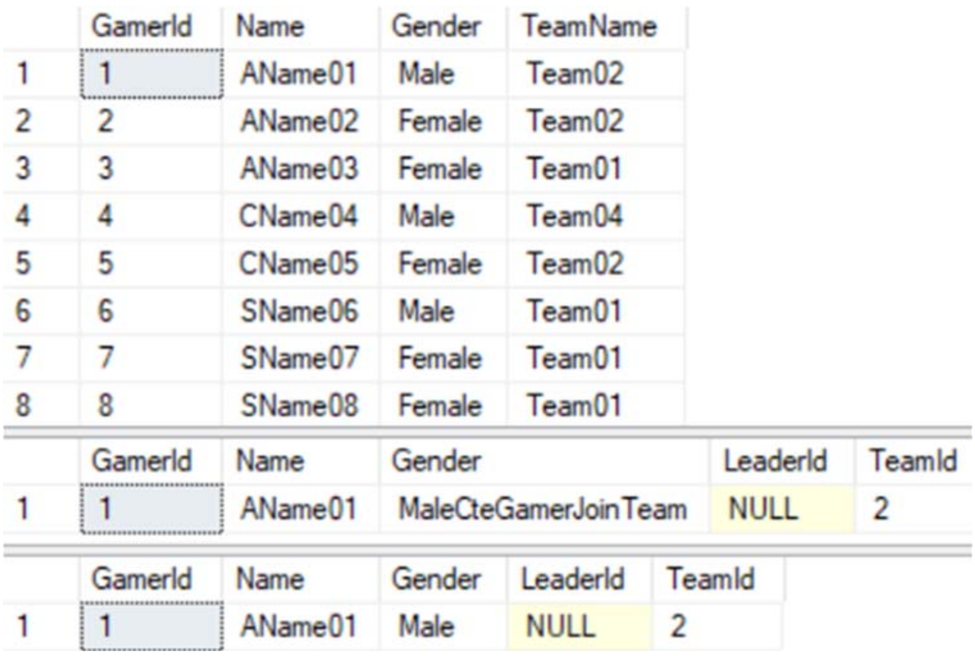
| | GamerId | Name | Gender |
|---|---|---|---|
| 1 | 1 | AName01 | Male |

| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | MaleCteGamer2 | NULL | 2 |

## 3.2. If CTE has many based tables

```
--==========================================================================================
--T017_03_02
--If CTE has many based tables,
--and if UPDATE affects only ONE base table,
WITH    cteGamerJoinTeam
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender ,
                        t.TeamName
               FROM     Gamer g
                        JOIN Team t ON g.TeamId = t.TeamId
             )
    SELECT  *
    FROM    cteGamerJoinTeam;
GO -- Run the prvious command and begins new batch
-- It works
WITH    cteGamerJoinTeam
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender ,
                        t.TeamName
               FROM     Gamer g
```

```
                        JOIN Team t ON g.TeamId = t.TeamId
           )
    UPDATE   cteGamerJoinTeam
    SET      cteGamerJoinTeam.Gender += 'CteGamerJoinTeam'
    WHERE    GamerId = 1;
GO -- Run the prvious command and begins new batch
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
--Clean up
UPDATE  Gamer
SET     Gender = 'Male'
WHERE   GamerId = 1;
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
GO -- Run the prvious command and begins new batch
/*
1.
If CTE has many based tables,
and if UPDATE affects only ONE base table,
then we may update the CommonTableExpressions(CTE).
But it might not work as we expected
1.1.
In this case, it works as we expected.
*/
```



| | GamerId | Name | Gender | TeamName |
|---|---|---|---|---|
| 1 | 1 | AName01 | Male | Team02 |
| 2 | 2 | AName02 | Female | Team02 |
| 3 | 3 | AName03 | Female | Team01 |
| 4 | 4 | CName04 | Male | Team04 |
| 5 | 5 | CName05 | Female | Team02 |
| 6 | 6 | SName06 | Male | Team01 |
| 7 | 7 | SName07 | Female | Team01 |
| 8 | 8 | SName08 | Female | Team01 |

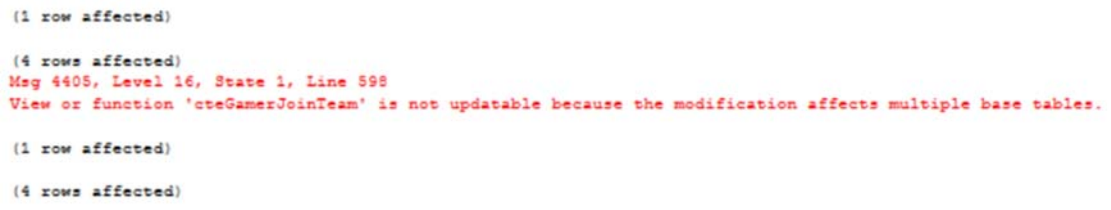
| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | MaleCteGamerJoinTeam | NULL | 2 |

| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |

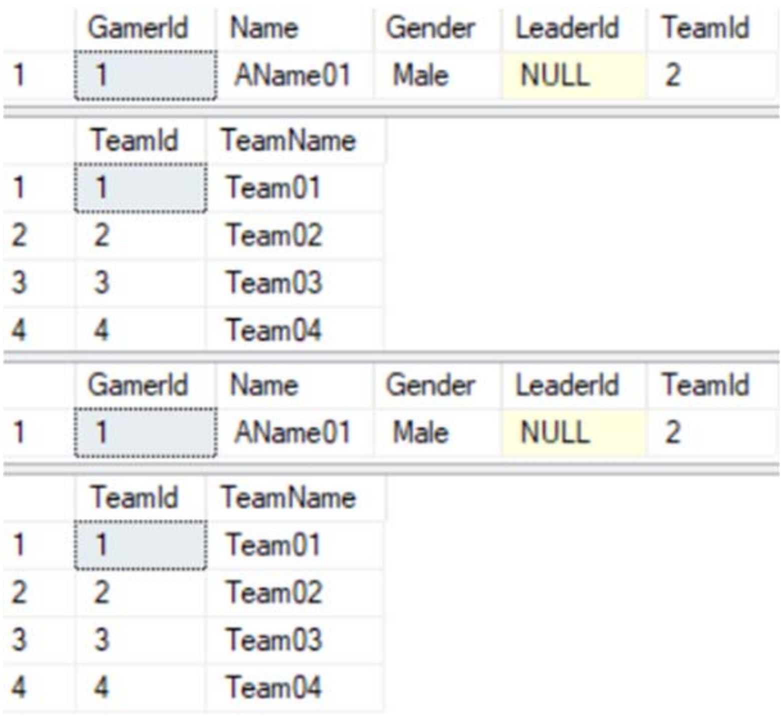
## 3.3. If CTE has many based tables

```
--==============================================================================================
--T017_03_03
--If CTE has many based tables,
--and if UPDATE affects multiple base tables,
--then it will return ERROR and terminates the UPDATE.
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
SELECT  *
FROM    Team;
```

```
GO -- Run the prvious command and begins new batch
WITH    cteGamerJoinTeam
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender ,
                        t.TeamName
               FROM     dbo.Gamer g
                        JOIN Team t ON g.TeamId = t.TeamId
             )
    UPDATE  cteGamerJoinTeam
    SET     cteGamerJoinTeam.Gender += 'cteGamerJoinTeam' ,
            cteGamerJoinTeam.TeamName = 'Team03'
    WHERE   GamerId = 1;
GO -- Run the prvious command and begins new batch
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
SELECT  *
FROM    Team;
GO -- Run the prvious command and begins new batch
/*
If CTE has many based tables,
and if UPDATE affects multiple base tables,
then it will return ERROR and terminates the UPDATE.
*/
```



```
(1 row affected)

(4 rows affected)
Msg 4405, Level 16, State 1, Line 598
View or function 'cteGamerJoinTeam' is not updatable because the modification affects multiple base tables.

(1 row affected)

(4 rows affected)
```



| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |

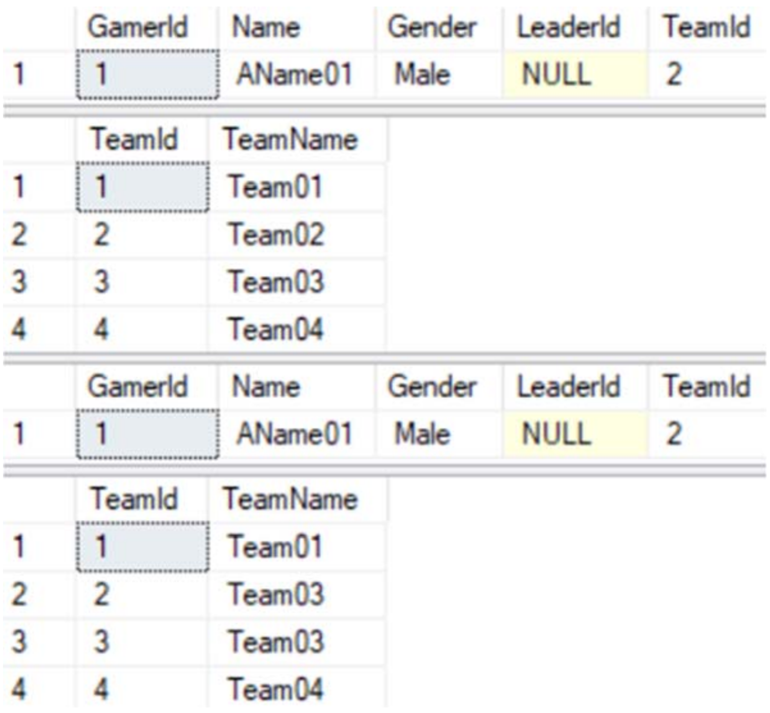
| | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team02 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

| | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |

| | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team02 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

## 3.4. Incorrectly update

```
--=====================================================================================
--T017_03_04
--**Incorrectly update
--If CTE has many based tables,
--and if UPDATE affects only ONE base table,
--then we may update the CommonTableExpressions(CTE).
--But it might not work as we expected
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
SELECT  *
FROM    Team;
GO -- Run the prvious command and begins new batch
WITH    cteGamerJoinTeam
          AS ( SELECT   g.GamerId ,
                        g.Name ,
                        g.Gender ,
                        t.TeamName
               FROM     dbo.Gamer g
                        JOIN Team t ON g.TeamId = t.TeamId
             )
    UPDATE  cteGamerJoinTeam
    SET     cteGamerJoinTeam.TeamName = 'Team03'
    WHERE   GamerId = 1;
SELECT  *
FROM    Gamer
WHERE   GamerId = 1;
SELECT  *
FROM    Team;
--Clean up
UPDATE  Team
SET     TeamName = 'Team02'
WHERE   TeamId = 2;
GO -- Run the prvious command and begins new batch
/*
1.
If CTE has many based tables,
and if UPDATE affects only ONE base table,
then we may update the CommonTableExpressions(CTE).
But it might not work as we expected
2.
It has the same result as you run the following
UPDATE  Team
SET     TeamName = 'Team03'
WHERE   TeamId = 2;
*/
```



|  | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |

|  | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team02 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

|  | GamerId | Name | Gender | LeaderId | TeamId |
|---|---|---|---|---|---|
| 1 | 1 | AName01 | Male | NULL | 2 |

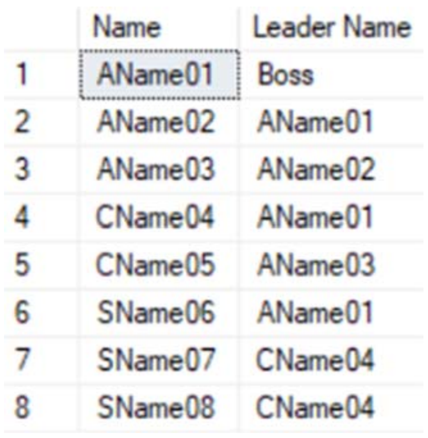
|  | TeamId | TeamName |
|---|---|---|
| 1 | 1 | Team01 |
| 2 | 2 | Team03 |
| 3 | 3 | Team03 |
| 4 | 4 | Team04 |

## 4. RecursiveCommonTableExpressions(CTE)

```
--=====================================================================================================
--T017_04_RecursiveCommonTableExpressions(CTE)
--=====================================================================================================
/*
AName01
  |_______________________
  |          |           |
AName02    CName04     SName06
  |          |_________
  |          |        |
AName03    SName07   SName08
  |
CName05
*/
```

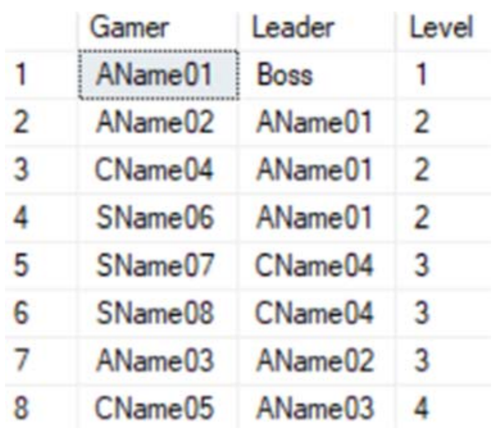
## 4.1. Recursive CommonTableExpressions(CTE)

```
--=====================================================================================================
--T017_04_01
--Recursive CommonTableExpressions(CTE)
-------------------------------------------------------------------------------------
--T017_04_01_01
SELECT  g.Name ,
        ISNULL(g2.Name, 'Boss') AS [Leader Name]
FROM    Gamer g
        LEFT JOIN Gamer g2 ON g.LeaderId = g2.GamerId;
GO -- Run the prvious command and begins new batch
```



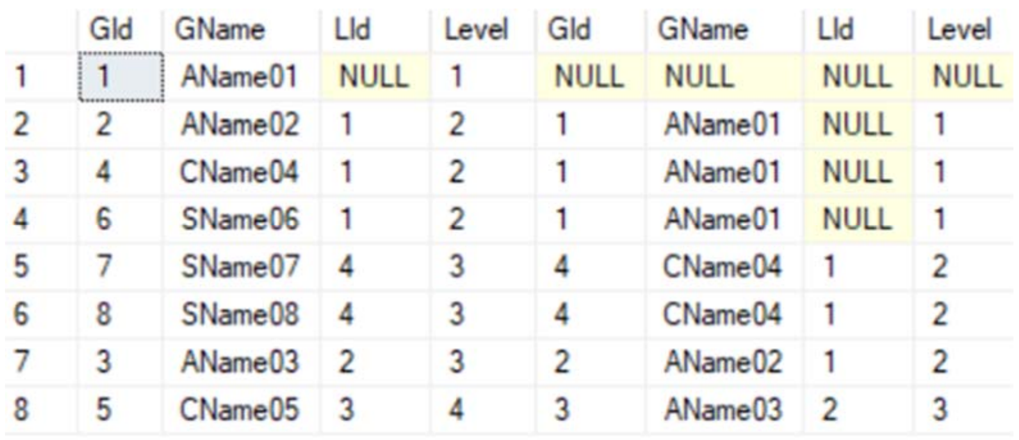
|   | Name | Leader Name |
|---|---|---|
| 1 | AName01 | Boss |
| 2 | AName02 | AName01 |
| 3 | AName03 | AName02 |
| 4 | CName04 | AName01 |
| 5 | CName05 | AName03 |
| 6 | SName06 | AName01 |
| 7 | SName07 | CName04 |
| 8 | SName08 | CName04 |

```
------------------------------------------------------------------------------------------
--T017_04_01_02
/*
AName01
  |_______________________
  |          |           |
AName02    CName04      SName06
  |          |_________
  |          |        |
AName03    SName07   SName08
  |
CName05
This query will return the Orgination Level.
E.g.
[Level]=1 contains AName01
[Level]=2 contains AName02, CName04, SName06
[Level]=3 contains AName03, SName07, SName08
[Level]=4 contains CName05
*/

WITH    cteGamer ( GId, GName, LId, [Level] )
          AS ( --Anchor Member
               SELECT   g.GamerId ,
                        g.Name ,
                        g.LeaderId ,
                        1
               FROM     Gamer g
               WHERE    g.LeaderId IS NULL
               UNION ALL
                        --Recursive Member
               SELECT   g.GamerId ,
                        g.Name ,
                        g.LeaderId ,
                        cteG.[Level] + 1
               FROM     Gamer g
                        JOIN cteGamer cteG ON g.LeaderId = cteG.GId
             )
        --**The Changes here
    SELECT  cteG.GName AS Gamer ,
            ISNULL(cteG2.GName, 'Boss') AS Leader ,
            cteG.[Level]
    FROM    cteGamer cteG
            LEFT JOIN cteGamer cteG2 ON cteG.LId = cteG2.GId;
GO -- Run the prvious command and begins new batch
```



| | Gamer | Leader | Level |
|---|---|---|---|
| 1 | AName01 | Boss | 1 |
| 2 | AName02 | AName01 | 2 |
| 3 | CName04 | AName01 | 2 |
| 4 | SName06 | AName01 | 2 |
| 5 | SName07 | CName04 | 3 |
| 6 | SName08 | CName04 | 3 |
| 7 | AName03 | AName02 | 3 |
| 8 | CName05 | AName03 | 4 |

```
-----------------------------------------------------------------------------------------
--T017_04_01_03
WITH    cteGamer ( GId, GName, LId, [Level] )
          AS ( --Anchor Member
               SELECT    g.GamerId ,
                          g.Name ,
                          g.LeaderId ,
                          1
               FROM      Gamer g
               WHERE     g.LeaderId IS NULL
               UNION ALL
                        --Recursive Member
               SELECT    g.GamerId ,
                          g.Name ,
                          g.LeaderId ,
                          cteG.[Level] + 1
               FROM      Gamer g
                         JOIN cteGamer cteG ON g.LeaderId = cteG.GId
             )
        --**The Changes here
    SELECT  *
    FROM    cteGamer cteG
            LEFT JOIN cteGamer cteG2 ON cteG.LId = cteG2.GId;
GO -- Run the prvious command and begins new batch
```



| | GId | GName | LId | Level | GId | GName | LId | Level |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | AName01 | NULL | 1 | NULL | NULL | NULL | NULL |
| 2 | 2 | AName02 | 1 | 2 | 1 | AName01 | NULL | 1 |
| 3 | 4 | CName04 | 1 | 2 | 1 | AName01 | NULL | 1 |
| 4 | 6 | SName06 | 1 | 2 | 1 | AName01 | NULL | 1 |
| 5 | 7 | SName07 | 4 | 3 | 4 | CName04 | 1 | 2 |
| 6 | 8 | SName08 | 4 | 3 | 4 | CName04 | 1 | 2 |
| 7 | 3 | AName03 | 2 | 3 | 2 | AName02 | 1 | 2 |
| 8 | 5 | CName05 | 3 | 4 | 3 | AName03 | 2 | 3 |

```
/*
0.
AName01
   |_______________________
   |           |           |
AName02     CName04      SName06
```

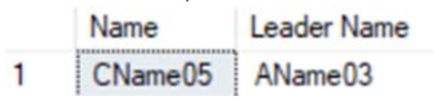
```
  |          |_________
  |          |        |
AName03    SName07   SName08
  |
CName05
----------------------------------
0.1.
----The 1st select query is Anchor Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId ,
--        1
--FROM     Gamer g
--WHERE    g.LeaderId IS NULL
--UNION ALL
--------------------------------
----The 2nd select query is Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId ,
--        cteG.[Level] + 1
--FROM     Gamer g
--        JOIN cteGamer cteG ON g.LeaderId = cteG.GId
How does the recursive CTE execute?
Step1: Execute the anchor member and get result R0
Step2: Execute the recursive member by using R0 as input and output result R1
Step3: Execute the recursive member by using R1 as input and output result R2
Step4: Recursion goes on until the recursive member output result is NULL
Step5: Finally apply UNION ALL on all the results to produce the final output
----------------------------------------------------------------------
1.
The cteGamer contains 2 queries.
1.1.
The 1st select query of cteGamer,
it gets the 'Boss' whose 'LeaderId' is null.
and Set [Level] of Boss to 1.
In this case, ID=1 is the boss.
The 1st select query will be completed in 1st round of Recursive cteGamer
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId ,
--        1
--FROM     Gamer g
--WHERE    g.LeaderId IS NULL
-----------------------------------------------
1.2.
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId ,
--        cteG.[Level] + 1
--FROM     Gamer g
--        JOIN cteGamer cteG ON g.LeaderId = cteG.GId
The 2nd select query of cteGamer,
It will set [Level] of the rest of people recursively under boss
and loop throgh the hierarchy.
(cteG.[Level] + 1)   means (his Leader level + 1).
Thus, the 2nd select query will start the 2st round of Recursive cteGamer
until the end of recursive.
In this case, we know ID=1 is the boss.
2nd select query will start from id=2 then id=3 then id=4 ... .
------------------------------
1.2.1.
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId ,
--        cteG.[Level] + 1
--FROM     Gamer g
```

```
--         JOIN cteGamer cteG ON g.LeaderId = cteG.GId
--WHERE    g.LeaderId = 2   or   4   or  6
The 2nd round of Recursive cteGamer will get all sub-member of the id=1 boss.
In this case, Id=2, 4, 6 are the sub-members of the id=1 boss.
(cteG.[Level] + 1)   means (his Leader level + 1).
Thus, (the cteG.[Level] of Id=2, 4, 6)  will be  (  (their Leader id=1 Boss level which is 1) + 1).
Therefore, (the cteG.[Level] of Id=2, 4, 6) will be 2.
------------------------------
1.2.2.
--SELECT   g.GamerId ,
--         g.Name ,
--         g.LeaderId ,
--         cteG.[Level] + 1
--FROM     Gamer g
--         JOIN cteGamer cteG ON g.LeaderId = cteG.GId
--WHERE    g.LeaderId = 3
The 3rd round of Recursive cteGamer will get all sub-member of the id=2 leader.
In this case, Id=3 is the sub-member of the id=2 Leader.
(cteG.[Level] + 1)   means (his Leader level + 1).
Thus, (the cteG.[Level] of Id=3)  will be  (  (their Leader id=2 leader level which is 2) + 1).
Therefore, (the cteG.[Level] of Id=3) will be 3.
------------------------------
1.2.3.
--SELECT   g.GamerId ,
--         g.Name ,
--         g.LeaderId ,
--         cteG.[Level] + 1
--FROM     Gamer g
--         JOIN cteGamer cteG ON g.LeaderId = cteG.GId
--WHERE    g.LeaderId = 7   or   8
The 3rd round of Recursive cteGamer will get all sub-member of the id=4 leader.
In this case, Id=7,8 are the sub-members of the id=4 Leader.
(cteG.[Level] + 1)   means (his Leader level + 1).
Thus, (the cteG.[Level] of Id=7,8)  will be  (  (their Leader id=4 leader level which is 2) + 1).
Therefore, (the cteG.[Level] of Id=7,8) will be 3.
------------------------------
1.2.4.
--SELECT   g.GamerId ,
--         g.Name ,
--         g.LeaderId ,
--         cteG.[Level] + 1
--FROM     Gamer g
--         JOIN cteGamer cteG ON g.LeaderId = cteG.GId
--WHERE    g.LeaderId = 5
The 4th round of Recursive cteGamer will get all sub-member of the id=3 leader.
In this case, Id=5 is the sub-member of the id=3 Leader.
(cteG.[Level] + 1)   means (his Leader level + 1).
Thus, (the cteG.[Level] of Id=5)  will be  (  (their Leader id=3 leader level which is 3) + 1).
Therefore, (the cteG.[Level] of Id=5) will be 4.
*/

=====================================================
```

# 5. GetOrganizationHierarchy

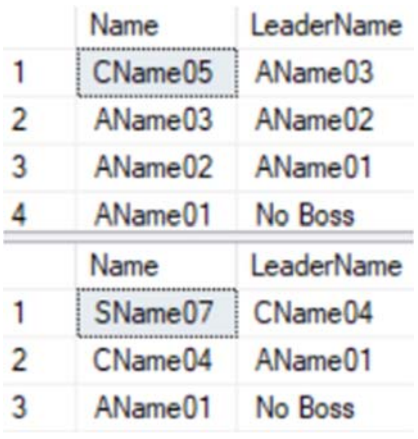
```
--==========================================================================================
--T017_05_GetOrganizationHierarchy
--==========================================================================================

--==========================================================================================
--T017_05_01
------------------------------------------------------------------------------
--T017_05_01_01
SELECT  g.Name ,
        ISNULL(g2.Name, 'Boss') AS [Leader Name]
```

```
FROM    Gamer g
        LEFT JOIN Gamer g2 ON g.LeaderId = g2.GamerId
WHERE   g.GamerId = 5;
GO -- Run the prvious command and begins new batch
```



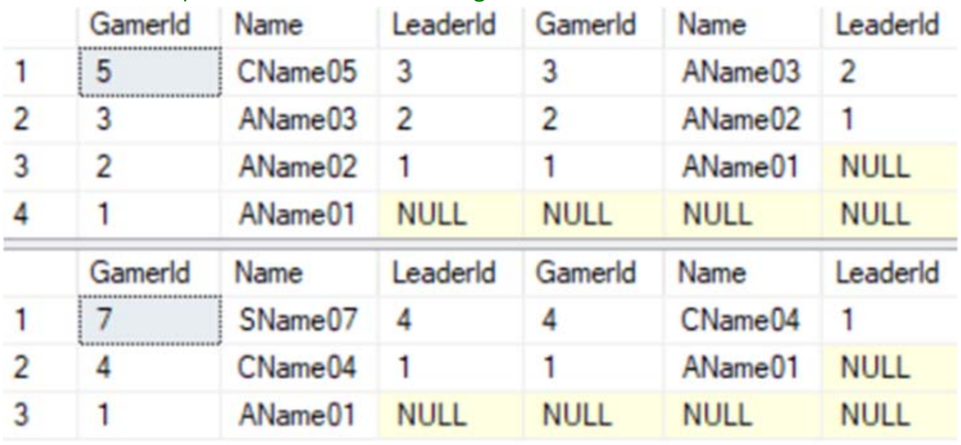
|   | Name | Leader Name |
|---|---|---|
| 1 | CName05 | AName03 |

```
------------------------------------------------------------------------------
--T017_05_01_02

/*
AName01
  |_______________________
  |          |            |
AName02    CName04      SName06
  |          |_________
  |          |        |
AName03    SName07   SName08
  |
CName05
Stored procedure spGetLeaders and spGetLeaders2
will take an ID INT as input,
Then return its leaders' information.
E.g.
--EXEC spGetLeaders 5;
will return information of ID=5, ID=3, ID2, ID1.
E.g.
--EXEC spGetLeaders 7;
will return information of ID=7, ID=4, ID1.
*/

GO -- Run the prvious command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'PROCEDURE'
                        AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                        AND SPECIFIC_NAME = 'spGetLeaders' ) )
    BEGIN
        DROP PROCEDURE spGetLeaders;
    END;
GO -- Run the previous command and begins new batch
CREATE PROC spGetLeaders ( @Id INT )
AS
    BEGIN
        WITH    cteGamer
                  AS ( --Anchor Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                       WHERE    GamerId = @Id
                       UNION ALL
                                   --Recursive Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                                JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
                    )
            --**The Changes here
           SELECT   cteG1.Name ,
                    ISNULL(cteG2.Name, 'No Boss') AS LeaderName
           FROM     cteGamer cteG1
                    LEFT JOIN cteGamer cteG2 ON cteG1.LeaderId = cteG2.GamerId;
    END;
GO -- Run the prvious command and begins new batch
EXEC spGetLeaders 5;
EXEC spGetLeaders 7;
GO -- Run the prvious command and begins new batch
```



```
     Name      LeaderName
1    CName05   AName03
2    AName03   AName02
3    AName02   AName01
4    AName01   No Boss

     Name      LeaderName
1    SName07   CName04
2    CName04   AName01
3    AName01   No Boss
```

```
------------------------------------------------------------------------------
--T017_05_01_03
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'PROCEDURE'
                        AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                        AND SPECIFIC_NAME = 'spGetLeaders2' ) )
    BEGIN
        DROP PROCEDURE spGetLeaders2;
    END;
GO -- Run the previous command and begins new batch
CREATE PROC spGetLeaders2 ( @Id INT )
AS
    BEGIN
        WITH    cteGamer
                  AS ( --Anchor Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                       WHERE    GamerId = @Id
                       UNION ALL
                                     --Recursive Member
                       SELECT   g.GamerId ,
                                g.Name ,
                                g.LeaderId
                       FROM     Gamer g
                                JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
                     )
            --**The Changes here
            SELECT *
            FROM     cteGamer cteG1
                     LEFT JOIN cteGamer cteG2 ON cteG1.LeaderId = cteG2.GamerId;
    END;
GO -- Run the prvious command and begins new batch
EXEC spGetLeaders2 5;
EXEC spGetLeaders2 7;
GO -- Run the prvious command and begins new batch
```



|   | GamerId | Name | LeaderId | GamerId | Name | LeaderId |
|---|---|---|---|---|---|---|
| 1 | 5 | CName05 | 3 | 3 | AName03 | 2 |
| 2 | 3 | AName03 | 2 | 2 | AName02 | 1 |
| 3 | 2 | AName02 | 1 | 1 | AName01 | NULL |
| 4 | 1 | AName01 | NULL | NULL | NULL | NULL |

|   | GamerId | Name | LeaderId | GamerId | Name | LeaderId |
|---|---|---|---|---|---|---|
| 1 | 7 | SName07 | 4 | 4 | CName04 | 1 |
| 2 | 4 | CName04 | 1 | 1 | AName01 | NULL |
| 3 | 1 | AName01 | NULL | NULL | NULL | NULL |

```
/*
0.
AName01
  |_______________________
  |          |           |
AName02    CName04     SName06
  |          |_________
  |          |        |
AName03    SName07   SName08
  |
CName05
----------------------------------
0.1.
----The 1st select query is Anchor Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = @Id
--UNION ALL
-------------------------------------------------
----The 2nd select query is Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--        JOIN cteGamer cteG ON g.GamerId = cteG.LeaderId
How does the recursive CTE execute?
Step1: Execute the anchor member and get result R0
Step2: Execute the recursive member by using R0 as input and output result R1
Step3: Execute the recursive member by using R1 as input and output result R2
Step4: Recursion goes on until the recursive member output result is NULL
Step5: Finally apply UNION ALL on all the results to produce the final output
----------------------------------------------------------------------
1.
--EXEC spGetLeaders 5;
This will output as following.
--Name    LeaderName
--CName05 AName03
--AName03 AName02
--AName02 AName01
--AName01 No Boss
---------------------------------
1.1.
```

```
----Anchor Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 5
The 1st round of Recursive cteGamer will get the parents-member of the id=5.
In this case, Id=3 is the parents-member of the id=5.
--AName01 No Boss
---------------------------------
1.2.
----Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 3
The 2nd round of Recursive cteGamer will get the parents-member of the id=3.
In this case, Id=2 is the parents-member of the id=3.
--AName01 No Boss
---------------------------------
1.3.
----Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 2
The 3rd round of Recursive cteGamer will get the parents-member of the id=2.
In this case, Id=1 is the parents-member of the id=2.
--AName01 No Boss
---------------------------------
1.4.
----Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 1
The 4th round of Recursive cteGamer will get the parents-member of the id=1.
In this case, nobody is the parents-member of the id=1.
--ISNULL(cteG2.Name, 'No Boss') AS LeaderName
Thus, it will return 'No Boss'
---------------------------------------------------------------------
2.
--EXEC spGetLeaders 7;
This will output as following.
--Name    LeaderName
--SName07 CName04
--CName04 AName01
--AName01 No Boss
--AName01 No Boss
---------------------------------
2.1.
----Anchor Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 7
The 1st round of Recursive cteGamer will get the parents-member of the id=7.
In this case, Id=4 is the parents-member of the id=7.
--AName01 No Boss
---------------------------------
2.2.
----Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 4
The 2nd round of Recursive cteGamer will get the parents-member of the id=4.
In this case, Id=1 is the parents-member of the id=4.
--AName01 No Boss
---------------------------------
2.3.
----Recursive Member
--SELECT   g.GamerId ,
--        g.Name ,
--        g.LeaderId
--FROM     Gamer g
--WHERE    GamerId = 1
The 3rd round of Recursive cteGamer will get the parents-member of the id=1.
In this case, nobody is the parents-member of the id=1.
--ISNULL(cteG2.Name, 'No Boss') AS LeaderName
Thus, it will return 'No Boss'
*/
```

```
================================================
```

# 6. Clean up

```
--==========================================================================================
--T017_06_Clean up
--==========================================================================================
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'Gamer' ) )
    BEGIN
        TRUNCATE TABLE Gamer;
        DROP TABLE Gamer;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'Team' ) )
    BEGIN
        TRUNCATE TABLE Team;
        DROP TABLE Team;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.TABLES
              WHERE     TABLE_NAME = 'vwGamerCount' ) )
    BEGIN
        DROP VIEW vwGamerCount;
    END;
GO -- Run the previous command and begins new batch
IF OBJECT_ID('tempdb..#TempGamerCount') IS NOT NULL
    BEGIN
        TRUNCATE TABLE #TempGamerCount;
        DROP TABLE #TempGamerCount;
    END;
```

```
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'PROCEDURE'
                        AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                        AND SPECIFIC_NAME = 'spGetLeaders' ) )
    BEGIN
        DROP PROCEDURE spGetLeaders;
    END;
GO -- Run the previous command and begins new batch
IF ( EXISTS ( SELECT    *
              FROM      INFORMATION_SCHEMA.ROUTINES
              WHERE     ROUTINE_TYPE = 'PROCEDURE'
                        AND LEFT(ROUTINE_NAME, 3) NOT IN ( 'sp_', 'xp_', 'ms_' )
                        AND SPECIFIC_NAME = 'spGetLeaders2' ) )
    BEGIN
        DROP PROCEDURE spGetLeaders2;
    END;
GO -- Run the previous command and begins new batch
```