Definitions

Power Query is a tool for extract-transform-load (ETL). That is, it lets you import and prepare your data for use in Microsoft data platforms including Power BI, Excel, Azure Data Lake Storage and Dataverse.

Power Query Editor is the graphical user interface to Power Query.

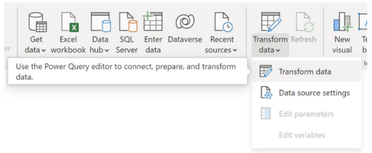
Power Query M ("M" for short) is the functional programming language used in Power Query.

DAX is the other programming language available for Power BI. DAX is used for data analysis rather than ETL. Learn more about it in the DataCamp DAX cheat sheet.

An expression is a single formula that returns a value.
A query is a sequence of expressions used to define more complex data transformations. Queries are defined using let- in code blocks.

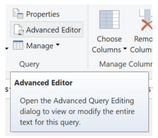
Accessing M in Power BI

M code can be seen in Power Query Editor. In the ribbon, click on 'Transform data' to open the Power Query Editor.



M code is shown in the Formula Bar.

M code can also be seen in the Advanced Editor window. Click 'Advanced Editor' to open the Advanced Editor window.



Creating values

```
999 // Define a number
true // Define a logical value
"DataCamp" // Define a text value
null // Define a null (missing value)
#date(2023, 12, 31) // Define a date with #date()
#datetime(2022, 9, 8, 15, 10, 0) // Define a datetime with #datetime()
>
```

Variables

```
// Variables are assigned by writing a query with let-in
let
  // Intermediate calculations
  TempF = 50
  TempC = 5 / 9 * (TempF - 32)
in
  // Resulting variable
  TempC
```

```
// By convention, variable names are UpperCamelCase
HeightM

// Quote variable names and prefix with # for non-standard names
#"Height in Meters"
```

Operators

Arithmetic operators

```
102 + 37 // Add two numbers with + 4 * 6    // Multiply two numbers with *
102 - 37 // Subtract a number with - 22 / 7   // Divide a number by another with /
```

Numeric comparison operators

```
3 = 3  // Test for equality with = 3 >= 3 // Test greater than or equal to with >=
3 <> 3 // Test for inequality with <> 3 < 4  // Test less than with <
3 > 1  // Test greater than with > 3 <= 4 // Test less than or equal to with <=
```

Logical Operators

```
not (2 = 2)          // Logical NOT with not (1 <> 1) and (1 < 1) // Logical AND with and (1 >= 1) or (1 < 1)  // Logical OR with or
```

Text Operators

```
"fish" & " & " & "chips" // Combine text with &
```

Numbers

Arithmetic

```
Number.Power(3, 4) // Raise to the power with Number.Mod(22, 7) // Get the remainder after Power()division with Mod()
Number.IntegerDivide(22, 7) // Integer divide Value.Equals(1.999999, 2, Precision.Double) // a number with IntegerDivide()Check number close to equal with Equals()
```

Math functions

```
Number.Ln(10) // Calculate natural logarithm with Ln()
Number.Exp(3) // Calculate exponential with Exp()
Number.Round(12.3456, 2) // Round to n decimal places with Round()
Number.Abs(-3) // Calculate absolute values with Abs()
Number.Sqrt(49) // Calculate the square root with Sqrt()
Number.IsNaN(Number.NaN) // Returns true if not a number
```

Text Values

Creating text

```
// Text values are double-quoted, and can span multiple lines
"M is a programming
language for ETL"

// Embed quotes in strings by doubling them """M is magnificent"", mentioned Mike."
```

```
// Include control characters with #()
"Split text with a tab character, #(tab), or start
a new line with carriage-return line feed,
#(cr,lf)"

// Embed # in strings with #(#)
"Hex codes for colors start with #(#)"
```

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Indexing

```
// Get the number of characters in text with Length() Text.Length("How long will dinner be? About 25cm.")
// Get a substring with Middle()
Text.Middle("Zip code: 10018", 10, 5)
```

Splitting and combining text

```
// Combine text, optionally separated with Combine() Text.Combine({"fish", "chips"}, " & ")
// Split text on a delimiter with Split() Text.Split("fish & chips", " & ")
```

Mutating text

```
// Convert text to upper case with Upper()
Text.Upper("iN cAsE oF eMeRgEnCy") // Returns "IN CASE OF EMERGENCY"

// Convert text to LOWer case with Lower()
Text.Lower("iN cAsE oF eMeRgEnCy") // Returns "in case of emergency"
```

```
// Convert text to title case with Proper()
Text.Proper("iN cAsE oF eMeRgEnCy") // Returns "In Case Of Emergency"

// Replace characters in text with Replace()
Text.Replace("Have a nice trip", " n", "n ")
// Returns "Have an ice trip"
```

Type Conversion

```
// Convert value to number with Number.From()// Convert number to text with Number.ToText() Number.From(true) // Returns 1—Formats: "D": integer digits, "E": exponential, "F": fixed, G": general, "N":
// Dates and datetimes given as time in days number, "P": percent
since 1899-12-30Number.ToText(4500, "E") // Returns "4.5E3" Number.From(#datetime(1969, 7, 21, 2, 56, 0)) // Returns 25405.12// Convert value to logical with Logical.From()
// Convert text to number with Number.FromText()Logical.From(2)
Number.FromText("4.5E3") // Returns 4500
```

Functions

```
// Define a function with (args) => calculations
let
  Hypotenuse = (x, y) => Number.Sqrt(Number.Power(x, 2) + Number.Power(y, 2)) in
  Hypotenuse
// each is syntactic sugar for a function with 1 arg named _
// Use it to iterate over lists and tables
each Number.Power(_, 2) // Same as (_) => Number.Power(_, 2)
```

Lists

Creation

```
// Define a list with {} // Lists can be nested
//You can include different data types including null {"outer", {"inner"}}
{999, true, "DataCamp", null}
 // Concatenate lists with &
{-1..3, 100} // Equivalent to {-1, 0, 1, 2, 3, 100}
// Define a sequence of numbers with m..n {1, 4} & {4, 9} // Returns {1, 4, 4, 9}
```

Example lists

```
let let
  Fruits = {"apple", null, "cherry"}  Menage = {1, -1, 0, 1, 2, 13, 80, 579}
in  in
  Fruits   Menage
```

Counting

```
// Access list elements with {}, zero-indexed// Get the first few elements with FirstN() Fruits{0} // 1st element; returns "apple"List.FirstN(Fruits, 2) // Returns {"apple", null}

// Accessing elements outside the range // Get the last few elements with LastN()
throws an errorList.LastN(Fruits, 2) // Returns {null, "cherry"} Fruits{3} // Throws an Expression.Error
// Get unique elements with Distinct()
// Append ? to return null if the index is List.Distinct(Menage) // Returns {1, -1, 0, 2, out of range13, 80, 579}
Fruits{3}? // Returns null
```

Selection

```
// Access list elements with {}, zero-// Get unique elements with Distinct() indexedList.Distinct(Menage) // Returns {1, -1, 0, 2, 13, Fruits{0} // 1st element; returns "apple"80, 579}

// Accessing elements outside the range // Get elements that match a criteria with Select() throws an errorList.Select(Menage, each _ > 1) // Returns {2, 13, Fruits{3} // Throws an Expression.Error80, 579}

// Append ? to return null if the index is // Return true if all elements match a criteria with out of rangeMatchesAll()
Fruits{3}? // Returns nullList.MatchesAll(Menage, each _ > 1) // Returns false

// Get the first few elements with FirstN()// Return true if any elements match a criteria with List.FirstN(Fruits, 2) // Returns {"apple", MatchesAny()
null}List.MatchesAny(Menage, each _ > 1) // Returns true

// Get the last few elements with LastN()// Get value from list of length 1, or return List.LastN(Fruits, 2) // Returns {null, default, with SingleOrDefault() "cherry"}List.SingleOrDefault(Menage, -999) // Returns -999
```

Manipulation

```
// Sort items in ascending order with Sort()// Remove items by position with RemoveRange() List.Sort(Menage) // Returns {-1, 0, 1, 1, 2, List.RemoveRange(Menage, 2, 3) // Returns {1, 13, 80, 579}-1, 13, 80, 579}

// Sort items in descending order// Repeat elements with Repeat() List.Sort(Menage, Order.Descending) // Returns List.Repeat({"one", "two"}, 2) // Returns
{579, 80, 13, 2, 1, 1, 0, -1}{"one", "two", "one", "two"}

// Reverse the order of items in a list with // Split list into lists of specified size with Reverse() Split()
List.Reverse(Menage) // Returns {579, 80, 13, List.Split(Menage, 2) // Returns {{1, -1}, {0, 2, 1, 0, -1, 1}1}, {2, 13}, {80, 579}}

// Get non-null values with RemoveNulls()// Flatten lists by removing 1 level of nesting List.RemoveNulls(Fruits) // Returns {"apple", with Combine()
"cherry"}List.Combine({{"alpha"}, {"bravo", {"charlie",
"delta"}}}) // Returns {"alpha", "bravo",
{"charlie", "delta"}}
```

Equality & membership

```
// Lists are equal if they contain the same elements in the same order
{1, 2} = {1, 2} // true {1, 2} = {2, 1} // false {1, 2} = {1, 2, 3} // false
```

Calculations

```
// Get the minimum value in a list with Min()// Get the sum of values in a list with Sum() List.Min({0, 7, -3, 2, 1}) List.Sum({0, 7, -3, 2, 1})

// Get the minimum value in a list with Max()// Get the product of values in a list with List.Max({0, 7, -3, 2, 1})Product()
List.Product({0, 7, -3, 2, 1})
// Get quantile values from a list with
Percentile()// Get the mean of values in a list with Average() List.Percentile(List.Average({0, 7, -3, 2, 1})
  {0, 7, -3, 2, 1}, {0.25, 0.5, 0.75},
  [PercentileMode=PercentileMode.SqlDisc]// Get the standard deviation of values in a list ) with StandardDeviation()
List.StandardDeviation({0, 7, -3, 2, 1})
```

Generation

```
// Generate random numbers between 0 and 1 // Generate a sequence of numbers with Numbers() with Random()List.Numbers(1, 5, 2)
List.Random(3)
// Mimic a for loop with Generate()
// Generate a sequence of dates with Dates()List.Generate(
List.Dates(#date(2023, 1, 1), 3, #duration(7,   () => 2,
0, 0, 0))   each _ < 20,
  each Number.Power(_, 2))
```

Set operations

```
// Get values in all inputs with Intersect()
List.Intersect({{1, 3, 6, 10, 15}, {21, 15, 9, 3}, {0, 3, 6}}) // Returns {3}

// Get values in any inputs with Union()
List.Union({{1, 3, 6, 10, 15}, {21, 15, 9, 3}, {0, 3, 6}}) // Returns {0, 1, 3, 6, 9, 10, 15, 21}

// Get value in one set but not the other with Difference()
List.Difference({1, 3, 6, 10, 15}, {21, 15, 9, 3}) // Returns {1, 6, 10}
```