# POLYGON

POLYGON returns properties of an area enclosed by a polygon in two dimensions relative to lines, axes and points:

- properties of <u>an area enclosed</u> by a polygon in two dimensions or;
- properties of <u>a line section within a polygon</u> in two dimensions or;
- Information on <u>whether a point is located inside or outside</u> a polygon in two dimensions.

## Syntax

1. POLYGON(Pno%, Ndim%[=2], "ColLab$_1", "ColLab$_2", X0, Y0, XN, YN, Mode%)
2. POLYGON(0, Npoints%, X_11, Y_12, X_21, Y_22,.., X_n1, Y_n2, X0, Y0, XN, YN, Mode%)
3. POLYGON(@ObjFn(..), Ndim%[=2], @ObjColPar_1, @ObjColPar_2, X0, Y0, XN, YN, Mode%)
4. POLYGON(Telitab$, Ndim%[=2], "ColLab$_1", "ColLab$_2", X0, Y0, XN, YN, Mode%)

**Arguments**

- Pno% is the number that refers to the TeLiTab sets in the Data slot. Pno% should be an integer value or a parameter which is assigned an integer value and is the number of the TeLiTab set in the expressions data slot.
- Ndim% is the number of dimensions, which is 2 for the POLYGON function.
- Npoints% is the number of points (X,Y) that are given in direct definition.
- @ObjFn() refers to the Object from which data will be used.
- TeLiTab$ refers to the string parameter that contains the TeLiTab data to be used.
- "ColLab$_1" and @ObjColPar_1 refer to the column containing the first values.
- "ColLab$_2" and @ObjColPar_2 refer to the column containing the second values.
- X_11, Y_12, X_21, Y_22,.., X_n1, Y_n2 are the X and Y coordinates of the points of the polygon that are given in the direct definition.
- X0, Y0 are the X and Y coordinates of point (X0, Y0).
- XN, YN are the X and Y coordinates of point (XN, YN).
- Mode% is the option of the function. There are 25 mode. See Remarks for all options.

## Remarks

POLYGON can be used in the following ways:

**1. Properties of an area enclosed by a polygon in two dimensions**

For Mode% = **1 to 15** the function POLYGON returns a <u>property of the polygon</u>.

In these cases the points (X0, Y0) and (XN, YN) are not used. **These points are no part of the polygon point set and X0, Y0, XN, YN should all be 0, to make sure that they will not influence the result.**

- For Mode%=1, the function returns the area of the polygon.
- For Mode%=2, idem with the polygon mirrored in the X-axis.
- For Mode%=3, idem with the polygon mirrored in the Y-axis.
- For Mode%=4, the function returns the COGX (X coordinate of the Centre Of Gravity) of the polygon.
- For Mode%=5, idem with the polygon mirrored in the X-axis.
- For Mode%=6, idem with the polygon mirrored in the Y-axis.
- For Mode%=7, the function returns the COGY (Y coordinate of the Centre Of Gravity) of the polygon.
- For Mode%=8, idem with the polygon mirrored in the X-axis.
- For Mode%=9, idem with the polygon mirrored in the Y-axis.
- For Mode%=10, the function returns the 2nd order moment of the area around the X-axis through the COG.
- For Mode%=11, idem with the polygon mirrored in the X-axis.
- For Mode%=12, idem with the polygon mirrored in the Y-axis.
- For Mode%=13, the function returns the 2nd order moment of the area around the Y-axis through the COG.
- For Mode%=14, idem with the polygon mirrored in the X-axis.
- For Mode%=15, idem with the polygon mirrored in the Y-axis.

**2. Properties of a line section within a polygon in two dimensions**

For Mode% = **16 to 24** the function POLYGON returns <u>properties of a line section within a polygon</u> in two dimensions.

**In these cases the point (X0, Y0) is the starting point and (XN, YN) is the end point of the line.** This line is not a part of the polygon and the property is calculated only for the section(s) inside the polygon.

- For Mode%=16, the function returns the length of the line section(s) within the polygon.
- For Mode%=17, idem with the polygon mirrored in the X-axis.
- For Mode%=18, idem with the polygon mirrored in the Y-axis.
- For Mode%=19, the function returns the 1st order moment of the line section(s) within the polygon around (X0, Y0).
- For Mode%=20, idem with the polygon mirrored in the X-axis.
- For Mode%=21, idem with the polygon mirrored in the Y-axis.
- For Mode%=22, the function returns the 2nd order moment of the line section(s) within the polygon around (X0, Y0).
- For Mode%=23, idem with the polygon mirrored in the X-axis.

- For Mode%=24, idem with the polygon mirrored in the Y-axis.

**3. Determine whether a point is located inside or outside a polygon in two dimensions**

For Mode% = **25 to 27** the function POLYGON <u>returns "1" when point (X0, Y0) is inside the polygon and "0" when it is outside</u> the polygon .

In these cases the point (XN, YN) is not used. **XN, YN should both be 0, to make sure that they will not influence the result.**

- For Mode%=25, the function returns "1" when point (X0, Y0) is inside the polygon and "0" when it is outside the polygon.
- For Mode%=26, idem with the polygon mirrored in the X-axis.
- For Mode%=27, idem with the polygon mirrored in the Y-axis.

# Examples

## Example 1: Syntax 1 (telitab in dataslot), Properties of the area

The relation

POLYGON(1, 2, "XC", "YC", 0, 0, 0, 0, Mode)

contains the following Telitab set in the Data slot:

```
|POLYGON1|
0
2 "XC" "YC"
"1" 0 0
"2" 1 0
"3" 1 1
"4" 0 1|
```

The polygon is a square with corner points (0,0), (1,0), (1,1) and (0,1), this gives for example the following properties:

- For Mode = 1, the area of the polygon is returned: 1.00
- For Mode = 2, the area of the polygon mirrored in the X-axis is returned: 2.00
- For Mode = 4, the COGX (X coordinate of the Centre Of Gravity) of the polygon is returned: 0.50
- For Mode = 10, the 2nd order moment of the area around the X-axis through the COG is returned: 0.08
- For Mode = 15, the 2nd order moment of the area around the Y-axis through the COG is returned for the polygon mirrored in the Y-axis: 0.67

## Example 2: Syntax 1 (telitab in dataslot), Properties of a line section

The function:

POLYGON(1, 2, "XC", "YC", X0, Y0, XN, YN, Mode)

with the TeLiTab of the previous example in the dataset gives the possibility to calculate properties of a line section within the polygon. Lets take a look at a line between the points (0,0) and (2,2):

X0 = 0
Y0 = 0
XN = 2
YN = 2

Only the section between the points (0,0) and (1,1) is within the polygon, this gives for example the following properties:

- For Mode = 16, the lenght of the line section is returned: 1.41
- For Mode = 19, the 1st order moment of the line section around (X0, Y0) is returned: 0.24

## Example 3: Syntax 1 (telitab in dataslot), Information on wheter a point is located inside or outside the polygon

The function:

POLYGON(1, 2, "XC", "YC", X0, Y0, 0, 0, Mode)

with the TeLiTab of the first example in the dataset gives the possibility to determine whether a point is located inside or outside a polygon. Lets take a look at the point (-0.5 , 0.5):

X0 = -0.5
Y0 = 0.5

This results in the following properties:

- For Mode = 25, the result is 0 because the point (X0, Y0) is not inside the polygon.
- For Mode = 27, the result is 1 because the point (X0, Y0) is inside the polygon mirrored in the Y-axis.

## Example 4: Syntax 2 (direct definition)

In direct definition, the points of the polygon are stated in the relation itself:

POLYGON(0, Npoints%, X_11, Y_12, X_21, Y_22,.., X_n1, Y_n2, X0, Y0, XN, YN, Mode%)

The minimum number of (X,Y) data points Npoints% in the list is 3 in which case the polygon is a triangle.

The syntax

POLYGON(0, 4, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, Mode)

is the same polygon as in the previous examples and e.g. for Mode = 1, the area of the polygon is returned: 1.00

---

Quick links: Functions overview | Attribute overview | Constants overview | Dimensions overview