

Assignment

EE23BTECH11008 - Meenakshi

Q: The difference between any two cosecutive interior angles of a polygon is 5° . If the smallest angle is 120° , find the number of sides of polygon.

Solution:

Variable	Description	Value
$x(0)$	first term of AP	120
d	common difference of AP	5
$x(n)$	general term of AP	none

TABLE 0: input parameters

Sum of interior angles of a polygon with $n + 1$ sides is given by

$$S = (n - 1)180 \quad (1)$$

Sum of n terms of AP is given by

$$y(n) = \sum_{k=0}^n x(k) \quad (2)$$

$$= x(n) * u(n) \quad (3)$$

$$x(n) * u(n) = (n - 1)180 \quad (4)$$

$$Y(z) = X(z)U(z) \quad (5)$$

$$= \left(\frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \right) \cdot \frac{1}{1 - z^{-1}} \quad |z| > 1 \quad (6)$$

$$= \frac{120}{(1 - z^{-1})^2} + \frac{5z^{-1}}{(1 - z^{-1})^3} \quad |z| > 1 \quad (7)$$

$$= \frac{120}{1 - z^{-1}} + \frac{125z^{-1}}{1 - z^{-1}} + \frac{130z^{-2}}{(1 - z^{-1})^2} + \frac{5z^{-3}}{(1 - z^{-1})^3} \quad (8)$$

applying inverse Z-transform for each term and solving we get,

$$y(n) = \frac{n + 1}{2} (240 + 5n) u(n) \quad (9)$$

now from (4)

$$y(n) = (n - 1)180 \quad (10)$$

$$\frac{n + 1}{2} (240 + 5n) u(n) = (n - 1)180 \quad (11)$$

$$(12)$$

now replace n by $n-1$:

$$n(235 + 5n) = (n - 2)360 \quad (13)$$

$$5n^2 - 125n + 720 = 0 \quad (14)$$

$$n = 16, 9 \quad (15)$$

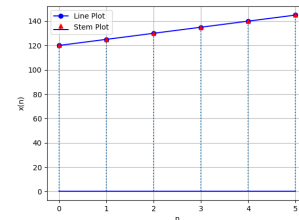


Fig. 0: Plot of the general term taken from Python