

# Assignment

EE23BTECH11008 - Meenakshi

Q:The difference between any two cosecutive interior angles of a polygon is  $5^\circ$ . If the smallest angle is  $120^\circ$ , 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

$$y(n) = x(n) * u(n) \quad (2)$$

where  $x(n) = 120 + 5n$

$$x(n) * u(n) = (n - 1)180 \quad (3)$$

$$Y(z) = X(z)U(z) \quad (4)$$

$$= \left( \frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \right) \frac{1}{1 - z^{-1}} \quad |z| > 1 \quad (5)$$

$$= \frac{120}{(1 - z^{-1})^2} + \frac{5z^{-1}}{(1 - z^{-1})^3} \quad |z| > 1 \quad (6)$$

$$(n + 1)u(n) \xrightarrow{Z} \left( \frac{1}{(1 - z^{-1})^2} \right) \quad |z| > 1 \quad (7)$$

$$\frac{(n)(n - 1)}{2}u(n - 1) \xrightarrow{Z} \left( \frac{z^{-1}}{(1 - z^{-1})^3} \right) \quad |z| > 1 \quad (8)$$

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 (3)

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

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

now replace  $n$  by  $n - 1$ :

$$n(235 + 5n) = (n - 2)360 \quad (12)$$

$$5n^2 - 125n + 720 = 0 \quad (13)$$

$$n = 16, 9 \quad (14)$$

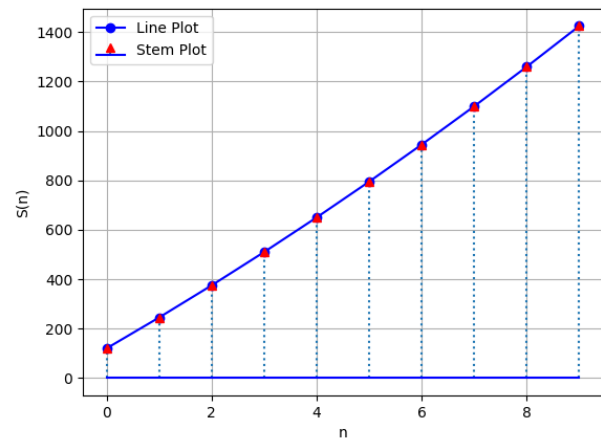


Fig. 0: Plot of the sum of n terms taken from Python