10.5.4-5

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Question:
A small terrace at a football ground comprises of 15 steps each of which is 50 m long and built of solid concrete.Each step has a rise of 1/4 m and a tread of 1/2 m. Calculate the total volume of concrete required to build the terrace. [Hint: Volume of concrete required to build the first step=

$$\text{volume} = 1/4 \cdot 1/2 \cdot 50 \tag{1}$$

solution

parameter for step one	value
length	50
breadth	0.25
height	0.5
volume	6.25

TABLE 0: input parameters

(2)

$$l_n = l_{n+1} \tag{3}$$

$$b_n = b_{n+1} \tag{4}$$

$$h_{n+1} - h_n = 0.25 \tag{5}$$

$$V_{n+1} - V_n = 6.25 \tag{6}$$

$$S_n = \frac{n+1}{2}[2a + (n)d] \tag{7}$$

$$n = 0, 1, 2, 3, ... \tag{8}$$

here

parameter	value	measurement
a	6.25	first term
d	6.25	common difference
n	14	no of terms from 0

TABLE 0: formula parameters

(9)

$$S_n = \frac{14+1}{2}[12.5 + (14)6.25] \tag{10}$$

$$S_n = \frac{15}{2}[12.5(14)6.25] \tag{11}$$

$$S_n = \frac{15}{2}[12.5 + 87.5] \tag{12}$$

$$volume = (7.5) \cdot 100 = 750m^3 \tag{13}$$

plot of x(n) and n

$$\text{x(n)} = (a + n \cdot d) \cdot u(n) \tag{14}$$

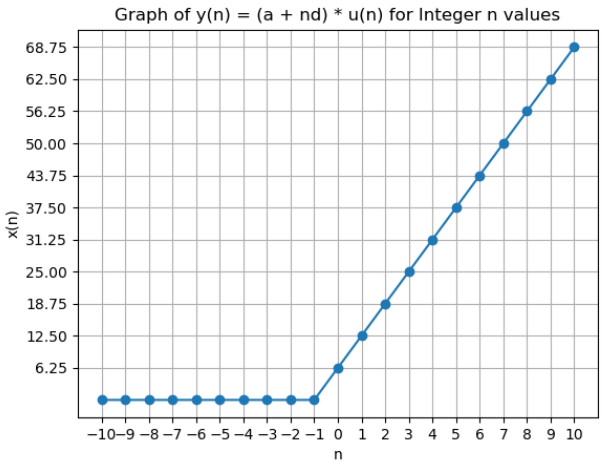

Fig. 1

(15)

$$x(n) \overset{Z}{\longleftrightarrow} X(Z) \tag{16}$$

$$x(n) = (a + nd)u(n) \tag{17}$$

$$X(Z) = \sum_{-\infty}^{\infty} x(n)Z^{-n} \tag{18}$$

$$= \frac{x(0)}{1 - z^{-1}} + \frac{dz^{-1}}{(1 - z^{-1})^2} \quad , |z| > |r| \tag{19}$$

$$= \frac{6.25}{1 - z^{-1}} + \frac{6.25z^{-1}}{(1 - z^{-1})^2} \quad , |z| > |r| \tag{20}$$