

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=

$$\text{volume} = 1/4 \cdot 1/2 \cdot 50 \quad (1)$$

solution

volume of any step = $\text{length} \cdot \text{breadth} \cdot \text{height}$ (2)

length, breadth, height of first step are 50m, 0.25m, 0.5m

$$\text{volume of first step} = 50m \cdot 0.25m \cdot 0.5m \quad (3)$$

$$= 6.25m^3$$

= All the dimensions except height are same for all 15 steps.

= The height difference between any 2 consecutive steps is 0.25 m.

= so, the height of the second step is $0.25m + 0.25m = 0.5m$

= So, the volume of the second step is $(50m)(0.5m)(0.5m) = 12.5m^3$

= in the similar way the volume of the third step is $18.75m^3$

= so, the volume of the steps are in arithmetic progression.

$$S_n = \frac{n+1}{2} [2a + (n)d] \quad (4)$$

$$\text{here } n \text{ starts from } 0 \quad (5)$$

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

$$S_n = \frac{14+1}{2} [12.5 + (14)6.25] \quad (6)$$

$$S_n = \frac{15}{2} [12.5 + (14)6.25] \quad (8)$$

$$S_n = \frac{15}{2} [12.5 + 87.5] \quad (9)$$

$$\text{volume} = (75) \cdot 100 \quad (10)$$

volume is 750

hence, the volume of the total concrete is $750 m^3$

plot of $x(n)$ and n

$$x(n) = (a + n \cdot d) \cdot u(n) \quad (11)$$

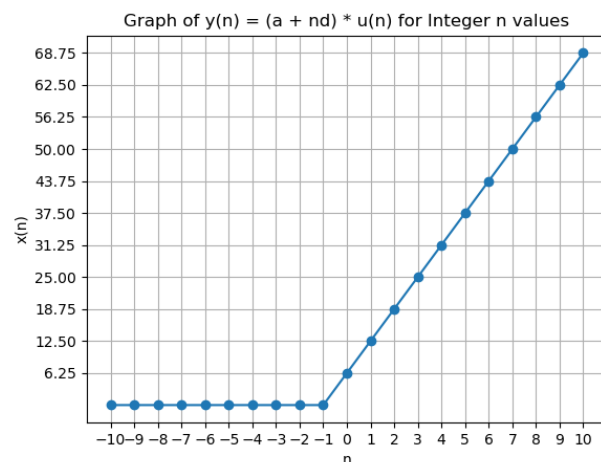


Fig. 1

here