

EE23BTECH11033-killana jaswanth

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 $\frac{1}{4}$ m and a tread of $\frac{1}{2}$ m. Calculate the total volume of concrete required to build the terrace. [Hint: Volume of concrete required to build the first step=

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

solution

dimensions of any step = *length* · *breadth* · *height*

length of first step is l

breadth of first step is b

height of first step = h.

$$l = 50m \quad (1)$$

$$b = 0.25m \quad (2)$$

$$h = 0.5m \quad (3)$$

=

$$\text{dimensions of first step} = 50m \cdot 0.25m \cdot 0.5m$$

=volume of first step is 6.25 cubicmeters

=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 $50m \cdot 0.25m \cdot 0.5m = 12.5$ cubicmeters

=in the similar way the volume of the third step is 18.75 cubicmeters

=so, we can clearly notice that the volume of the steps are in arithmetic progression.

=the first term of A.P is 6.25,

=the common difference is 6.25

=we have to find the sum of first 15 terms

=the formula of sum of first n terms in an AP is

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

=n= number of terms

=a is first term of the AP

d is the common difference
here

$$a = 6.25 \quad (4)$$

$$d = 6.25 \quad (5)$$

$$n = 15 \quad (6)$$

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

$$S_n = \frac{15}{2}[12.5 + (15 - 1)6.25]$$

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

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

$$\text{volume} = 7.5 \cdot 100$$

volume is 750

hence, the volume of the total concrete is 750 cubicmeters