

10.5.4-3

EE23BTECH11023-ABHIGNYA GOGULA*

Question:

A ladder has rungs 25cm apart. The rungs decrease uniformly in length from 45cm at the bottom to 25cm at the top. If the top and bottom rungs are 2 and 1/2 meter apart, what is the length of wood required for the rungs?

Solution:

To find the total length of wood required for the rungs of the ladder:

The ladder has rungs uniformly spaced at 25 cm apart. The lengths of the rungs decrease uniformly from 45 cm at the bottom to 25 cm at the top.

Calculate the number of rungs:

The top and bottom rungs are 2 and 1/2 meters apart, which is 250 cm (2.5 meters \times 100 cm/meter = 250 cm). The total length of the ladder: Total length = distance between top and bottom rungs + length of bottom rung + length of top rung
Total length = 250 cm + 45 cm + 25 cm = 320 cm

Next, calculate the number of rungs:

Number of rungs = $\frac{\text{Total length of the ladder}}{\text{Spacing between rungs}}$

Number of rungs = $\frac{320 \text{ cm}}{25 \text{ cm}} = 12.8$

However, a fraction of a rung isn't possible, so there are 12 rungs in total.

Now, calculate the sum of the lengths of the rungs:

Sum of rung lengths = Number of rungs \times Average of first and last rung length

Sum of rung lengths = $12 \times \left(\frac{45 \text{ cm} + 25 \text{ cm}}{2} \right) = 12 \times \left(\frac{70 \text{ cm}}{2} \right) = 12 \times 35 \text{ cm} = 420 \text{ cm}$

Therefore, the total length of wood required for the rungs of the ladder is 420 centimeters.

Parameter	Value
Spacing between rungs	25 cm
Length of bottom rung	45 cm
Length of top rung	25 cm
Total length of ladder	320 cm