Sequence(19) 10.5.3

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Question :-

200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on . In how many rows are the 200 logs placed and how many logs are in the top row?

Symbol	Description	Value
$x(0)$	bottom row	20
d	common difference	-1
$y(n)$	total number of logs	200
$x(n)$	number of logs in n row	depends on n

TABLE I

For an Arithmetic Progression :-

$$x(n) = [x(0) + nd]\,u(n) \tag{1}$$

$$= [20 - n]\,u(n) \tag{2}$$

$$\implies X(z) = \frac{20 - 21z^{-1}}{(1 - z^{-1})^2} \quad |z| > 1 \tag{3}$$

$$200 = \frac{1}{2}\left[20\,(n+2)\,(n+1) - 21\,(n)\,(n+1)\right] \tag{4}$$

$$400 = (n+1)\,(40 - n) \tag{5}$$

$$n = 15\ ,\ 24 \tag{6}$$

Using equation (**??**)

$$x(15) = 5 \tag{7}$$

$$x(24) = -4 \tag{8}$$

x(24) is rejected because it is negative

$$x(15) = 5 \tag{9}$$