NCERT DISCRETE

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Question 10.5.3.5: The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.
solution:
Given AP is 5, . . . , 45.
Therefore $x_1 = 5$ and $x_n = 45$ and given S_n=400.

x_1	x_n	S_n
5	45	400

Table 1: Given inputs

n	d
?	?

Table 2: Finding Variables

we know the equation of x_n is

$$x_n = x_1 + (n-1)d \tag{1}$$

by substituting the values of x_1 and x_n in the equation 1, we get

$$40 = (n-1)d \tag{2}$$

Also we know the equation of S_n is

$$S_n = \frac{n}{2}[2x_1 + (n-1)d] \tag{3}$$

by substituting the values of S_n, x_1 and (n-1)d in the equation 3, we get

$$400 = \frac{n}{2}[10 + 40] \tag{4}$$

$$800 = 50n \tag{5}$$

Therefore,

$$n = 16 \tag{6}$$

by substituting the value of n in the equation 2, we get

$$40 = 15d \tag{7}$$

$$d = \frac{8}{3} \tag{8}$$

Therefore the number of terms n=16 and the common difference d=$\frac{8}{3}$.