Assignment 1

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Question 10.5.2.8:
An AP consists of 50 terms of which 3^{rd} term is 12 and the last term is 106. Find the 29^{th} term.
Solution :
General form of n^{th} term of an AP is

$$a_n = a_0 + nd \tag{1}$$

Where d is the common difference of an AP.
Given that a_3 is 12.

$$a_0 + 3d = 12 \tag{2}$$

Given that a_{50} is 106.

$$a_0 + 50d = 106 \tag{3}$$

By solving equations (2) and (3) we get $d = 2$ and $a_0 = 6$.
From (1), we know that

$$a_{29} = a_0 + 29d \tag{4}$$

By substituting values of a_0 and d in equation (4) we get $a_{29} = 64$.

Question 11.9.3.18:
Find the sum to n terms of the sequence $8, 88, 888, 8888 \ldots$
Solution :
In the above series $a_1 = 8, a_2 = 88, a_3 = 888 \ldots$
By this observation we can conclude that

$$a_n = 88 \ldots ntimes$$

This can also be represented as

$$a_n = 8(10)^0 + 8(10)^1 + \ldots + 8(10)^{n-1} \tag{1}$$

Now, finding the sum of the series till n terms:

$$S_n = a_1 + a_2 + a_3 + \ldots + a_n$$

On substituting (1) in the above equation we get

$$S_n = n \times 8(10)^0 + (n-1) \times 8(10)^1 \ldots + 1 \times 8(10)^{n-1} \tag{2}$$

This is an AGP. Therefore,

$$10S_n = n \times 8(10)^1 + (n-1) \times 8(10)^2 + \ldots + 1 \times 8(10)^n \tag{3}$$

Now, subtracting (2) from (3)

$$9S_n = 8(10)^1 + 8(10)^2 + \ldots + 8(10)^n - 8n$$

$$S_n = \left(\frac{8}{9}\right)\left(\left(\frac{10^n - 1}{10 - 1}\right) 10 - n\right)$$

$$S_n = \left(\frac{80}{81}\right)(10^{n-1} - 1)$$

Therefore, the above expression is the required expression.