Exercise 11C

Question 16:
All 3 digit numbers which are divisible by 13 are 104, 117, 130, 143, ... 988
This is an AP in which a = 104, d = 117 - 104 = 13 and l = 988
Let the number of these term be n, then

$$T_n = 988 \Rightarrow a + (n-1)d = 988$$

$$\Rightarrow 104 + (n-1)13 = 988$$

$$\Rightarrow (n-1)13 = 884$$

$$\Rightarrow (n-1) = 68 \Rightarrow n = 69$$

$$\text{Required sum} = \frac{n}{2}(a+l)$$

$$= \frac{69}{2}(104 + 988) = 69 \times 546 = 37674$$

Question 17:
Let a be the first term and d be the common difference of the given AP, then

$$T_2 = 2 \text{ and } T_4 = 8$$

$$\Rightarrow a + (2-1)d = 2 \text{ and } a + (4-1)d = 8$$

$$a + d = 2 \quad ----(1)$$

$$a + 3d = 8 \quad ----(2)$$

On subtracting (1) from (2), we get

$$2d = 6$$

$$d = 3$$

substituting $d = 3$ in (1)

$$a + 3 = 2$$

$$a = -1$$

$$\therefore a = -1, d = 3, n = 51$$

$$\text{Sum of first 51 terms} = \frac{n}{2}[2a + (n-1)d] \text{ where } n = 51$$

$$= \frac{51}{2}[2 \times (-1) + (51-1) \times 3]$$

$$= \frac{51}{2}(-2 + 150) = 51 \times 74 = 3774$$

Question 18:
Let a and d be the first term and common difference of an APrespectively.
n = 20

$$T_n = a + (n-1)d$$

$$T_5 = a + (5-1)d = a + 4d = -4 \text{ - - - } (1)$$

$$T_{12} = a + (12-1)d = a + 11d = -18 \text{ - - } (2)$$

Subtracting (1) from (2)

$$7d = -18 + 4 = -14 \quad \therefore d = -2$$

from (1), $a + 4 \times (-2) = -4$

$$\therefore \quad a = 8 - 4 = 4$$

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

$$\therefore \quad S_{20} = \frac{20}{2}[2 \times 4 + (20-1) \times (-2)]$$

$$= 10(8 - 38) = -300$$

Question 19:
Here a = 21, d = (18 - 21) = -3
Let the required number of terms be n, then

$$S_n = 0 \Rightarrow \frac{n}{2}[2a + (n-1)d] = 0$$

$$\Rightarrow \quad \frac{n}{2}[2 \times 21 + (n-1)(-3)] = 0$$

$$\Rightarrow \frac{n}{2}(45 - 3n) = 0$$

$$\Rightarrow n(45 - 3n) = 0$$

$$\Rightarrow 45 - 3n = 0 \Rightarrow 3n = 45$$

$$\Rightarrow n = 15$$

sum of first 15 terms = 0

Question 20:
Here a = 63, d = 60 - 63 = -3
Let the sum of n terms be 693, then

$$S_n = 693 \Rightarrow \frac{n}{2}\left[2a + (n-1)d\right] = 693$$

$$\Rightarrow \frac{n}{2}\left[2 \times 63 + (n-1)(-3)\right] = 693$$

$$\Rightarrow n\left[126 - 3n + 3\right] = 1386$$

$$\Rightarrow 126n - 3n^2 + 3n = 1386$$

$$\Rightarrow 129n - 3n^2 = 1386$$

$$\Rightarrow 3n^2 - 129n + 1386 = 0$$

$$\Rightarrow n^2 - 43n + 462 = 0$$

$$\Rightarrow n^2 - 22n - 21n + 462 = 0$$

$$\Rightarrow n(n-22) - 21(n-22) = 0$$

$$\Rightarrow (n-22)(n-21) = 0$$

$$\Rightarrow n = 22 \text{ or } n = 21$$

sum of first 22 terms = sum of first 21 terms = 693

$\therefore$ This means that 22^{nd} term is zero

$T_{22} = 0$

********** END **********