Ans
5.7.21

13. How many three digit no.'s are divisible by 7?

A: First three digit no. divisible by 7 = 105
Next no. 105 + 7 = 112
∴ 105, 112, ...
First term = 105, d = 7

The maximum possible 3-digit no. is 999. When we divide it by 7 remainder will be 5. 999 − 5 = 994
∴ The maximum possible 3-digit no. divisible by 7.
Series is 105, 112, 119, ..., 994
nth term is 994
a = 105, d = 7, n = ?
$a_n = 994$
$a_n = a + (n-1)d$
⇒ $994 = 105 + (n-1)7$
⇒ $889 = (n-1)7$ ⇒ $n = 128$

∴ 128 three-digit no are divisible by 7.

14. How many multiples of 4 lies between 10 & 250?

A. Multiple of 4
4, 8, 12, 16, 20, 24, ----

First term is 12, d = 4

When we divide 250 by 4, remainder will be 2. 250 - 2 = 248 is divisible by 4.

Series: 12, 16, 20, 24, ----, 248

$a_n = 248$

$\Rightarrow 248 = 12 + (n-1)4 \Rightarrow 248 - 12 = (n-1) \times 4$

$\Rightarrow 236 = (n-1) \times 4 \Rightarrow \frac{236}{4} = n-1$

$\Rightarrow 59 = n-1 \Rightarrow n = 60$

15. For what value of n, are the n^{th} term of two APs: 63, 65, 67, ---- & 3, 10, 17, ---- equal?

A. AP, 63, 65, 67, ----

$a = 63$, $d = 65 - 63 = 2$

$\Rightarrow a_n = 63 + (n-1)2 = 63 + 2n - 2$

$\Rightarrow a_n = 61 + 2n$ (1)

3, 10, 17, ----

$a = 3$, $d = 10 - 3 = 7$

$a_n = 3 + (n-1)7$

$\Rightarrow a_n = 3 + 7n - 7 \Rightarrow a_n = 7n - 4$ (2).

$61 + 2n = 7n - 4$

$\Rightarrow 61 + 7 = 5n \Rightarrow 5n = 65 \Rightarrow n = 13$

$\therefore$ 13th term of both these AP are equal to each other

Q. Determine the AP. whose third term is 16 & 7th term exceeds the 5th term by 12.

A. $a_3 = 16$

$a + (3-1)d = 16 \Rightarrow a + 2d = 16 \quad (1)$

$a_7 - a_5 = 12$

$[a + (7-1)d] - [a + (5-1)d] = 12$

$\Rightarrow (a + 6d) - (a + 4d) = 12 \Rightarrow 2d = 12 \Rightarrow d = 6$

$a + 2d = 16$

$\Rightarrow a + 2(6) = 16 \Rightarrow a + 12 = 16 \Rightarrow a = 4.$

2nd term $= 4 + 6 = 10$

3rd term $= 10 + 6 = 16$

AP, $4, 10, 16, \ldots$

Q. Find the 20th term from last term of AP:
$3, 8, 13, \ldots 253$

A. AP: $3, 8, 13, \ldots 253$

$d = 5$

In reverse order $253, 248, 243, \ldots 13, 8, 3$

$n = 20, \quad d = 248 - 253 = -5$

$a_n = 253 + (20-1)(-5)$

$\Rightarrow a_n = 253 + 19 \times (-5) \Rightarrow a_n = 253 - 95 \Rightarrow a_n = 158$

Q. The sum of 4th & 8th term of an AP is 24 & sum of 6th & 10th term is 44. Find first three term of AP.

A. $a_4 = a + (4-1)d \Rightarrow a_4 = a + 3d$

$a_8 = a + 7d$

$a_6 = a + 5d$

$a_{10} = a + 9d$

$a_4 + a_8 = 24$

$a + 3d + a + 7d = 24$

$\Rightarrow 2a + 10d = 24$

$a_6 + a_9 = 44$

$(a+5d) + (a+9d) = 44 \Rightarrow 2a + 14d = 44$

$\Rightarrow 2a = 44 - 14d \Rightarrow a = \frac{44-14d}{2}$

$2 \times \left(\frac{44-14d}{2}\right) + 10d = 24$

$\Rightarrow 44 - 14d + 10d = 24 \Rightarrow 44 - 4d = 24 \Rightarrow 44 - 24 = 4d$

$\Rightarrow 20 = 4d \Rightarrow \frac{20}{4} = d \Rightarrow d = 5$

$a = \frac{44 - (4)(5)}{2} \Rightarrow \frac{44-20}{2} = \frac{-26}{2} = -13$

2nd term $= -13 + 5 = -8$

3rd term $= -8 + 5 = -3$.

19. A \$ salary is increased by ₹200
Salaries of each year after 1995 \$ are 5000, 5200, 5400

$a = 5000 \quad d = 200$

$a_n = 7000$

$7000 = 5000 + (n-1)200 \Rightarrow 200(n-1) = 2000$

$\Rightarrow (n-1) = 10 \Rightarrow n = 11$

∴ 11th yr, his salary will be ₹ 7000

20. A $a = 5, \quad d = 1.75, \quad a_n = 20.75$

$20.75 = 5 + (n-1) \times 1.75 \Rightarrow 15.75 = (n-1) \times 1.75$

$(n-1) = \frac{15.75}{1.75} = \frac{1575}{175} = \frac{63}{7} = 9$

$n-1 = 9 \Rightarrow n = 10$